УДК 316.62

Sydorov, M., Salnikova, S., & Severyn, A. (2024). (Non-)Return of Ukrainian War Refugees: Modeling Repatriation Using Logistic Regression. *Sociological Studios*, 2(25), 81–93. https://doi.org/10.29038/2306-3971-2024-02-33-33

(Non-)Return of Ukrainian War Refugees: Modeling Repatriation Using Logistic Regression

Микола Сидоров –
кандидат фіз.-мат. наук, доцент, зав.кафедри методології та методів соціологічних досліджень, КНУ імені Тараса Шевченка

Mykola Sydorov –
PhD in Mathematics, Associate Professor, Head of the Department of Methodology and Methods of Sociological Research, Faculty of Sociology, Taras Shevchenko National University of Kyiv, Ukraine
E-mail: myksyd@knu.ua
ORCID: https://orcid.org/0000-0002-5333-8393

Світлана Сальнікова –
кандидат соц. наук, доцент кафедри методології та методів соціологічних досліджень, КНУ ім. Тараса Шевченка

Svitlana Salnikova –
PhD in Sociology, Associate Professor, Department of Methodology and Methods of Sociological Research, Taras Shevchenko National University of Kyiv, Ukraine.
E-mail: sv.salnikova@gmail.com
ORCID: https://orcid.org/0000-0001-6368-9480

Анна Северин –
студентка магістратури соціології, факультет соціології, КНУ імені Тараса Шевченка

Anna Severyn –
Master's student in sociology, Faculty of Sociology, Taras Shevchenko National University of Kyiv, Ukraine.
E-mail: severyn7b@gmail.com
ORCID: https://orcid.org/0009-0006-4610-5432

DOI: 10.29038/2306-3971-2024-02-33-33

Received: June 25, 2024
1st Revision: August 26, 2024
Accepted: December 18, 2024

The scale of forced migration of Ukrainians following the full-scale Russian invasion of Ukraine on February 24, 2022, population losses, destruction of infrastructure, and other consequences underscore the importance of addressing the issue of return migration. The return of forced migrants from Ukraine is a significant phenomenon that arises in socio-demographic and economic contexts and requires theoretical revision and conceptual clarification. The purpose of this study is to develop predictive models for the repatriation of Ukrainian war refugees and to evaluate the factors that decrease the likelihood of their return. The authors used the Factum Group dataset, focusing on Ukrainian women who left Ukraine after the full-scale invasion and did not return from emigration, to obtain a sample of forcibly displaced Ukrainian migrant women. Repatriation models were constructed using logistic regression, applied to the overall dataset, and to subsamples from Germany and Poland – countries that received the largest number of Ukrainian war refugees. The assumption that return factors depend on the host country was confirmed. Repatriation models for Germany and Poland demonstrate higher accuracy than the general model and reveal distinct sets of factors influencing the (non-)return of war refugees. In Germany, key factors include the standard of living, availability of work abroad, overall life satisfaction, and prior residence in areas of Ukraine unaffected by active hostilities. For Poland, the significant factors are overall life satisfaction and the intention to return. It was found that not all factors influencing the decision to leave the country – such as region, availability of financial resources, knowledge of a foreign language, and family status – are significant for the decision to return. The repatriation models demonstrate a high level of accuracy in predicting negative cases and moderate accuracy in predicting positive cases, with cases of uncertainty excluded from the regression analysis. These findings confirm that factors related to economic stability, social comfort, and personal intentions are fundamental for predicting the likelihood of (non)return among Ukrainian female migrants.

Key words: war refugees, forced migration, repatriation model, logistic regression, migration factors, repatriation factors.

Сидоров Микола, Сальнікова Світлана, Северин Анна. (Не)повернення українських біженців війни: побудова моделей репатріації засобами логістичної регресії. Масштаби вимушеної міграції українців опісля повномасштабного вторгнення росії на територію України 24 лютого 2022 року, утрати населення, знищення інфраструктури тощо, актуалізують питання зворотної міграції. Повернення вимушених українських мігрантів є важливим дослідницьким феноменом, що постає в соціально-демографічному й економічному контекстах та потребує теоретичного переосмислення й концептуального ускладнення. Метою цього дослідження є побудова прогнозних моделей репатріації українських біженців війни та оцінка факторів, що знижують рівень їхнього повернення. Автори здійснили відбір за умовами виїзду з України опісля повномасштабного вторгнення та неповернення з еміграції українських жінок на масиві даних від Factum Group, щоб отримати вибірку українських вимушених мігрантів. Моделі репатріації побудовані за допомогою логістичної регресії на загальному масиві даних та на підвибірках Німеччини й Польщі як країнах, які прийняли найбільше біженців війни з України. Підтвердилося припущення про те, що чинники повернення залежать від країни, у якій перебувають мігранти. Для Німеччини домінуючими є економічний та безпековий фактори; для Польщі – фактори соціального комфорту й особистих намірів. Установлено, що не всі фактори, які стосуються рішення виїхати з країни – це регіон, наявність фінансових ресурсів, знання іноземної мови та сімейний статус, є значущими для рішення повернутися. Моделі репатріації мають високий рівень правильного прогнозування негативних випадків і помірну точність прогнозів щодо позитивних випадків, випадки невизначеності не включалися до регресійних моделей.

Ключові слова: біженці війни, вимушена міграція, модель репатріації, логістична регресія, фактори міграції, фактори репатріації.

INTRODUCTION

The Russo-Ukrainian War and Forced Migration

Discussions around forced migration emerged as a result of mass refugee movements during World War I, and later after World War II; a surge of interest in emigration occurred in the early 1990s, just at the end of the Cold War (Fiddian-Qasmiyeh et al., 2014, p. 26). The 2014 Russian-Ukrainian War caused one of the largest waves of forced migration of Ukrainians and added new emphasis to migration research.

According to the Ministry of Foreign Affairs of Ukraine, the civil network OPORA recorded 8,2 million Ukrainians living abroad as of June 21, 2023 (OPORA, 2023). «In response to the request from the Civil Network OPORA, the Ministry of Foreign Affairs reported that as of June 21, 2023, 8,177 million Ukrainians were staying abroad». Almost half of these Ukrainians are in just three countries: Poland (22 %), Germany (15 %), and the USA (11 %).

As per the latest update on December 16, 2024, from the UN Refugee Agency (UNHCR, 2024), 6,813,900 Ukrainian refugees have been registered since the start of the war on February 24, 2022. Despite different approaches to estimating the number of Ukrainian refugees, it is clear that Ukraine's population losses are significant. The Demographic Development Strategy of Ukraine for the period until 2040 records a population reduction in the first two years from the beginning of the large-scale invasion in 2022 by 15 %, taking into account territories not controlled by Ukrainian authorities, and by 25 % in territories controlled by Ukrainian authorities (Ministry of Social Policy of Ukraine, 2024).

«A large number of refugees means a loss of the working population, tax revenues, a significant part of the consumer market, and a significant number of qualified specialists who may not return» (The Cost of the State, 2024). Therefore, numerous sociological studies attempt to track the intentions of Ukrainian citizens to return or not return to Ukraine. Unfortunately, in addition to the complexities of fixing the status of Ukrainian citizens abroad, the UNHCR methodology does not allow for the analysis of the actual number of Ukrainians returning across Europe.

The Purpose of the Study and Its Place Among Other Studies of Forced Migration

Summarizing the main directions of research on forced migration over the past twenty-five years, scientists Stepputat and Sørensen (2014) from the Danish Institute for International Studies highlight several key points: (1) Distinction Between Voluntary and Forced Migration: They note the difficulty in clearly distinguishing between voluntary and forced migration due to new areas and processes, where this distinction is either hard to draw or loses analytical meaning; (2) Theoretical Understanding and Conceptual Complexity: There is a lack of theoretical understanding and conceptual complexity in the field of forced

migration research; (3) Focus on Political Issues: There is a tendency to limit the study of forced migration to political issues.

However, they emphasize that a theoretical approach to forced migration must consider the global context, where political and economic factors interact to create conditions for mass movements of people. This study aligns with these directions and aims to build predictive models of the repatriation of Ukrainian war refugees, assessing the factors that reduce their return. While most studies focus on the motives behind forced migration (van Tubergen et al., 2024), our study seeks to identify the reasons for the return of migrants, i.e., the factors influencing repatriation.

1. ANALYSIS OF THE MAIN RESEARCH ON THIS PROBLEM

1.1. Theoretical Framework of Research on (Re-)Migration

Migration researchers note that the boundaries between forced and economic migration are becoming increasingly blurred (Castles, 2003; Stepputat & Sørensen, 2014). This is due to the fact that countries experiencing economic development often face numerous domestic political problems, such as government corruption and human rights violations (Salnikova, Muradyan, & Sydorov, 2020). As a result, many migrants and asylum seekers have a variety of reasons for their migration, making it difficult to completely separate economic motives from legal ones (Castles, 2003).

Forced migration differs from voluntary migration in the factors that compel people to leave their homes. Researchers distinguish four types of forced migration, which can sometimes be combined, namely: migration caused by conflict; migration due to environmental disaster; migration due to economic development projects (e.g., dams, mining); migration due to human trafficking (White, 2016, p. 605).

The large-scale Russian invasion of Ukraine in 2022 caused a massive wave of forced migration of Ukrainians, primarily due to the environmental disaster resulting from the explosion of the Kakhovka reservoir dam by Russian forces[1]. Thus, the term «war refugees» is used to describe Ukrainians who have moved outside the borders of Ukraine[2].

Within the framework of migration research, scholars propose using several theoretical approaches[3] (King & Kuschminder, 2022, p. 6). In the context of forced migration due to war, one can appeal to the theory of structuralism, which considers migration as a consequence of global economic and political structures that create inequality and force people to migrate. This approach associates migration with colonialism, capitalism, and imperialism. The Russian-Ukrainian war and its consequences, as well as the migration wave of the 1990s, are linked to Ukraine's post-colonial past. Ukraine's colonial past hindered the formation of stable political and economic structures, and the promise of a democratic European future prompted Ukrainian citizens to seek stability outside their state borders. Since the war impacts all spheres of life, these intentions among Ukrainians only intensify.

Social network theories consider migration as a result of the social ties and networks people have with other migrants. This concept explores how migration networks facilitate the migration process and influence

[1] Russia caused a large-scale humanitarian and environmental disaster by blowing up the Kakhovka HPP dam. URL: https://war.ukraine.ua/crimes/russia-blew-up-the-kakhovka-dam-causing-disaster/

[2] There is a distinction in the interpretation of the concepts of «*refugee*» and «*forced migrant*». The term «refugee» is applied to a person who left the administrative borders of the Motherland and received legal status in the host country, and also did not have the opportunity to choose a new place of residence due to lack of time, while forced migrants have more opportunities to plan their move (Baranyak, 2023, p. 3). In the case of Ukrainian migrants who left the state borders from February 24, 2022, both terms are relevant: some Ukrainians were taken to special camps for refugees from the war zone, others left on their own and partly moved from country to country in search of a better place.

[3] Some of these approaches are more concerned with voluntary economic migration, either by (1) viewing migration as a rational choice of individuals seeking to maximize their well-being by moving from places with low wages and opportunities to places with better economic conditions (neoclassical economics), or (2) focusing on the impact of migration on the labor market and economy of sending and receiving countries in terms of wages, employment, and economic growth (new labor economics of migration), or (3) examining the transnational ties that migrants maintain with their countries of origin, studying how migrants send remittances, maintain family ties, and influence the politics and culture of their countries of origin (*transnationalism*).

the behavior and choices of migrants. Ukrainians used existing ties to migrate and find places to settle, network for support of Ukraine, seek work, employment, and more. Clearly, connections with other migrants and those who remained in Ukraine impact the decision or desire to return to Ukraine.

The authors of the article on the challenges of forced migration in the experience of Ukraine argue that migration unfolds between the place of origin and the place of arrival, as well as on the plane of time among the past, present and future. The migration experience is dynamic, constantly transforming through the interaction between the migrant and the society they find themselves in. Therefore, it is worth distinguishing three levels of arrival: individual, interactional, and institutional (Fiddian-Qasmiyeh et al., 2014, p. 27). On the other hand, the return of migrants to their home country – whether through repatriation or remigration – is an equally important phenomenon that significantly impacts the lives of individuals, their families, and society, especially in the context of forced migration caused by war, persecution, or natural disasters. The consequences of return migration are reflected across social, demographic, political, cultural, and economic levels. In Ukraine today, the topic of returning citizens from abroad is primarily considered at demographic and economic levels (Ministry of Social Policy of Ukraine, 2024).

As mentioned in the introduction, migrants are a large socio-demographic potential and economic capital that leaves their homes in search of a better life and security, but has a significant impact on the country of origin. King and Kuschminder (2023) identified general trends in the consequences of return migration – particularly the return of capital and skills. Ukraine experienced such a stage during the 1990s and early 2000s[1], when economic migrants sent their earnings to their relatives in Ukraine, thereby supporting the economy. However, this support primarily went towards the consumption economy (purchasing real estate, household items, education, etc.) rather than entrepreneurship.

The current wave of migration is more powerful, "washing out" not only the existing workforce from Ukraine but also the potential one (including children), creating competition in the labor market of mainly European countries. Thus, the historical development of discussions around forced migration and different approaches to the demographic and economic roles of migrants reflect changes in global economic and political contexts that affect perceptions and policies regarding migrants and refugees in general. Ukraine is interested in the mass return of its citizens but, due to the protracted war, it cannot offer them favorable economic conditions in the labor market or security for daily living.

1.2. Forced Migration: The Ukrainian Context (in the Context of (Non-)Return)

The full-scale invasion threatened the inhabitants of all regions of Ukraine. The state was not prepared for the large number of internally displaced people who had to adapt to the new reality, although certain changes were being introduced (Mikheieva, Sereda, & Kuzemska, 2023). Since the beginning of 2022, there has been significant heterogeneity in the trajectories of forced migration experiences. Departure from the place of residence can begin with the status of an internally displaced person (IDP) and, over time, transform into other migration statuses, such as refugees (asylum seekers) or labor migrants (Mikheieva & Jaroszewicz, 2023, p. 122).

It is worth mentioning the study on the independent decision of Ukrainian citizens to go abroad (van Tubergen et al., 2024). The authors consider both economic and non-economic motives, including the security motive – fleeing from violence and seeking protection and security for oneself and/or loved ones. In the context of these motives, the decision to (not) return can be examined: if the desire to emigrate, or the economic motive, arose before the war, then the migrant, having taken advantage of the opportunity to leave the country, will most likely not return. However, if the security motive was dominant, then the chances of returning are higher, although they largely depend on the region from which they left.

Researchers identify several key factors that stimulated emigration and influenced the choice of a country for residence: region, availability of financial resources, knowledge of a foreign language, and family status (van Tubergen et al., 2024). Neighboring countries such as Poland, the Czech Republic, and Germany have become significant centers for Ukrainian refugees, necessitating the introduction of new social protection systems to promote refugee integration. Researchers Jirka, Kamionka, and Macková (2023)

[1] Researchers call the stage that emerged in the 1990s and 2000s the era of neoliberalism, when remittances, savings, and entrepreneurship were considered the driving force behind the development of the home country (King, & Kuschminder, 2022, p. 12).

point out that the authorities of host countries ensured Ukrainian migrants were welcomed hospitably. However, just as before the Great War, neighboring countries did not consider the level of human capital of the newcomers, offering mainly low-skilled work. Thus, millions of forced migrants have been employed mainly in the service sector, i.e., in public catering, hotels, trade, care, and less frequently in agriculture and logistics. In their study, scientists cite several reasons for the difficult entry of Ukrainians into the foreign labor market: many were mothers with children who had no one to care for them, a lack of knowledge of the host country's language, and the expectation and readiness to return to Ukraine at any moment.

The first year of the invasion was characterized by a wave of migration and remigration: the return of Ukrainians in 2022 was associated with the desire to see their relatives, resume work, avoid losing their jobs, and the availability of housing. However, the main obstacle to return was security concerns (Mikheieva, Sereda, & Kuzemska, 2023, p. 203). Some Ukrainians, mainly from the Western and Central regions, visited Ukraine while in exile. Among those who left during the war, 60 % had never visited Ukraine (Tkalych, Skrypchenko, & Duhnich, 2023, p. 12).

In April 2023, 4Service recorded the following sentiments of forced migrants: 72 % plan to return home after the war ends, while 16 % intend to stay and live abroad (The cost of the state, 2024). In August 2023, RatingGroup stated that 49 % of Ukrainians who moved after the invasion would not want to stay and live abroad. Almost every fifth person was hesitant to return or stay, while the rest were considering permanent residence abroad. The key factors influencing the decision not to return, according to researchers, are (1) the opportunity to live a comfortable life and achieve success and (2) the availability of education and housing (this influence is less pronounced) (Tkalych, Skrypchenko, & Duhnich, 2023, p. 39).

All surveys of Ukrainians abroad reveal a predictable trend: the percentage of migrants who plan to return is decreasing, while those who plan to stay are increasing. Ella Libanova, Director of the Institute of Demography and Social Research named after M. V. Ptukha and a member of the National Academy of Sciences of Ukraine, claims that we can expect the return of about a third of forced migrants, as approximately that many returned in all Balkan countries after the Balkan wars (Matveychuk, 2024).

2. RESEARCH METHODOLOGY

2.1. Data

As part of the research on Ukrainian refugees, conducted by the independent company Factum Group Ukraine within the framework of the regular «YOUkraina» social research, a quantitative online study (CAWI) was carried out during the field stage from July 15 to August 10, 2023.

The target population was male and female Internet users aged 18 to 55 who, before the full-scale Russian invasion (excluding temporarily occupied territories and Crimea), lived in Ukrainian cities with a population of over 50,000 people and subsequently moved abroad.

The study involved a sample of N=1400 respondents, divided into two groups: G1 (700 respondents) who were still abroad at the time of the survey, and G2 (700 respondents) who had already returned (Factum Group, 2023).

A quota sampling method was used, taking into account age, gender, regional structure and type of settlement based on data from the State Statistics Committee of Ukraine before the full-scale invasion. The study was conducted in two stages. In the first stage, a sampling quota was established among individuals who lived in Ukraine before the war. In the second stage, respondents were asked about their current place of residence, which allowed identifying those who are currently abroad or have returned to Ukraine. The initial sample included approximately 10,000 individuals, from which 1,499 valid responses were received from war refugees and returnees.

2.2. Select Cases

To build a repatriation model, we selected observations under the following conditions:

- Departure from Ukraine after the start of the full-scale invasion on February 24, 2022.
- Non-return to Ukraine at the time of the survey. Thus, we will analyze only group G1.
- Female gender. The motives for leaving and (non-)returning to Ukraine for men and women differ due to problems with border crossing by men, mobilization processes in Ukraine. Additionally, the number of male respondents in the dataset is insufficient for analysis (19 % of men are internally displaced persons).

Therefore, we will build a repatriation model on a sample of female individuals who left Ukraine after the full-scale invasion and did not return at the time of the survey.

In the next step, we selected only those respondents who answered the question about the possibility of returning to Ukraine: «Do you plan to return to live in Ukraine?». The answers had three options: 1) plan to return, 2) undecided/refusal to answer, 3) do not plan to return. For the analysis, we excluded individuals who were undecided or did not answer this question, and the characteristic itself was recoded into a dichotomous variable: 1 – plan to return, 0 – do not plan to return.

The total number of such respondents in all countries where the study was conducted is 398 people. The distribution of respondents by country of residence at the time of the survey is presented in table 1.

Table 1

Distribution of Respondents by Country of Residence

Country of Residence	Germany	Poland	Czech Republic	Italy	Romania	Other Countries
Number of respondents	107	89	28	17	14	143

Source: author's calculations.

Among other assumptions, we considered that the chance of return might be influenced by the region of Ukraine[1] from which refugees moved. Therefore, we recoded the variable Oblast (Region of residence before the start of the full-scale invasion) into a variable Zone with three categories:

1. Territories under occupation or where active hostilities were taking place (Kyiv and the region, Donetsk, Zaporizhia, Luhansk, Mykolaiv, Sumy, Kharkiv, Kherson, and Chernihiv).
2. Territories near active hostilities (Dnipropetrovsk, Kirovohrad, Odesa, and Poltava).
3. Territories where or near which active hostilities did not take place (Vinnytsia, Volyn, Zhytomyr, Zakarpattia, Ivano-Frankivsk, Lviv, Rivne, Khmelnytskyi, Cherkasy, and Chernivtsi).

The distribution according to the new attribute is presented in table 2.

Table 2

Distribution of Respondents by Region of Residence Before the Start of the Full-Scale Invasion

Region	1	2	3
Number of Respondents	289	68	41

Source: author's calculations.

Data analysis was performed in the R package[2].

2.3. Repatriation Models: Logistic Regression and Factors

When constructing a repatriation model, we estimate the probability that the respondent will return. This involves modeling a dichotomous attribute with two outcomes: 0 – will not return, and 1 – will return. One of the convenient tools for constructing such a model is logistic regression, where the dependent variable is the return itself.

The choice of factors for constructing a logistic regression model that estimates the probability of migrants returning to Ukraine is justified by their influence on the decision to return.

One of the key aspects is the **availability of work**, as it directly affects the economic stability of the migrant. If she works abroad, this may reduce the probability of return, since work abroad usually provides a stable income, which is an important factor for people who have adapted to new conditions. On the other hand, the lack of work may encourage return if there are employment opportunities in Ukraine (Variable Work0 – «Are you currently working?»).

[1] We use different approaches to distinguish regions of Ukraine in studies related to the war in Ukraine (Sydorov, Salnikova, & Dembitskyi, 2024).

[2] R Core Team (2024). _R: A Language and Environment for Statistical Computing_. R Foundation for Statistical Computing, Vienna, Austria. <https://www.R-project.org/>.

Another important factor is the comparison of the **standard of living** that a migrant could afford in Ukraine with the standard of living abroad. If the standard of living abroad is higher, this may reduce the desire to return, as people often stay in a country with better living conditions. On the other hand, if conditions abroad do not provide the desired standard of living, this may stimulate the decision to return home, where the environment is familiar, sources of income are available, and living opportunities are present (Variable LifeLevel3 – «Compared to the standard of living that you could afford in Ukraine, your standard of living abroad…»).

Proficiency in the **language** of the host country is another important factor. If the respondent has a good command of the language, this facilitates her integration and adaptation to the local environment, which may reduce the desire to return to Ukraine. At the same time, if the language barrier is significant, this may encourage her to return, as communication difficulties create a feeling of isolation and discomfort (Variable Lang4. «Rate your level of proficiency in the language of the host country»).

The **size of the family living abroad** should also be taken into account. If most of the migrant's relatives are in Ukraine, this may create an emotional incentive to return, especially if there is a need to care for elderly relatives or restore ties with loved ones. If the family is abroad, the woman may feel less attached to Ukraine, which reduces the likelihood of returning (Variable HHSize – «How many people in your family, including you, live abroad?»).

Another factor is the **attitude towards emigration before the start** of the full-scale invasion. If the respondent was already considering the possibility of emigration before the war, this may indicate a greater tendency to remain abroad after the war, since her life circumstances were not limited only by the war. If she did not plan to emigrate before the war, this may increase the likelihood of returning, since the decision to leave was determined only by the extraordinary circumstances of the war (Variable IntentionBW – «Have you considered temporary or long-term emigration before the full-scale invasion?»).

The **comfort** that a woman feels abroad is also a significant factor. The feeling of comfort, which includes social, economic, and cultural aspects, can significantly influence the decision to return. If a respondent feels comfortable, she will be less likely to return, since adaptation to new conditions significantly reduces the need to return home (Variable OverallSatisfaction – «How comfortable you currently feel abroad, taking into account all aspects of life comprehensively?»).

An equally important factor is the **security** factor, **namely proximity to the front line**. If a respondent lived in a combat zone or close to the front line before emigration, this may increase her desire to stay abroad, where security is at a higher level (Variable Zone – «Region of residence before the start of the full-scale invasion»).

Thus, each of these factors provides important information for predicting the likelihood of Ukrainian female migrants returning home. They reflect the economic, social, cultural, and security aspects of life abroad and in Ukraine, which allows for the formation of a sound model for assessing the chance of return.

3. RESULTS OF LOGISTIC REGRESSION

3.1. General Repatriation Model

A logistic regression model was constructed to estimate the probability of return of Ukrainian female migrants. The model included 398 observations, and the dependent variable was Tech.Return, which indicates the probability of return to Ukraine (1 – plan to return, 0 – do not plan). The model type is binary logistic regression with a logit function, which allows estimating the probability of return based on independent variables. The statistical significance of the model is confirmed by $\chi^2(8) = 98{,}75$, $p = 0{,}00$, which indicates its adequacy and ability to explain the data.

The results of the model (see Fig.1) show a significant impact of several variables on the probability of return. In particular, factors such as work abroad (Work0), standard of living (LifeLevel3), family size (HHSize), intention to return (IntentionBW), and overall satisfaction (OverallSatisfaction) are statistically significant ($p < 0{,}05$). However, the variables of language proficiency (Lang4) and zone of residence (Zone) did not show a statistically significant effect on the probability of return, indicating their smaller contribution to the decision-making process. According to the results obtained, the factors of economic stability, social comfort, and personal intentions are the main ones for predicting the probability of return of Ukrainian female migrants.

```
MODEL INFO:
Observations: 398
Dependent Variable: Tech.Return
Type: Generalized linear model
  Family: binomial
  Link function: logit


MODEL FIT:
χ²(8) = 98.75, p = 0.00
Pseudo-R² (Cragg-Uhler) = 0.42
Pseudo-R² (McFadden) = 0.34
AIC = 212.27, BIC = 248.15


glm(formula = Tech.Return ~ Work0 + LifeLevel3 + Lang4 + HHSize + IntentionBW +
OverallSatisfaction + Zone, family = binomial("logit"),
    data = dat)

Coefficients:
                   Estimate Std. Error z value Pr(>|z|)
(Intercept)         10.1458     1.4765   6.872 6.34e-12 ***
Work0                0.5441     0.2297   2.369  0.01784 *
LifeLevel3          -0.6059     0.2460  -2.463  0.01376 *
Lang4               -0.2023     0.1762  -1.148  0.25088
HHSize              -0.4247     0.1424  -2.982  0.00287 **
IntentionBW         -0.7097     0.2385  -2.975  0.00293 **
OverallSatisfaction -1.0395     0.2611  -3.982 6.84e-05 ***
Zone2               -0.7526     0.4903  -1.535  0.12479
Zone3               -0.4860     0.5471  -0.888  0.37435
```

For model optimization, we applied the method of building a logistic model with stepwise variable selection.

```
MODEL INFO:
Observations: 398
Dependent Variable: Tech.Return
Type: Generalized linear model
  Family: binomial
  Link function: logit


MODEL FIT:
χ²(5) = 94.75, p = 0.00
Pseudo-R² (Cragg-Uhler) = 0.41
Pseudo-R² (McFadden) = 0.32
AIC = 210.27, BIC = 234.19


glm(formula = Tech.Return ~ Work0 + LifeLevel3 + HHSize + IntentionBW +
OverallSatisfaction, family = binomial("logit"), data = dat)

Coefficients:
                   Estimate Std. Error z value Pr(>|z|)
(Intercept)         9.4680     1.3689   6.917 4.62e-12 ***
Work0               0.6033     0.2122   2.842 0.004476 **
LifeLevel3         -0.6380     0.2398  -2.661 0.007799 **
HHSize             -0.4227     0.1326  -3.188 0.001435 **
IntentionBW        -0.7787     0.2355  -3.306 0.000945 ***
OverallSatisfaction -1.0201     0.2528  -4.036 5.45e-05 ***
```

Fig. 1. *General Repatriation Model*

Source: author's calculations.

The resulting optimized general model does not include the variables Lang4 and Zone, as they are not significant. However, this model is built for respondents from all countries participating in the study. We assume that there may be differences for different countries, at least for these variables.

The overall accuracy of the model is 89,7 % (95 % CI: 0,8628, 0,9251). Compared to the «No Information Rate» (87,94 %), this result indicates that the model exceeds the level of random predictions. Sensitivity is 33,33 %, which indicates that the model correctly classifies only a third of the real positive cases (class «1», corresponding to those who plan to return). On the other hand, specificity is 97,4 %, showing that the model has a high level of correct prediction of negative cases (class «0» – do not plan to return). However, the positive predicted value (Pos Pred Value) is 64 %, which is average, indicating moderate accuracy of predictions for positive cases. At the same time, the negative predicted value (Neg Pred Value) is 91,42 %, indicating reliable predictions for negative cases.

The balanced accuracy is 65,38 %, reflecting the weak value of sensitivity and specificity and providing a minimum estimate of the model considering class imbalance. Cohen's Kappa coefficient is 0,3878, indicating a satisfactory agreement between the model predictions and the actual results.

3.2. Repatriation Model: Germany

A logistic regression model was constructed based on 107 observations to estimate the probability of return of Ukrainian female migrants from Germany. The result was obtained using the same method of building a logistic model with stepwise variable selection. It is statistically significant ($\chi^2(6) = 34,80$, $p = 0,00$) and has good Pseudo R^2 indicators (Cragg-Uhler = 0,49, McFadden = 0,39), which indicates the adequacy of the model and its ability to explain variation in the data. The AIC (69,49) and BIC (88,20) indices confirm the optimality of the model for current data set.

```
glm(formula = Tech.Return ~ Work0 + LifeLevel3 + HHSize + OverallSatisfaction
+ Zone, family = binomial("logit"), data = germany)

Coefficients:
                   Estimate Std. Error z value Pr(>|z|)
(Intercept)          9.2411     2.6992   3.424 0.000618 ***
Work0                1.0681     0.4823   2.215 0.026793 *
LifeLevel3          -1.1582     0.4982  -2.325 0.020076 *
HHSize              -0.4165     0.2292  -1.817 0.069241 .
OverallSatisfaction -0.9901     0.4595  -2.155 0.031167 *
Zone2               -1.2219     0.9593  -1.274 0.202730
Zone3               -2.5930     0.9419  -2.753 0.005908 **
```

Fig. 2. *Repatriation Model: Germany*

Source: author's calculations.

As can be seen from the model (see Fig. 2), the standard of living abroad (LifeLevel3) has a negative effect on return ($p = 0,00$), indicating a decrease in the probability of return in the case of better living conditions abroad. Additionally, the presence of work abroad (Work0), overall life satisfaction (OverallSatisfaction), and factors related to geographical location (Zone2 and Zone3) showed statistical significance. This confirms the influence of economic and security conditions on the decision to return. It should be noted that language knowledge is also not significant for Germany.

The significantly lower value of the Akaike AIC index indicates a higher relative quality of the model obtained for Germany compared to the general model. The overall accuracy of the model is 88,79 %, indicating that the model correctly classifies 88,79 % of the observations (95 % CI: 0,8123, 0,9407). Compared to the «No Information Rate» (85,05 %), this result indicates that the model outperforms chance predictions. An important characteristic is the sensitivity, which is 50 %, indicating that the model correctly classifies half of the real positive cases (class «1», corresponding to those who plan to return). On the other hand, the specificity is 95,6 %, showing that the model has a high level of correct prediction of negative cases (class «0» – not planning to return). However, the positive predicted value (Pos Pred Value) is 66,67 %, which is average, indicating moderate accuracy of predictions for positive cases. At the same time, the negative predicted value (Neg Pred Value) is 91,579 %, indicating reliable predictions for negative cases.

The balanced accuracy of 72,8 % is a satisfactory value of sensitivity and specificity and provides a balanced assessment of the model considering class imbalance. However, Cohen's Kappa coefficient is 0,50, indicating moderate agreement between the model predictions and the actual results (see Fig. 3).

```
          Reference
Prediction  0  1
         0  8  4
         1  8 87


               Accuracy : 0.8879
                 95% CI : (0.8123, 0.9407)
    No Information Rate : 0.8505
    P-Value [Acc > NIR] : 0.1719

                  Kappa : 0.5084

 Mcnemar's Test P-Value : 0.3865

            Sensitivity : 0.50000
            Specificity : 0.95604
         Pos Pred Value : 0.66667
         Neg Pred Value : 0.91579
             Prevalence : 0.14953
         Detection Rate : 0.07477
   Detection Prevalence : 0.11215
      Balanced Accuracy : 0.72802



       'Positive' Class : 0
```

Fig. 3. *Evaluation of the Repatriation Model, Germany*

Source: author's calculations.

3.3. Repatriation Model: Poland

A similar analysis for Poland (see Fig. 4) based on 89 observations also showed statistically significant results ($\chi^2(5) = 30{,}26$, $p = 0{,}00$) with Pseudo R^2 (Cragg-Uhler = 0,6, McFadden = 0,52) and AIC = 40,04. In this case, overall life satisfaction (OverallSatisfaction) and intention to return (IntentionBW) were found to be key factors reducing the likelihood of return. Family size (HHSize), standard of living (LifeLevel3), and availability of work (Work0) did not show a significant impact on the decision to return.

```
glm(formula = Tech.Return ~ Lang4 + IntentionBW + OverallSatisfaction + Zone,
family = binomial("logit"), data = poland)

Coefficients:
                    Estimate Std. Error z value Pr(>|z|)
(Intercept)          15.7049     5.0532   3.108  0.00188 **
Lang4                -0.7393     0.4646  -1.591  0.11154
IntentionBW          -1.7816     0.6749  -2.640  0.00829 **
OverallSatisfaction  -2.2447     1.0362  -2.166  0.03029 *
Zone2                -0.2854     1.1036  -0.259  0.79594
Zone3                18.5696  2719.5270   0.007  0.99455
```

Fig. 4. *Repatriation Model, Poland*

Source: author's calculations.

This model is also better than the general one. It should be noted that the presence of work and family relations are not significant for Poland in our study, and language, although not significant, is present in the final model. The overall accuracy of the model (see Fig. 5) is 93,26 % (95 % CI: 0,859, 0,9749). Compared to the «No Information Rate» (89,89 %), this result indicates that the model exceeds the level of chance predictions. Sensitivity is 55,56 %, indicating that the model correctly classifies more than half of the real positive cases (class «1», corresponding to those who plan to return). On the other hand, specificity is 97,5 %, showing that the model has a high level of correct prediction of negative cases (class «0» – not planning to return). However, the positive predicted value (Pos Pred Value) is 71,43 %, which is average, indicating moderate accuracy of predictions for positive cases. At the same time, the negative predicted value (Neg Pred Value) is 95,12 %, indicating reliable predictions for negative cases.

The balanced accuracy of 76,53 % reflects satisfactory sensitivity and specificity, providing a balanced assessment of the model considering class imbalance. Cohen's Kappa coefficient is 0,59, indicating moderate, closer to high, agreement between the model predictions and the actual results.

CONCLUSSION AND DISCUSSION

The scope of forced migration of Ukrainians as a result of Russia's full-scale invasion of Ukraine on February 24, 2022, has added a new direction to migration research. This requires a theoretical understanding of forced migration within the context of political, economic, and security interactions, as well as the methodological complexity of such studies. The return of migrants, also known as repatriation or remigration, is becoming a more important phenomenon in socio-demographic and economic contexts, despite the fact that the consequences of return migration are reflected at all levels: social, demographic, political, cultural, and economic.

```
Reference
Prediction  0  1
         0  5  2
         1  4 78


               Accuracy : 0.9326
                 95% CI : (0.859, 0.9749)
    No Information Rate : 0.8989
    P-Value [Acc > NIR] : 0.1923

                  Kappa : 0.5886

 Mcnemar's Test P-Value : 0.6831

            Sensitivity : 0.55556
            Specificity : 0.97500
         Pos Pred Value : 0.71429
         Neg Pred Value : 0.95122
             Prevalence : 0.10112
         Detection Rate : 0.05618
   Detection Prevalence : 0.07865
      Balanced Accuracy : 0.76528



       'Positive' Class : 0
```

Fig. 5. *Evaluation of the Repatriation Model, Poland*

Source: author's calculations.

The war is becoming the main motive for the 2022 migration wave, but researchers do not consider this process simple and one-sided. Van Tubergen et al. (2024) distinguish among economic and security factors those that stimulated emigration and the choice of a country for life: the region of residence before making the decision to migrate, the availability of financial resources, knowledge of a foreign language, and family status. Similarly, the 2022 remigration wave was motivated by various factors: the desire to see relatives, the resumption of work and the unwillingness to lose a job, and the availability of housing (Mikheieva, Sereda, & Kuzemska, 2023, p. 203). Researchers identify the key factors for non-return as the opportunity to live a comfortable life and achieve success (Tkalych, Skrypchenko, & Duhnich, 2023, p. 39).

In order to build predictive models of the repatriation of Ukrainians, it is essential to consider the motives for emigration, as they play a role in deciding whether to return as a result of forced migration. To build a repatriation model, we used logistic regression, as in the study of migration motives (van Tubergen et al., 2024). Linear regression, which RatingLab used to identify the intentions and motives of Ukrainians to stay or return (Matveychuk, 2024), is not a relevant method for forecasting. The regression analysis was conducted on the «YOUkraina» social research dataset (Factum Group, 2023) with a preliminary selection of cases according to the conditions of (1) departure from Ukraine after February 22, 2024, (2) non-return to

Ukraine as of August 10, 2023 – the survey period, and (3) belonging to the female gender (the main reasons being the size of the subsample of men did not allow the application of regression analysis, and the motives of (re)migration of men differ significantly from those of women). To more clearly define the factors in logistic regression, the repatriation model was built on a sample of those who decided to (not) return as a result of forced migration, with cases of those who were undecided removed from the analysis.

We believe that forced migrants from Ukraine should not be considered as a single group. War refugees often independently chose their host country, each of which has a different standard of living and opportunities to help refugees. However, for comparison, we first built a general model of repatriation (N=398), which confirmed the factors we identified at the stage of building the conceptual model. In particular, it demonstrated the significance of almost all factors (availability of work abroad, standard of living, family size, intention to return, and general satisfaction with life), in addition to language proficiency and area of residence before emigration.

On the one hand, we received confirmation that the factors of economic stability, social comfort, and personal intentions are among the main ones in the model for predicting the probability of (non-)return of Ukrainian female migrants. On the other hand, these same factors differ not only at the individual level but also in different countries. To test the impact of the selected factors on the likelihood of women returning, an analysis was conducted on data concerning women residing in Poland and Germany – countries with the largest number of Ukrainian war refugees, and thus the largest subsamples in the total dataset.

We constructed separate repatriation models for each country. Both repatriation models turned out to be of higher quality than the general model, with significantly better indicators of adequacy and explanatory power, and the set of factors differed. For Germany, these factors are the standard of living, the availability of work abroad, general life satisfaction, and distance from the zone of active hostilities; the dominant factors are economic and security. For Poland, these factors are general life satisfaction and the intention to return; the dominant factors are social comfort and personal intentions.

It turned out that not all factors (region, availability of financial resources, knowledge of a foreign language, and family status) relating to the decision to leave the country (van Tubergen et al., 2024) are significant for the decision to return.

Analysis of the obtained models shows their high overall accuracy and exceeding the level of chance predictions. Additionally, the repatriation models have a high level of correct prediction of negative cases (those who answered that they do not plan to return to Ukraine have finally decided) and moderate accuracy of predictions for positive cases. Considering the trend of the return of forced migrants is downward, it is possible to determine only the percentage of those who will not return; however, those who have not decided and who plan to return are a potential percentage of repatriates. Further research requires constant monitoring of the remigration sentiments of Ukrainians who have become forced migrants, but with a detailed study for each country separately.

Creating favorable conditions, ensuring guarantees of security, work, and a decent life should become one of the components of post-war reconstruction in Ukraine (Dembitskyi et al., 2024), as these are the most important prerequisites for the return of Ukrainians (The cost of the state, 2024). However, in the words of Ella Libanova, «every month of the war contributes to the adaptation of our migrants abroad and destroys the infrastructure in Ukraine» (Matveychuk, 2024). Therefore, respondents who did not respond or have not yet decided to return to Ukraine deserve a separate study.

ACKNOWLEDGMENTS AND FUNDING

The authors express their sincere gratitude to the research company FactumGroup (Ukraine) for the opportunity to participate in the study of Ukrainian migrants abroad and for the provided data sets; as well as to Yeliena Kovalska (postdoctoral researcher at the Department of History, Sociology, Empirical Education Research and Sport Science, University of Konstanz, Germany), who worked on the development of the questionnaire for this study. We are especially grateful to the Armed Forces of Ukraine, border guards and other law enforcement agencies of Ukraine for the opportunity to work on this article.

This article was prepared on a non-commercial and unpaid basis.

REFERENCES

Baranyak, I., (2023). Theoretical and Conceptual Approaches to the Research of Forced Population Migration. *Economy and Society*, 55. https://doi.org/10.32782/2524-0072/2023-55-56

Castles, S. (2003). Towards a Sociology of Forced Migration and Social Transformation. *Sociology*, 37(1), 13–34. https://doi.org/10.1177/0038038503037001384

Dembitskyi, S., Kyrychenko, R., Salnikova, S., & Sydorov, M. (2022). The Value Dimension of Public Opinion in Ukraine During the Full Scale War and Its Role for Post-War Reconstruction. *Sociological Studios*, 2(21), 42–56. https://doi.org/10.29038/2306-3971-2022-02-42-56

Factum Group (2023). YOUkraina. Special Edition: Research on Ukrainian Refugees. Retrieved June 10, 2024 from https://factum-ua.com/document/YOUkraina%20by%20Factum%20Group.%20UKRAINIANS%20ABROAD.pdf

Fiddian-Qasmiyeh, E., et al. (2014). Introduction: Refugee and Forced Migration Studies in Transition. In E. Fiddian-Qasmiyeh, and others (eds), *The Oxford Handbook of Refugee and Forced Migration Studies*. Oxford Academic. https://doi.org/10.1093/oxfordhb/9780199652433.013.0001

Jirka, L., Kamionka, M., & Macková, L. (2023). High-skilled precarity: The situation of Ukrainian refugees in the Czech Republic and Poland. *Sociological Studios*, 2 (23), 51–61. https://doi.org/10.29038/2306-3971-2023-02-24-24

King, R., & Kuschminder, K. (2022). Introduction: definitions, typologies and theories of return migration. In R. King, and K. Kuschminder (Eds.), *Handbook of return migration*. Edward Elgar Publishing. https://doi.org/10.4337/9781839100055

Matveychuk, M. (2024, December 25). "If we don't return women, men will leave". An interview with Ella Libanova. *BBCNews Ukraine*. Retrieved December 25, 2024 from https://www.bbc.com/ukrainian/articles/c70e898kqrno?fbclid=IwY2xjawHc7WpleHRuA2FlbQIxMQABHdhvull1lAJCtLq6htv-UoL_8XgjRiTpZBc-T0mwqEpTwoFuOF1y7u-NUA_aem_P0w-m4K8kDoUBKXqbekJTg

Mikheieva, O., Sereda, V. & Kuzemska, L. (2023). Forced Displacement of Ukrainians during the War: Patterns of Internal and External Migration (2014–2022). In B. Madlovics & B. Magyar (Ed.), *Russia's Imperial Endeavor and Its Geopolitical Consequences: The Russia-Ukraine War, Volume Two* (pp. 199–228). Budapest, Hungary: Central European University Press. https://doi.org/10.1515/9789633866528-011

Mikheieva, O., & Jaroszewicz, M. (2023). Editorial Introduction: Migration Dynamics, Trajectories and Policies in the Context of Russian Full-Scale Aggression against Ukraine. *Central and Eastern European Migration Review*, 12(1), 115–126. DOI: 10.54667/ceemr.2023.16

Ministry of Social Policy of Ukraine. (2024). *Strategy for the demographic development of Ukraine for the period up to 2040*. MSP of Ukraine. Retrieved December 17, 2024 from https://www.msp.gov.ua/projects/870/

OPORA (2023, July 05). Number of Ukrainians and Their Migration Abroad Because of the War – Research by Civil Network OPORA. Retrieved December 17, 2024 from https://www.oporaua.org/en/viyna/24791-kilkist-ukrayintsiv-ta-yikh-migratsiia-za-kordon-cherez-viinu-doslidzhennia-gromadianskoyi-merezhi-opora-24791

Salnikova, S., Muradyan, O., & Sydorov, M. (2020). International Macrosocial Indicators as Analytical Tools in Sociology. *Sociological Studios*, 2 (17), 41–54. https://doi.org/10.29038/2306-3971-2020-02-41-54

Stepputat, F., & Sørensen, N. N. (2014). Sociology and Forced Migration. In E. Fiddian-Qasmiyeh, and others (eds), *The Oxford Handbook of Refugee and Forced Migration Studies.* Oxford Academic. https://doi.org/10.1093/oxfordhb/9780199652433.013.0036

Salnikova, S., Sydorov, M., & Dembitskyi, S. (2024). (Non-)Exposure to Active Combat Zones and Forced (Non-) Relocation as Factors in Stress States Among Ukrainians. *Bulletin of the National Technical University of Ukraine "Kyiv Polytechnic Institute". Political Science. Sociology. Law*, 4 (64), 35–48. https://doi.org/10.20535/2308-5053.2024.4(64).322685

The cost of the state. (2024, February 21). Migration processes: what is the situation with Ukrainian refugees? *The cost of the state*. Retrieved June 21, 2024 from https://cost.ua/migratsijni-protsesy-yaka-sytuatsiya-z-ukrayinskymy-bizhentsyamy/

Tkalych, M., Skrypchenko, T., & Duhnich, O. (2023). Comparative study: "Pan-European study of Ukrainians in Europe". *RatingLab*. Retrieved September 11, 2024 from https://ratinggroup.ua/files/ratinggroup/reg_files/rl_refugees_from_ukraine_in_the_eu_082023_ua.pdf

UNHCR (2024, 16 December). *Ukraine Refugee Situation*. UNHCR. Retrieved December 17, 2024 from https://data.unhcr.org/en/situations/ukraine

van Tubergen, F., Kogan, I., Kosyakova, Y., & Pötzschke, S. (2024). Self-selection of Ukrainian refugees and displaced persons in Europe. *Journal of Refugee Studies*, 37(1), 72–96. https://doi.org/10.1093/jrs/fead089

White, M. J. (Ed.). (2016). *International Handbook of Migration and Population Distribution*, vol. 6. NY: Springer.