

ДЕМОГРАФІЯ, ЕКОНОМІКА ПРАЦІ, СОЦІАЛЬНА ЕКОНОМІКА І ПОЛІТИКА

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LOSSES OF HUMAN CAPITAL IN THE REGIONS OF UKRAINE DURING THE PERIOD OF RUSSIAN MILITARY AGGRESSION

The purpose of the work is to study the loss of human capital in Ukraine and its regions during the latest Russian-Ukrainian war, which began in 2014. The study of the loss of human capital in Ukraine and its regions during the period of Russian military aggression was carried out in three stages. At the first stage, direct losses of this capital during 2014–2021 were calculated. The second and third stages of this study are devoted to the study of indirect losses of this capital, respectively, for the same period and the period after the full-scale invasion of Russian troops on February 24, 2022. The conducted studies showed that during the Russian military aggression, the human capital of Ukraine suffered significant losses. The calculation of direct losses of this capital showed that these losses for the period of 2014–2021 amounted to 1994,55 thousand people on an average annual basis. The largest direct losses of the HC of Ukraine were experienced in the Donetsk, Dnipropetrovsk, Kharkiv and Zaporizhzhia regions, and the smallest – in the Chernivtsi, Kyiv, Volyn and Ivano-Frankivsk regions. Studies of indirect losses of human capital before and after a full-scale invasion by the Russians also indicate their significant volumes. The largest volumes of indirect losses of human capital were observed after the full-scale Russian invasion of the country on February 24, 2022. According to the number of damaged, destroyed and destroyed educational, cultural and health care institutions in the regions of Ukraine after that date, the greatest losses of human capital were incurred in the Donetsk, Kyiv, Luhansk, Mykolaiv, Kharkiv, Kherson and Chernihiv regions.

Key words: human capital, region, direct loss of human capital, indirect loss of human capital, Russian military aggression, full-scale invasion of Russian troops into Ukraine.

JEL classification: O15, C80

Statement of the problem. The Russian military aggression, which began in 2014, significantly affected all aspects of public life and the economy of Ukraine. The country's human capital (HC), which mainly ensures its socio-economic development, also suffered significant losses. This became especially noticeable after the full-scale Russian invasion of Ukraine on February 24, 2022. Activation of migration processes, negative natural population growth, unemployment, underemployment, the collapse of the economy and the breakdown of partnership ties between business structures, the destruction and destruction of many educational, cultural and health care institutions, the mobilization of a significant number of the population to the ranks of the Armed Forces of Ukraine negatively affected the level of development of this capital.

One of the primary tasks that will be faced by Ukraine after its successful conclusion of the Russian-Ukrainian war will be to overcome its consequences, in particular,

to restore the losses suffered by human capital during this war throughout the country and its regions. After all, HC is closely related to the growth of the region's economy. It increasingly affects the level, pace of development and competitiveness of the region. It is also an important part of the knowledge-based economy. Its «value and level directly affect innovation processes, as well as the processes of creation and transfer of knowledge and technologies» [1]. According to the research of scientists, human capital is the most important factor of production because it explains a significant part of the regional dispersion [2]. Therefore, scientific studies of human capital, in particular its losses in Ukraine in the process of Russian military aggression, are needed, not only on a national scale, but also on a regional scale.

Analysis of recent research and publications. A number of scientists and practitioners were engaged in researching the loss of human capital during the Russian-

Ukrainian war of 2014. In particular, certain aspects of the investigated problem at the first stages of this war are considered in the scientific article of Y. Matsievskiy [3] and an analytical report prepared by the author's team of employees of the National Academy of Sciences of Ukraine [4]. The overall losses of the Ukrainian economy, including the losses of human capital from the beginning of this war to the moment of the full-scale invasion of the Russians, are quite fully covered in the analytical report of the National Institute of Strategic Studies of Ukraine [5], and the problems of internally displaced persons in the country in the first weeks of this invasion – in the scientific article of E. Libanova [6]. In this publication, the author made an attempt to assess the scale of refugees and determine the priority actions of the state leadership to ensure their employment and relatively satisfactory living and living conditions.

An in-depth study of the losses and gains of the Ukrainian Armed Forces as a result of the full-scale Russian invasion on February 24, 2022 was made by scientists of the Institute of Industrial Economics of the National Academy of Sciences of Ukraine Y. Zaloznova and N. Azmuk. In the work of these scientists, the main direct (migration, loss of the civilian population, forced "evacuation", military deaths) and indirect (not using the intellectual and creative potential to the full extent, destruction of the educational infrastructure, implantation of a foreign language and culture, temporary suspension of the educational process, decrease its qualities) the human losses of the country, as well as the gains of this capital during this short period of Ukraine's existence [7]. However, the analysis of the results of scientific research in these publications indicates the insufficiency of practical materials on the indicated issues, especially at the regional level.

Objectives of the article. The purpose of this work is to study the losses suffered by human capital in the regions of Ukraine during the latest Russian-Ukrainian war.

The study of regional losses of the (HC) Ukrainian Armed Forces during the period of Russian military aggression is complicated by the absence of the necessary statistical data for certain periods of time and the division of these losses into direct and indirect. In this regard, our scientific research was carried out in three stages. At the first stage of our research, following the terminology proposed in the paper [7], calculated direct losses of human capital in the regions of Ukraine for 2014–2021. At the second stage, some indirect regional losses of HC during the same years were investigated. At the third stage, certain indirect losses of this capital in the regions of Ukraine after the full-scale invasion of Russian troops into Ukraine on February 24, 2022 until today were studied.

Summary of the main research material. I. Analysis of direct losses of human capital in the regions of Ukraine for the period 2014–2021. The concept of human capital is understood differently by different scientists. For example, some scientists understand this economic category as a stock of habits, knowledge, social and personal attributes (including creativity), embodied in the ability to perform work for the purpose of obtaining economic benefits [10; 11], others – as a value that, when applied, brings income to the owner and values that have the ability to achieve and multiply income and other benefits [12].

Other definitions of this concept can be given. For example, human capital is a capital asset and the result of the development of physical, mental, intellectual, ethical and other qualities of the population, which has the property of acting as an inherited or acquired territorially defined condition for satisfying certain consumer needs, can be an object of investment and provide the owner of capital (innovation medium) income (rent) [13]. An overview of the definitions of the studied concept by other scientists is presented in the article [12].

Differences in scientists' understanding of the concept of human capital lead to ambiguity in assessing losses of this capital. In particular, L. Halkiv uses the method of multidimensional comparative analysis to empirically evaluate the dynamics of these losses. This scientist believes that the structure of the HC consists of seven aggregated indicator systems: 9 primary demographic indicators, 13 socio-demographic indicators, 5 economic indicators, 9 socio-economic indicators, 11 social-psychological indicators, 4 environmental indicators and 3 socio-political indicators (indices of democracy, freedom of the press and perception of corruption) indicators. Statistical, administrative and analytical data and data of international organizations are proposed to be considered as information sources for such a study [8]. Another scientist to analyze such losses used a set of indicators based on the methodology of assessing this capital by the World Economic Forum and the Organization for Economic Cooperation and Development [9]. To carry out the specified procedure, these institutions consider not only quantitative, but also qualitative indicators. However, when calculating the quantitative losses of HC, this scientist did not take into account the amount of hidden unemployment in the country, that is, the loss of human capital due to forced underemployment or, in other words, due to vacations without salary.

The use of a sufficiently large number of primary factors that characterize these losses for the analysis of HC losses does not make sense because it will complicate calculations and will not lead to more accurate results and better conclusions. After all, the main volume of these losses is determined by only a few primary factors, and others have a minor influence on these losses. For example, the value of the indicator "loss of human capital from accidents (acute occupational diseases (poisonings/accidents) with fatal consequences and due to temporary disability of victims of accidents that ended in the reporting year" increases the volume of these losses in the region, but very insignificantly. Therefore, in our calculations, we will limit ourselves to a small number of these primary factors, the analysis of the dynamics of which will show the general trends of such losses.

Based on the information available in statistical sources, for the assessment of direct regional losses of human capital of Ukraine, at the first stage of this analysis, we will limit ourselves to the following quantitative primary indicators that characterize this capital: natural and migration growth (abbreviations are marked with the sign "–") of the population; the number of unemployed, calculated according to the methodology of the International Labor Organization (ILO); the number of people convicted by court verdicts that have entered into legal force; loss of human capital due to forced underemployment of part of

the employees, i.e. forced vacations without salary (for the period of termination of work). In the table 1 shows the direct losses of HC for 2021.

It can be seen from Table 1 that in 2021, the largest losses of HC in Ukraine were due to unemployment and natural and migratory reduction of the population, and the smallest – due to forced underemployment. Although in Kyiv region, unlike other regions, natural and migration growth was positive, that is, the population increased. As for other regions, the largest losses of HC due to natural and migratory population reduction this year were in Dnipropetrovsk, Donetsk, Kharkiv and Zaporizhzhia regions, and the smallest – in Zakarpattia, Volyn, Chernivtsi and Rivne regions.

The largest number of unemployed among the regions of Ukraine this year was in the Dnipropetrovsk and Donetsk regions and the city of Kyiv, and the smallest in the Chernivtsi, Rivne, Sumy and Ivano-Frankivsk regions. The number of people convicted according to court verdicts that entered into force in 2021 did not significantly affect the losses of HC this year. The largest number of such persons were in Dnipropetrovsk, Kharkiv, Donetsk and Odesa regions, and the least in Ternopil, Chernivtsi, Ivano-Frankivsk, Luhansk and Khmelnytskyi regions. The value of the indicator «the number of full-time employees who were in conditions of forced underemployment» had an even smaller effect on the value of the investigated losses of HC. Among the regions of Ukraine, Zaporizhzhia,

Dnipropetrovsk, and Kharkiv regions had the largest number of such workers, and Rivne, Chernivtsi, Vinnytsia, and Zhytomyr regions had the least.

Studies of the values of component losses of HC in the regions of Ukraine for 2014–2020 showed that the structure of these losses is approximately the same as in 2021, with the exception of some deviations. In particular, the natural and migration growth of the population in the city of Kyiv was negative (the population decreased) only in 2020 and 2021, and during all previous years it was positive (the population increased). In addition, the value of this indicator was positive in Rivne Oblast in 2014–2016, Zakarpattia Oblast in 2014, and Dnipropetrovsk Oblast in 2017. For Ukraine as a whole, due to the natural and migratory reduction of the population, the losses of HC are increasing from year to year. In particular, in 2014, these losses amounted to 143,82 and in 2021 – 421,02 thousand people. The number of convicts, on the contrary, decreased from 102,2 in 2014 to 64,12 thousand people in 2021. According to the ILO methodology, the number of unemployed initially decreased from 1847,1 thousand people in 2014 to 1486,9 thousand people in 2019, and then increased to 1709,5 thousand people in 2021.

Compared to the previous year, the total direct losses of HC in Ukraine increased in 2015 and 2021 and decreased in 2016 and 2019 (Table 2). In the average annual measure for the period 2014–2020, these direct losses amounted to 1994,55 thousand people.

Table 1 – Amounts of direct losses of human capital in the regions of Ukraine in 2021 (thousands of people)

Region / Indicator	Natural and migration growth (abbreviations are indicated by the sign “-”) of the population	The number of convicted persons whose court decisions have entered into force	The number of full-time employees who were under conditions of forced part-time employment	Unemployed population (according to the ILO methodology)	Total losses of HC
Ukraine	-421,02	64,12	24,18	1709,5	2182,62
Vinnytsya	-19,61	2,7	0,20	77	98,31
Volyn	-6,04	1,9	0,30	52,4	60,14
Dnipropetrovsk	-45,55	8,3	2,93	131	185,58
Donetsk	-40,91	3,9	1,98	126,8	171,89
Zhytomyr	-16,46	2,1	0,23	60,5	78,89
Zakarpattia	-5,65	2	0,38	60,6	66,73
Zaporizhzhya	-28,05	3,1	4,65	86	120,20
Ivano-Frankivsk	-9,29	1,4	0,30	51,3	61,49
Kyiv	6,55	2,1	0,93	57,3	52,28
Kirovohrad	-16,42	1,8	0,40	53,6	71,32
Luhansk	-18,40	1,5	0,53	53	72,73
Lviv	-19,62	4	1,13	85,7	109,65
Mykolaiv	-16,57	1,7	0,53	59,4	76,00
Odesa	-16,72	3,4	0,63	76,6	96,55
Poltava	-19,25	3	1,33	78,1	100,58
Rivne	-6,67	1,9	0,08	48,6	56,65
Sumy	-17,68	2,4	0,90	49,8	68,78
Ternopil	-8,85	1,1	0,43	52,8	62,38
Kharkiv	-34,87	4,8	2,78	85	122,05
Kherson	-15,11	2	0,43	56,5	73,14
Khmelnytskyi	-14,96	1,5	0,80	56,6	72,86
Cherkasy	-17,52	1,8	0,55	54,8	72,97
Chernivtsi	-6,11	1,1	0,18	37,9	44,19
Chernihiv	-17,39	1,7	0,53	56,1	74,92
City of Kyiv	-9,88	2,9	1,13	102,1	112,41

Source: calculated by the authors based on [14]

As can be seen from the table. 2, for 2014–2021. The largest direct losses of the HC of Ukraine were experienced in the Donetsk, Dnipropetrovsk, Kharkiv and Zaporizhzhia regions, and the smallest – in Chernivtsi, Kyiv, Volyn and Ivano-Frankivsk regions. If until 2019, the first place in terms of these losses was occupied by Donetsk, then from 2020 – Dnipropetrovsk region. If in all regions of Ukraine the studied annual losses of HC have increased during this time, then in Donetsk and Luhansk regions they have decreased. During the studied period, these losses increased with the greatest acceleration in the city of Kyiv, Zaporizhzhia, Volyn and Kirovohrad regions, and the least acceleration – in Kyiv, Rivne and Cherkasy regions.

II. Analysis of indirect losses of human capital in the regions of Ukraine for the period 2014–2021. In addition to direct or quantitative losses, Russian aggression led to qualitative or indirect losses of human capital of Ukraine. The main expressions of these losses are losses of educational and scientific capital and health capital, which can be estimated with the help of experts. The lack of expert data forces us to look for other ways of approximating the loss of these capitals. They can be determined indirectly or indirectly with the help of some statistical indicators. In particular, indirect losses of educational and scientific capital can be roughly estimated using the following statistical indicators: the number of persons who studied in professional (vocational and technical) education institutions; the number of persons who studied at institutions of higher education; the number of researchers involved in scientific research and development. To assess the health capital, such primary indicators as the number

of doctors of all specialties and the number of average medical personnel can be used.

According to statistical data, the number of students and trainees of vocational and technical educational institutions in Ukraine in 2021 decreased by 21% compared to 2014. The value of this indicator decreased during this period in all regions of Ukraine (excluding Crimea, Donetsk and Luhansk Oblasts), with the exception of Odesa Oblast, where this indicator increased by 52%. The largest such decrease for the period from 2014 to 2021 was observed in the city of Kyiv (by 28%), Lviv (30%), Ternopil (29%), Khmelnytskyi and Chernihiv (27% each), and the smallest – in Mykolaiv (10%), Rivne (11%), Kharkiv (12%), Zaporizhzhia and Kyiv (13% each) regions.

The value of the indicator "number of students of higher education institutions" also decreased by 46% in Ukraine for the period from 2014 to 2021. Moreover, the decrease in the value of this indicator also occurred in all regions of Ukraine (excluding Crimea, Donetsk and Luhansk regions), with the exception of Odesa region, where its value increased by 24%. During this period, the value of this indicator decreased the most in Chernihiv (by 59%), Kirovohrad (58%), Zhytomyr, Rivne, Sumy and Kherson (49% each), and the least in Cherkasy (by 19%), Lviv (20%) and Zakarpattia (23%) regions.

To a certain extent, the HC of the region is indirectly characterized by the value of the indicator «the number of researchers involved in the performance of scientific research and development». Due to the lack of statistical data on the value of this indicator in the regions of Ukraine in 2021, this value was studied for 2013–2020 (Table 3).

Table 2 – Amounts of direct losses of human capital in the regions of Ukraine in 2014–2021 (thousands of people)

Region / Year	2014	2015	2016	2017	2018	2019	2020	2021	Average annual losses of HC
Ukraine	1845,15	2126,33	1947,07	1989,77	2026,78	1916,99	1921,66	2182,62	1994,55
Vinnitsya	76,97	90,11	83,09	90,00	95,96	90,31	90,04	98,31	89,35
Volyn	38,89	47,83	47,56	54,38	57,11	53,61	51,85	60,14	51,42
Dnipropetrovsk	135,77	163,43	150,70	132,98	163,29	159,86	164,04	185,58	156,96
Donetsk	221,83	256,69	154,87	178,05	167,34	160,02	154,11	171,89	183,10
Zhytomyr	67,20	78,72	75,37	75,77	75,85	74,68	70,97	78,89	74,68
Zakarpattia	45,11	55,74	55,66	59,95	61,93	61,11	57,34	66,73	57,95
Zaporizhzhya	75,31	90,01	99,95	102,90	108,32	103,24	104,64	120,20	100,57
Ivano-Frankivsk	45,99	50,35	55,92	57,90	57,87	54,69	54,32	61,49	54,82
Kyiv	50,92	64,78	54,54	39,54	43,79	43,03	49,41	52,28	49,79
Kirovohrad	47,57	59,96	60,42	65,69	65,65	64,37	62,46	71,32	62,18
Luhansk	90,80	129,84	70,63	89,84	78,25	72,57	65,69	72,73	83,79
Lviv	91,37	107,21	98,68	98,50	98,89	94,12	97,06	109,65	99,43
Mykolaiv	50,76	60,32	60,98	65,08	69,13	66,66	65,50	76,00	64,30
Odesa	66,10	83,83	78,92	82,19	84,92	76,53	79,47	96,55	81,06
Poltava	71,86	92,73	98,57	100,55	96,27	90,69	91,15	100,58	92,80
Rivne	52,13	58,62	55,28	61,00	65,80	57,07	51,64	56,65	57,27
Sumy	55,86	63,79	64,48	61,95	63,77	62,20	58,23	68,78	62,38
Ternopil	51,69	59,26	63,15	63,51	63,43	57,33	58,18	62,38	59,87
Kharkiv	103,04	124,62	118,96	99,23	105,31	94,42	100,68	122,05	108,54
Kherson	53,24	58,87	60,26	67,37	66,74	63,46	62,09	73,14	63,15
Khmelnytskyi	59,60	64,38	69,88	67,56	63,10	61,35	59,42	72,86	64,77
Cherkasy	67,62	71,88	72,39	74,47	76,36	73,06	67,95	72,97	72,09
Chernivtsi	31,77	38,75	41,42	39,22	38,53	37,44	36,70	44,19	38,50
Chernihiv	62,80	69,23	65,51	69,78	70,08	67,53	66,47	74,92	68,29
City of Kyiv	64,73	85,44	89,76	94,17	89,10	77,69	102,06	112,41	89,42

Source: calculated by the authors based on [14]

This table also shows the basic growth rate of the studied indicator in 2020 compared to 2013, which is calculated according to the formula

$$T_{ij}^k = \frac{x_j^k}{x_i^k} \cdot 100\%, \quad (1)$$

where T_{ij}^k – the basic growth rate for the k -th region in the j -th year to the i -th year as a percentage (the j -th year is current and the i -th year is the base),

x_i^k – value of the investigated indicator for the k -th region in the i -th year.

As statistics show, approximately half of all researchers in Ukraine involved in scientific research and development were located in Kyiv. The value of this indicator for the country as a whole during the Russian military aggression decreased annually, with the exception of 2020. During this year, the number of researchers in the country increased by 306 people, or by 0,6%. Despite this growth, the value of the studied indicator for Ukraine for the period from 2013 to 2020 decreased by 33,94%. The highest chain growth rates (calculated by formula (1) when the j -th year is the current one and the i -th year is the previous to the current one in percentage) of this indicator were observed in 2016 (99,7%) and 2020 (100,6%), and the smallest – in 2014 (89,15%) and 2019 (88,71%).

As for the regions, in some of them the number of researchers even increased during the specified period. Such an increase occurred in the following regions: Khmelnytsky (by 59.35%), Ternopil (37.69%), Ivano-

Frankivsk (23.42%) and Mykolaiv (5.56%). In the Rivne region, the number of researchers has not changed during this time.

According to the value of the indicated indicator, the largest losses of the HC suffered (without taking into account the Autonomous Republic of Crimea, Donetsk and Luhansk regions) in the Kirovohrad, Volyn, Poltava and Sumy regions. After all, its basic growth rate in 2020 compared to 2013 for these regions was the lowest.

For an indirect assessment of the loss of health capital, we will consider the dynamics of the indicators "Number of doctors of all specialties" and "Number of secondary medical personnel" in Ukraine and its regions. The value of the first of these indicators decreased by 3,41% from 2014 to 2020 in the country as a whole. Although in Kyiv and Khmelnytskyi region it increased by 4,38 and 0,63 percent, respectively. The largest losses of HC for the specified period, determined on the basis of the decrease in the number of doctors, were in Kherson (base growth rate in 2020 to 2014 was 87,34%), Mykolaiv (87,61%), Kirovohrad (89,94%), Cherkasy (90,70%) and Chernihiv (91,48%) regions.

During the Russian military aggression, the number of secondary medical personnel decreased much more than the number of doctors. The basic growth rate for this indicator in 2020 to 2014 for Ukraine as a whole was 81,49%. In the regional section, the greatest losses in terms of the value of this indicator were experienced by human capital in the Kherson, Mykolaiv, Chernihiv, Sumy, Vinnytsia and Ternopil regions.

Table 3 – The number of researchers involved in scientific research and development in the regions of Ukraine in 2013–2020 (persons) and the base rate of growth in 2020 to 2013 in percent

Region / Year	2013	2014	2015	2016	2017	2018	2019	2020	Basic growth rate in 2020
Ukraine	77853	69404	63864	63694	59392	57630	51121	51427	66,06
Vinnytsya	442	479	364	491	445	447	324	301	68,10
Volyn	224	145	166	211	277	265	176	103	45,98
Dnipropetrovsk	6892	6531	6344	6039	5604	5216	4394	4168	60,48
Donetsk	5230	2657	1797	146	170	158	284	236	4,51
Zhytomyr	229	222	166	251	302	244	189	180	78,60
Zakarpattia	416	363	316	453	344	314	325	288	69,23
Zaporizhzhya	1837	1646	1553	1458	1508	1295	1467	1310	71,31
Ivano-Frankivsk	316	311	310	440	483	492	395	390	123,42
Kyiv	1543	1437	1351	1156	1120	1098	1081	982	63,64
Kirovohrad	365	370	347	348	382	353	121	120	32,88
Luhansk	734	233	165	195	186	168	150	155	21,12
Lviv	3422	3239	2967	3542	3622	3862	3140	3056	89,30
Mykolaiv	809	766	767	816	1023	1073	669	854	105,56
Odesa	2342	2129	2030	2525	2173	1818	1622	1462	62,43
Poltava	827	775	710	1013	878	763	460	391	47,28
Rivne	203	172	147	267	275	232	195	203	100,00
Sumy	1429	1271	1238	1840	1098	888	499	708	49,55
Ternopil	199	204	163	325	302	293	98	274	137,69
Kharkiv	12685	11853	10928	11380	9988	9528	8345	7965	62,79
Kherson	616	609	425	468	509	472	348	386	62,66
Khmelnytskyi	123	132	113	251	321	295	308	196	159,35
Cherkasy	605	554	490	481	449	449	347	337	55,70
Chernivtsi	451	416	390	620	641	569	467	418	92,68
Chernihiv	367	363	302	305	284	265	218	224	61,04
City of Kyiv	33309	32527	30315	28673	27008	27073	25499	26720	80,22

Source: calculated by the authors based on [14]

III. Analysis of indirect losses of human capital in the regions of Ukraine for the period after the full-scale invasion of Russian troops on February 24, 2022.

After the full-scale invasion of the Russians on the territory of Ukraine on February 24, 2022, human capital suffered even greater losses. The Russian aggressor is waging a war to destroy the Ukrainian people and the state of Ukraine as such. They destroy not only military facilities, but also civilian ones. Institutions of education, culture, and health care are specially damaged or destroyed, which directly affects the decrease in the level of development of the HC of the country and its regions. For example, the destruction by the Russians as a result of an aerial bombing of the building of the Donetsk Drama Theater in Mariupol, which was used as a bomb shelter, was deliberate and brought significant losses to the (HC) city's defense forces. It is rather problematic to estimate these and other losses of HC within the country or its regions. Indirectly, they can be estimated by the amount of destruction that the Russian barbarian inflicts on Ukraine.

Due to the paucity of statistical data, the work analyzed losses of HC in the regions of Ukraine based on rocket and other shelling of educational institutions, theaters, hospitals, churches, etc. In the table 4 shows the number of damaged, destroyed and destroyed educational, cultural and health care institutions in the regions of Ukraine for the period from February 24 to the beginning of December 2022. If two numbers are indicated in the cell of the table, then the first of them means the corresponding amount until the end of August, and the second – until the beginning of December 2022.

Institutions of education, culture and health care suffered the greatest destruction in the initial period of this stage of the war. If by the beginning of September 2022 educational facilities 2381 were damaged and destroyed, then after this date until the beginning of December 2022 – 404 facilities.

Among the regions, the north-eastern, eastern and south-eastern regions of Ukraine were the most affected, where the occupier conducted the most active military operations. In the Volyn, Zakarpattia, Ivano-Frankivsk, and Chernivtsi regions, not a single one was damaged, and in the Lviv, Rivne, and Khmelnytsky regions – only a few objects in the considered area.

In total, 2442 educational institutions were damaged and 343 were destroyed in Ukraine. Among the regions, educational institutions were the most affected in the Donetsk, Kharkiv, Mykolaiv, Kyiv, Luhansk and Dnipropetrovsk regions. Among the 1100 damaged and destroyed health care facilities across the country, the largest number are located in the Kharkiv, Donetsk, Mykolaiv, Kyiv and Chernihiv regions.

During the full-scale aggression of Russian troops, a total of 244 cultural institutions were damaged, 158 were destroyed, and 43 were destroyed throughout Ukraine. Among the regions, the most affected cultural objects were in the Donetsk, Kharkiv, Luhansk, Kyiv and Chernihiv regions.

Conclusions. During the period of Russian military aggression in 2014, the human capital of Ukraine suffered significant losses. In the process of researching these losses, they were divided into direct and indirect. Calculated in

Table 4 – The number of damaged, destroyed and destroyed educational, cultural and health care institutions in the regions of Ukraine since the full-scale invasion of Russian troops on February 24, 2022

Name of the region	Education		Culture			Health care
	damaged	destroyed	damaged	destroyed	destruction	damaged and destroyed
Vinnitsya	20	0	1	1	0	9
Volyn	0	0	0	0	0	0
Dnipropetrovsk	48/142	5/6	5/7	0	0	20/41
Donetsk	585/682	61/65	29/36	57/64	18	177/210
Zhytomyr	76/80	1	4	1	0	25
Zakarpattia	0	0	0	0	0	0
Zaporizhzhya	11	89/127	10/14	6/7	1	38/47
Ivano-Frankivsk	0	0	0	0	0	0
Kyiv	178/180	13	29	14	2	121
Kirovohrad	3/9	0	0	0	0	0
Luhansk	147/164	17/22	20	23	6	28/29
Lviv	1	0	1/2	0	0	0
Mykolaiv	184/211	23/25	5/6	4/5	2	135/148
Odesa	16/21	0	3	1	0	2
Poltava	10/11	0	0	0	0	3
Rivne	2	0	0	0	0	1
Sumy	91	1	14	3	3	38/41
Ternopil	2	0	0	0	0	0
Kharkiv	472/517	31/47	66/69	23/24	6/7	171/249
Kherson	70/84	12/23	1/2	1	0/2	62/65
Khmelnytskyi	5	0	0	0	0	0/1
Cherkasy	11	0	0	0	0	1
Chernivtsi	0	0	0	0	0	0
Chernihiv	103	12	21	12	1	64/66
City of Kyiv	78/94	0	4/16	0/2	0/1	32/41

Source: calculated by the authors according to statistical data [14]

the work at the first stage of the performed research, the amount of direct losses of HC for the period 2014–2021 in the average annual measure was 1994,55 thousand people. The largest direct losses of the HC of Ukraine were experienced in the Donetsk, Dnipropetrovsk, Kharkiv and Zaporizhzhia regions, and the smallest – in the Chernivtsi, Kyiv, Volyn and Ivano-Frankivsk regions.

The assessment of indirect losses of HC is carried out in the work in the following two stages. The second stage of the conducted research is devoted to the study of indirect losses of this capital in the regions of Ukraine before the full-scale invasion of Russian troops on February 24, 2022 for the period from 2014 to 2021 using statistical information from the educational and scientific sphere and the sphere of health care, and the third stage is to study these losses after a full-scale Russian invasion. Studies of

indirect losses of HC during the period of Russian military aggression showed their significant amounts. For example, the number of researchers involved in scientific research and development in Ukraine for the period from 2013 to 2020 decreased by 33.94%. According to the value of the indicated indicator, the largest losses of the HC suffered (without taking into account the Autonomous Republic of Crimea, Donetsk and Luhansk regions) in the Kirovohrad, Volyn, Poltava and Sumy regions.

The largest volumes of indirect losses of HC were observed after the full-scale Russian invasion of the country on February 24, 2022. In terms of the number of damaged, destroyed and destroyed educational, cultural and health care facilities in the regions of Ukraine after that date, the largest losses were incurred by HC in the Donetsk, Kyiv, Luhansk, Mykolaiv, Kharkiv, Kherson and Chernihiv regions.

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ВТРАТИ ЛЮДСЬКОГО КАПІТАЛУ В РЕГІОНАХ УКРАЇНИ ЗА ПЕРІОД РОСІЙСЬКОЇ ВІЙСЬКОВОЇ АГРЕСІЇ

Метою роботи є дослідження втрат людського капіталу в Україні і її регіонах за час новітньої російсько-української війни, яка розпочалася у 2014 р. Вивчення регіональних втрат ЛК України за період російської військової агресії ускладняється відсутністю за певні періоди часу необхідних статистичних даних і поділ цих втрат на прямі і непрямі. У зв'язку з цим, вивчення втрат людського капіталу в Україні і її регіонах за період російської військової агресії виконано у три етапи. На першому етапі розраховано прямі втрати цього капіталу протягом 2014–2021 років. Другий і третій етапи даного дослідження присвячено вивченню непрямих втрат цього капіталу відповідно за цей же період і період після повномасштабного вторгнення російських військ 24 лютого 2022 року. Виконані дослідження показали, що за час російської військової агресії людський капітал

України зазнав суттєвих втрат. Розрахунок прямих втрат цього капіталу показав, що ці втрати за період 2014–2021 роки в середньорічному вимірі становили 1994,55 тис. осіб. Найбільших прямих втрат ЛК України зазнав у Донецькій, Дніпропетровській, Харківській і Запорізькій областях, а найменших – у Чернівецькій, Київській, Волинській та Івано-Франківській областях. Крім прямих чи кількісних втрат, російська агресія привела до якісних чи непрямих втрат людського капіталу України. Основними виразниками цих втрат є втрати освітньо-наукового капіталу і капіталу здоров'я, оцінити які можна за допомогою експертів. Дослідження непрямих втрат людського капіталу до і після повномасштабного вторгнення росіян також вказують на значні їх обсяги. Найбільші обсяги непрямих втрат людського капіталу спостерігались після повномасштабного російського вторгнення у країну 24 лютого 2022 року. За кількістю пошкоджених, зруйнованих та знищених закладів освіти, культури і охорони здоров'я в регіонах України після цієї дати найбільші втрати людський капітал поніс у Донецькій, Київській, Луганській, Миколаївській, Харківській, Херсонській і Чернігівській областях.

Ключові слова: людський капітал, регіон, прямі втрати людського капіталу, непрямі втрати людського капіталу, російська військова агресія, повномасштабне вторгнення російських військ в Україну.
