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ANALYSING FORCED MIGRATION'S IMPACT ON UKRAINE'S ECONOMIC SUSTAINABILITY

Purpose. To characterize consequences of forced migration from Ukraine to European countries, quantifying its impact on economic growth, the number, income of the economically active population, investment and industry of Ukraine, and to develop recommendations for overcoming the negative economic effect of migration.

Methodology. The methods of analysis and synthesis, scientific abstraction, statistical analysis, economic and mathematical modeling, and graphical analysis were used.

Findings. The article studies the factors that caused forced migration from Ukraine's to European countries as well as the main differences in migration processes provoked by Russia's war against Ukraine are substantiated. The economic effects and consequences of its impact on the Ukrainian economy are analyzed. The study is based on statistical data characterizing economic growth (GDP) and the factors that determine it (capital investment, economically active population). On the basis of the Cobb-Douglas production function with neutral scientific and technological progress or Hicks scientific and technological progress and the use of linear regression analysis methods, the relationship between changes in the number of economically active population and economic growth is established.

Originality. A forecast of changes in GDP under the influence of forced migration of the economically active population of Ukraine in 2023 is calculated and three main scenarios of GDP dynamics are developed in accordance with these forecasts. Each of them envisages a significant drop in output under the influence of migration.

Practical value. The article proposes ways to address the problem of forced migration in Ukraine's economy and the consequences of its negative impact on sustainable development based on the experience of European countries. Ways to restore industry and attract investments to Ukraine are substantiated.

Keywords: *Cobb-Douglas production function, forced migration, employment of the population, refugees, sustainable development*

Introduction. Since Russia's invasion of Ukraine and the outbreak of war in February 2022, many people have been forced to flee to other territories and countries. This has led to a crisis of forced migration from Ukraine to the EU, the economic consequences of which are very significant for the host countries and are devastating for the Ukrainian economy.

Migration from Ukraine to the EU has an impressive scale, extensive geography of movement of temporarily displaced persons, refugees and emigrants, significant duration, structure and quantitative indicators. More than a quarter of these people are infants, children and youth under 18 (from 28 to 44 % in different countries), 87 % of migrants are women with children (65 % of them are of working age), and more than 70 % of migrants have higher education [1].

The number of refugees from Ukraine in Europe as of April 25, 2023, amounted to 8,174,779 people, 5,047,700 of them were registered as in need of temporary protection or other similar protection programs in Europe [2]. For comparison, the maximum number of refugees during the war in Syria was 6.5 million people (5.4 million in 2022), of which 51,000 people returned to Syria. During the Yugoslav wars, the number of refugees was 3.7−4 million, of which 600−800 thousand left for European countries. Danger to life and health, loss of housing, property and savings, closure of businesses, the crisis economic situation during the war, and lack of confidence in the future push Ukrainians to go abroad as refugees and persons in need of protection. The term "refugees" is used here according to the UN definition in the broadest sense − as persons who have left Ukraine.

Initially, migration from Ukraine to European countries was characterized by a brain drain, when highly skilled labor left to join European companies, and then by an outflow of workers who also migrated to find employment abroad. But at the present stage, Ukrainian migration is a forced migration − a migration with a completely new context, causes, consequences, and duration.

Migration to European countries has an impact not only on the Ukrainian economy but also on the European economy. According to economists who have studied the economic effects and consequences of international migration (A. Smith, A. Marshall, K. Marx, T. Malthus, J. M. Keynes), migration results in changes in the global labor market, disrupts the relationship between labor supply and demand in the regions, and changes in the structure and evolution of productive forces, employment, and population [3].

In the case of Ukrainian migration, which is taking place at the present stage, the economic consequences of migration are as follows: effective demand has increased in host countries, Ukrainians have replenished and created new jobs, the GDP of these countries has increased, European companies have reduced the cost of wages to employees in the face of excess labor [4]. It is the Ukrainian economy that will suffer the greatest losses as a result of this migration: a sharp drop in population, an outflow of working-age people with education and qualifications, the export of savings of the migrating population, job cuts and closure of enterprises, limited government spending on economic development, extremely low wages, etc.

In addition, the question of whether Ukrainian migrants will return home or not, and what effective measures the state and the international community should take to address this problem remain open.

Therefore, solving the problem of the impact of forced migration from Ukraine and identifying problems, consequences of migration processes, ways and methods for returning migrants back to Ukraine, and mitigating the negative effects of migration in European countries is very important and relevant.

Literature review. Many of scholars have focused on the problems of labor migration and its economic consequences

for the countries participating in the migration movement. They found that one of the factors of migration is the size of the absolute income of the population. Opportunities for higher labor income can not only improve the standard of living of households but also the incomes of other entities in the country that donates migrants as the income they receive from labor migration returns home and is transformed into demand for goods and services (Oded Stark).

It is known from migration theory that the economic effect of migration does not depend on the reasons for this process: the desire to receive higher labor and non-labor income, political conflicts and wars, the disintegration (unification) of the state, natural disasters and natural catastrophes and personal reasons, etc. Thus, as a result of migration, the recipient country receives an inflow of migrants and an increase in the supply of labor resources, while the donor country experiences a reduction in the number of labor resources.

On the one hand, the migration contributes to attracting highly educated personnel, increasing the country's productivity and competitiveness, and on the other hand, poses the threat of additional unrecoverable social costs in the recipient country, social contradictions in society, strengthening of corruption and Power-property Tendencies [5, 6]. In addition, migration has a negative impact on the economic development and progress of the country of origin, as well as the individual, causes stratification of society, becomes the basis for the decline of key industries [7].

To the greatest extent, this manifests itself in the loss of the intellectual potential of the country from which highly qualified specialists leave, as well as in the decline in the quality of its social capital, which is a necessary institutional condition for ensuring the innovative development of society [8].

Modern international migration is associated with the trends of internationalization and globalization of the modern world, when developing countries integrate actively into the world economy directing labor flows to developed countries and new industrialized countries, which is associated with the historical conditions of exchange, trade, and colonization (Massey and Taylor). Structural changes in economic relations between these countries became the basis not only for the formation of labor flows but also for their constant and sustainable movement in the late twentieth and early twenty-first centuries.

Other studies have shown that labor migration to European countries in the twentieth century was driven by the effects of business cycles (demand — pull), as well as by the chain effect (supply — push). At the present stage of development of Europe accelerated migration prevails, and one of the factors that affect migration flows is economic differences between host regions and living conditions of potential migrants, as stated in the works by Zimmerman K. F., Todaro M. P., as well as in the works by modern researchers [9]. One cannot but agree with this conclusion since these results empirically confirmed the theory of gains and losses of the two countries involved in the migration process.

The attractiveness of countries for potential migrants depends on a combination of factors, among them are: economic, socio-demographic, political and security, linguistic, cultural, and environmental factors [10]. The presence and compliance of these factors shapes the directions of migration flows in the process of international migration.

At the same time some works of scholars that are directly devoted to the analysis of forced migration of Ukrainians to European countries in connection with the war in Ukraine, present a slightly different conclusion. Scientists empirically proved that the amount of social financial assistance is not a determining factor for Ukrainian migrants [11]. The most important factors are the opportunity to find a job in the host country and the ability to adapt to new living conditions, as well as the proximity of the recipient country to Ukraine. From our point of view, such results of the analysis are due to the composition of migrants who left Ukraine. Most of them are women with certain level of education, with disposable income and savings, who have had jobs and have never lived on social benefits. However, the weakness of the study mentioned above is that it was conducted at the beginning of the war, and more accurate results could be obtained at least after a longer period.

In addition, the specific features of migration from Ukraine in the pre-war period were the prevalence of migration of the highly educated population, and later — of low-skilled labor trying to find work and employment abroad. The migration challenges of the pre-war period included high mortality and deteriorating demographics, high unemployment, low wages, and the political situation in Ukraine and the world [12]. On the other hand, Ukrainians' desire for labor migration was also caused by depopulation of the population, income differentiation and deepening poverty, insufficient state funding for healthcare, education, insufficient social security [13, 4]. Thus, in the period under review migration was exclusively economic in nature.

The forced migration of Ukrainians to European countries began in 2014 due to the outbreak of the military conflict with Russia. The search for better living conditions, the depreciation of the national currency, the crisis in Ukraine's economy, and the desire for economic and social security led to the migration of Ukrainians during this period and created a critical migration zone in Europe. The largest centers of attraction for migrants in 2014—2016 were such European countries as Portugal, the Czech Republic, Poland, Malta, Liechtenstein, and Spain.

However, the scale of migration in that period was not as significant and incomparable to modern migration. The full-scale war of 2022—2023, which resulted in more than 14 million people being forced to leave their homes, to go abroad and seek asylum, caused the largest migration to European countries in terms of its size [14]. And while in 2014—2016 migrants were mostly young people with secondary education, now they are mostly women with children with higher education who can apply for jobs in the service sector, including part-time (shift) work [15, 16].

Forced migration creates the problem of outflow of young people abroad, deterioration of the gender and age structure and "aging" of the population in the country of origin of migrants, which leads to a reduction in economic growth and a decrease in fertility [17].

At the same time there may be different scenarios for the development of migration from Ukraine to European countries [18, 19]. According to the pessimistic scenario after the war ends, some migrants who have adapted to new living conditions, found jobs, started studying and settled in a new country will not return home and will try to reunite with other family members who were in Ukraine during the war [20, 21]. In an optimistic scenario some migrants will return to Ukraine after the war ends to reunite with other family members who remained in Ukraine, but this will happen after the infrastructure (especially social infrastructure), housing, and conditions for normal life in Ukraine are restored [22, 23].

The consequences of migration from Ukraine to European countries may also have similarities with the consequences of migration from Bosnia and Herzegovina to Croatia, which took place in the 1990s during the Bosnian war when 1.8 million people were displaced [24]. Forced migration to Croatia from Bosnia and Herzegovina led to the fact that a part of the population did not return to their homeland after the war due to the post-war economic crisis, the destruction of housing, bridges, roads, social infrastructure, including schools and hospitals. The other part expects to return to Bosnia and Herzegovina upon reaching retirement age or in case of loss of refugee status, they enjoy benefits and social payments for refugees and the opportunity to work in more developed European countries (Germany, Austria). This model of forced migration is characterized by rapid adaptation of immigrants in

the new economic environment, the desire of immigrants to enjoy migration benefits, limited financial investments in the war-torn economy by the state and international organizations and, as a result, economic backwardness and decline of their home-country, its depopulation and unwillingness of migrants to return to their homeland [25].

Thus, the process of migration from Ukraine to European countries can have similar negative economic and social consequences and create new challenges for society.

Unsolved aspects of the problem. Therefore, the study of the economic effect and consequences of its impact on the Ukrainian economy as well as the development of recommendations for the return of migrants to their homeland requires a more detailed analysis and consideration of all the specifics of this process.

The purpose of the article is to characterize consequences of forced migration from Ukraine to European countries, quantifying its impact on economic growth, the number, income of the economically active population, investment and industry of Ukraine, and to develop recommendations for overcoming the negative economic effect of migration.

The authors' hypothesis is that forced migration from Ukraine to European countries will have a negative impact on real GDP in Ukraine, as the number of economically active population and the volume of capital investment will decrease. From the authors' point of view, this will have other negative economic consequences and will lead to a deterioration of the socio-economic situation in Ukraine, cause a slowdown in economic growth and limit its opportunities for sustainable economic development.

Methods. The forced migration of Ukrainian citizens which began on February 24, 2022, has a number of features that affect the current state of Ukraine's economy and will have an impact on its economic growth in the future.

Since one of the goals of this article is to substantiate the impact of forced migration on the economic situation in Ukraine the first stage of the study will be to justify the main differences in migration processes that were provoked by Russia's war against Ukraine.

1. *A large number of migrants.* According to the UN Refugee Agency's Operational Data Portal, as of May 16, 2023, the number of refugees from Ukraine registered in European countries was 8,240,289 [2]. As of January 1, 2022, the number of the current population of Ukraine (excluding the temporarily occupied territory of the Autonomous Republic of Crimea and the city of Sevastopol) was 41,167,300 people. This means that approximately 20 % of the population left the country, which is 9.8 times higher than the same figure for the entire period since gaining country's independence in 1991.

2. *A significant share of the working-age population in the age structure of migrants who left Ukraine.* Notably, a distinctive feature of the current migration wave in Ukraine is the critically large number of people of working age who make up a large share of the population involved in GDP creation. According to the UN Refugee Agency's Rapid Data Portal, as of May 10, 2023, the number of people aged from 18 to 60 who left Ukraine is approximately 54 % of the total number of migrants, or 4,284,950 people. According to the State Statistics Service of Ukraine at the end of 2021 the total number of people aged 15 to 60 was 16,617,200. This means that the number of economically active people has decreased by more than a quarter due to migration alone.

3. *A large number of children and young people aged 0 to 17 (35 % of the total number of migrants or 2,884,101 people), who can be considered as a part of generation lost for Ukraine in case they do not return to their homeland.* Consequently, this leads to an increase in the demographic burden of the unproductive population on society, as well as the level of population aging in the near future.

In our opinion the specifics of migration processes in Ukraine combined with such factors as the participation of a significant part of the working-age population in hostilities as part of the Armed Forces of Ukraine as well as the presence of a large number of people of working age on the temporarily occupied territories of Ukraine give reason to assume that the war and the wave of migration provoked by it have significantly affected the demographic situation in Ukraine. In particular:

1. Since the beginning of the war, more than 8 million people have left Ukraine, 54 % of them aged 18 to 60, which has led to a 25 % reduction in the economically active population.

2. Demographic burden indicators calculated as the ratio of the total number of people of working age and people aged 70 and older to the economically active population will have a negative upward trend. Currently, we have a temporary decrease in this indicator by 5 % as of May 2023 (43.1 % in May 2023 due to a significant share of children under 17 who went abroad, compared to 48.3 % in 2021) (Fig. 1).

The above-mentioned features of migration from Ukraine have a direct impact on changes in the size and composition of the labor force, a decrease in capital equipment and labor productivity, and consequently, on output and the real sector of the economy. Therefore, there is a need to assess the level of this impact. Justification of the method. There are many methods for assessing the negative impacts of changes in key macroeconomic indicators on a country's GDP, including methods and econometric models that describe crisis phenomena in the economy [26, 27]. In particular, various approaches exist for evaluating the impact of changes in population size on GDP. These approaches are based on the fact that the dependence between indicators is determined by function, but the variables taken as factors and the type of functional dependence in these approaches are different

$$Y = f(X_1, X_2, ..., X_n) + \varepsilon,$$

where Y is the indicator of economic growth; $X_1, X_2, ..., X_n$ are the factors that determine it in the amount of n; ε is the random error of the model.

In the context of the subject matter of the study this functional relationship will allow identifying and analyzing significant factors that affect economic growth including demographic factors. In this sense the use of the production function apparatus allows us to assess the contribution of each factor to the economic growth rate.

The concept of a production function as a model of a sufficiently large production facility or system (production association, industry, regional economy, country) is based on the assumption that the value of output is uniquely determined by the set and level of use of production factors. At the same time the internal structure of the production object under study is considered insignificant for the purposes of the study and it is assumed that production factors are used rationally.

The following types of production function are most often used for applied macroeconomic analysis: linear, Cobb-
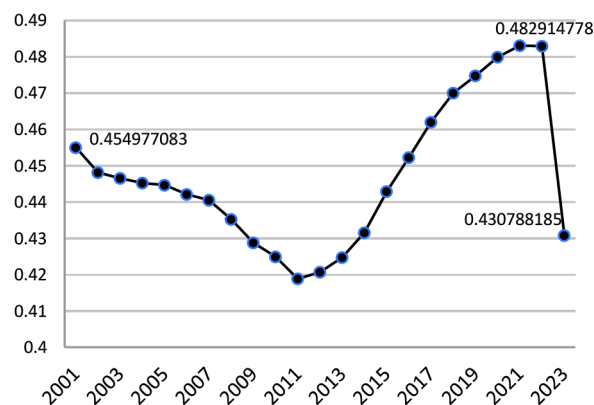

Fig. 1. Dynamics of the demographic burden ratio (2001–May 2023) [28]

Douglas, constant elasticity of substitution (CES), and Leontief function.

The advantages of using a production function to solve the problem of analytically establishing the relationship between changes in the size and composition of the economically active population and economic growth are a small number of parameters which facilitates statistical estimation, and a clear economic interpretation of the calculated model parameters.

In macroeconomic terms a production function essentially describes the relationship between total output (usually gross domestic product) and the basic costs of its production. The model also includes a constant parameter that characterizes the efficiency of the economy as a whole and can be interpreted in different ways. For example, such an indicator is Scientific and technological progress, which characterizes the impact of innovations on the country's economic development.

Taking into account the peculiarities of the study and the possibilities provided by the mathematical apparatus of production functions, in this paper the functional dependence used for modeling will be in the form of a Cobb-Douglas production function with neutral scientific and technological progress or scientific and technological progress in Hicks' sense

$$Y = A \cdot K^{\alpha} \cdot L^{\beta} + \varepsilon,$$

where Y is GDP for a given period; A is the coefficient of economic efficiency; K is capital investment for a given period; L is the economically active population; α and β are model parameters interpreted as an indicator of the elasticity of output by factors. Let us define the main parameters of the input data for building the model, in particular sources of statistical data, economic terminology, sample size, and limitations.

The statistical data for the modeling is taken from the website of the State Statistics Service of Ukraine [28] and the UNHCR Operational Data Portal [2].

To conduct the analysis, we use the following indicators of the State Statistics Service of Ukraine calculated according to the methodology of the International Labor Organization:

1. L – economically active population as the population of both sexes aged 15 and under 60 who provided labor supply in the labor market during the survey period.

2. K – capital investment in constant prices.

3. Y – GDP in constant prices.

The initial sample has to meet the requirements of homogeneity, comparability (in terms of the area of observation and calculation methodology), and sufficiency. Therefore, the initial values for modeling will have a frequency of 1 quarter and cover the period from 2016 to 2021. Thus, the sample size will be 24 values.

Additionally, to ensure that the parameters of the production function are calculated correctly all output indicators must have the same units of measurement ($ USA). In this case we create a variable "wage fund" to avoid this discrepancy by calculating the indicator of wage fund

$$WF = EAP \cdot AW,$$

where WF is wage fund; EAP – economically active population; AW – average wage in constant prices.

Also if the input series are non-stationary, it is easy to fall into the trap of spurious (false) regression. Such a regression with correct values of the main quality criteria (high coefficient of determination, presence of high values of t-statistics) does not reflect cause-and-effect relationships between the studied changes, but only states the presence of a common trend.

Let us move from absolute values to relative values and consider the joint dynamics of the basic indices of GDP, capital investments (CI) and the wage fund (WF) (Fig. 2).

The initial data are non-stationary, contain seasonality and a constant trend. Couse of visual analysis indicates a clear seasonality in the input data, suggesting the presence of auto-
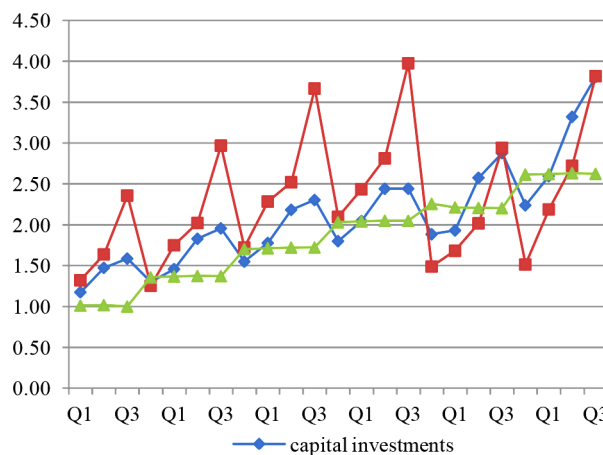
Fig. 2. Dynamics of the indices (*January 2016–December 2021*) [28]

correlation. Therefore, in the first step, the input data were deseasonalized by applying a seasonality index (I_s)

$$I_s = (\overline{X_{mon}}) / \overline{X},$$

where $(\overline{X_{mon}})$ is the average value of the indicator calculated for a specific period (season), in our case – for a quarter; $\overline{X}$ – the average value of the indicator calculated for whole period.

In order to obtain a correctly specified production function, in the second step we will construct the production function in the first logarithmic differences.

As a result of logarithmic transformations and the application of the least squares method, the production function of the following type was obtained

$$Y = 0.854K^{0.532}L^{0.696}.$$

To test the statistical significance and quality of the model, we calculated the corresponding indicators for the significance level $\alpha = 0.1$. The results are presented in Table.

The obtained value of the coefficient of determination indicates an extremely high quality of the built model as this indicator is equal to 0.944 (it has almost a functional dependence). The residual sum of squares is 0.069. The estimated model parameters are significant.

Autocorrelation testing of residuals has also been conducted. The obtained value of Durbin-Watson criterion $DW = 3.062$ belong to uncertain area. So we have no enough arguments to reject H0 hypothesis. Additionally, we have conducted visual analysis of residual autocorrelation function (Fig. 3).

Table

Checking the statistical significance of the built model

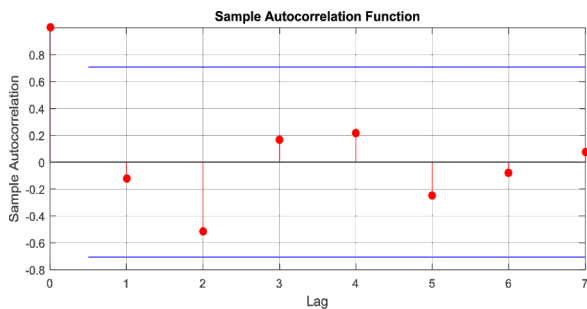| Indicator		Value of the indicator	
Indicators of statistical significance of the model as a whole			
The Fisher criterion		F_{fact}	$F_{0,1}$
		41.931	9.36
Coefficient of determination R^2		0.944	
Adjusted R-squared		0.921	
Indicators of statistical significance of model parameters			
Student's t-test		t_{fact}	$t_{0,1}$
	t_1	7.766	1.72
	t_2	2.258	1.72

Fig. 3. Sample autocorrelation function

The obtained results also indicate the absence of autocorrelation in the residuals.

In accordance with the properties of the production function, we conclude that the intensive development of Ukraine's economy during the study period in 2016−2021 ($\alpha + \beta > 1$) is due to the growth in labor productivity, when the elasticity coefficient for capital investment (α) is less than the elasticity coefficient for labor costs (β).

The obtained correlation between the elasticity coefficients of the production function ($\alpha < \beta$) allows us to conclude that a 1 % increase or decrease in the economically active population leads to a greater unidirectional change in GDP than a similar percentage change in capital investment.

Results. The model proposed allows us to assess and predict the impact of forced migration on the development of Ukraine's economy in 2023. According to the obtained value of the parameter β, a 1 % change in the wage bill will lead to a 0.7 % change in GDP. At the same time there are three main options for changes in migration flows and, accordingly, changes in the development of the situation in the Ukrainian economy.

We will evaluate three scenarios of GDP dynamics according to three forecasts of changes in the processes of forced migration of the economically active population of Ukraine. In particular, we will assume that under the first scenario the level of forced migration will remain the same, and the number of those who return to Ukraine will be insignificant and will not affect the GDP.

The second and third scenarios, respectively, envisage the possibility of some migrants returning to Ukraine. Based on the results of a survey conducted by the Gremi Personal Analytical Center [29, 30], we will determine the share of forced migrants who plan to return to Ukraine. By the end of the year, this figure may reach almost 10 % of the total population of Ukraine that have left abroad, and after the war end it may reach 55 %. We will use these values to forecast the second and third scenarios of economic development.

According to approximate estimates, the number of economically active people who left the labor force due to forced migration abroad (4,284,950 people), people serving in the Armed Forces (700,000 people), and those who remain in the temporarily occupied territories (1,200,000 people) is 37.2 % [31, 32].

In other words, the first scenario − the most pessimistic and undesirable one, will see the deepest decline in Ukraine's economy − the expected decline in GDP due to the reduction of the economically active population alone will be almost 26 %! These data correlate with the official figures of the State Statistics Service of Ukraine, which estimated the decline in GDP in 2022 at 29 %, but our calculations take into account the economic decline due to only one of the two main factors − the reduction of the economically active population. This scenario can take place if the war in Ukraine continues, territories are lost, housing and infrastructure are destroyed, air and sea connections are not available, the state cannot perform its economic functions due to the lack of necessary financial resources to encourage migrants to return home and create new jobs, the state cannot ensure the safety of people's health and lives, guarantee the payment of wages and transfers, financial support and foreign investment from the EU, the US and international funds are not used rationally in terms of ensuring economic development.

The second scenario assumes that approximately 10 % of the economically active population will return to Ukraine this year. According to the model, the GDP decline under these will be 18.93 %. conditions (again, we make a reservation that this decline takes into account only the decline in the economically active population). Such a situation may exist if a part of the population that was part of the refugees would have significantly reduced savings or if they do not have enough financial benefits to continue staying abroad. In this scenario, the country's economy will remain in recession for a long period of time, characterized by high inflation, unemployment, further production cuts, and the return of a small part of the population home will not have a significant impact on its recovery from the economic and financial crisis. Provided that the war continues, there will be no preconditions for economic growth and development in Ukraine, for lower inflation, for increased output and investment inflows, etc. If the war enters the freezing stage, there will be an unfavorable investment climate, a shortage of financial resources, destroyed infrastructure and housing, low economic activity and employment. It will take a long time for the economy to recover and return to pre-war mechanisms of regulation and functioning.

Scenario number three is the most optimistic. It envisages the return of more than a half of our compatriots to Ukraine (55 %), but according to the survey its implementation is possible only if the war ends [29]. Under this scenario the expected decline in GDP will be 12.9 %. Despite the fact that there is also a significant decline in Ukraine's economy, it will be a situation with prospects for further development. Under the third scenario the economy will be in crisis, but the level of life safety will increase, and the absence of war on the territory of Ukraine as well as the availability of external financial assistance will help to increase the number of enterprises, raise business activity, create new jobs, gradually reduce inflation, restore economic ties and logistics, increase investor confidence and increase investment. A comparison of the trajectories of Ukraine's economy under the three scenarios is shown in Fig. 4.

As we can see, if any of the three forecasts is realized, GDP will decline significantly. This will result in job losses and higher unemployment, an increase in the budget deficit, a decline in wages and investments, higher production costs, falling markets, a slowdown in economic development, and a reduction in the income of each individual and society as a whole [33].
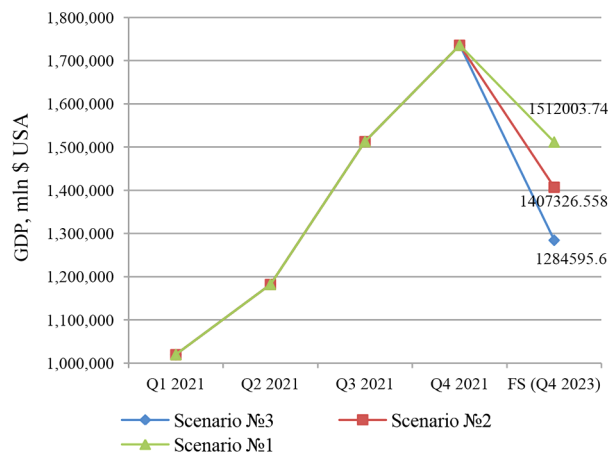

Fig. 4. Forecast of Ukraine's economic development under three scenarios of changes in the economically active population

The results obtained allow us to conclude that it is necessary to implement state regulation in the field of solving the problem of forced migration and its economic consequences for the Ukrainian economy and create the basis for increasing aggregate output and attracting investment.

Conclusions. The article studies the economic consequences of the impact of forced migration from Ukraine to European countries. Based on the use of the production function and linear regression analysis an economic model that proves the existence of a close relationship between the rate of economic growth in Ukraine and the reduction of the economically active population due to forced migration is built. Similar conclusions have been reached by other scholars [27]. The authors forecast changes in GDP growth rates under the influence of this process in 2023 and develop three possible scenarios for Ukraine's economic progression. The results obtained in this study are significant and consistent with the recommendations of international organizations. It is concluded that the state needs to develop ways to address the problem of forced migration and its negative impact on Ukraine's economic development.

In the conditions of war, budget deficit, uncertainty and high economic risks one cannot hope to balance the total output only by increasing capital investments. Moreover, Ukraine is experiencing an objective decline in capital investment due to the war which together with the decline in the economically active population creates the basis for a negative trajectory for the Ukrainian economy.

What could be the directions of the state's policy in these circumstances? The authors see several possible options.

1. The state should develop and implement social programs aimed at stimulating the re-emigration of forced migrants. Such programs should include tax incentives for opening new businesses and creating new jobs which will form the basis for temporary or permanent employment.

2. This implies that the state should provide assistance in finding a job, launch microcredit programs for small and medium-sized businesses, educational projects to train specialists in demanded specialties, provide consulting services for starting their own business, improve skills, retrain labor resources, etc.

3. Involvement of external financial resources. The implementation of such measures requires appropriate funding and financial assistance from the EU and the US, international economic organizations and investors. For example, after the Dayton Peace Agreement was signed, the World Bank and the European Bank for Reconstruction and Development created reconstruction programs for Bosnia and Herzegovina. The volume of financial assistance under these programs amounted to USD 6.8 billion between 1994 and 2004. The measures offered to returnees included assistance for the reconstruction of destroyed housing, loans for starting their own businesses, humanitarian and financial assistance for current needs, medical services, and social assistance. This experience of EU assistance in rebuilding European economies after the war can be used in Ukraine.

4. The experience of Kosovo can also be taken into account. Since 2003 the United Nations Development Program has been implementing the SPARK project in Kosovo, which provided targeted assistance to refugees returning home, depending on their professional skills and community needs. All refugees under this project received grants to start their own businesses, take training and advanced training, business courses, obtain business loans for entrepreneurial activities, government counseling services and assistance in finding job, etc. All these measures were aimed at encouraging refugees to return to their homeland. At the same time, the experience of Kosovo has proven that such programs can only be effective when combined with programs to restore the industrial sector and create new jobs in the manufacturing industry.

5. Therefore, from our point of view, it is necessary to stimulate an increase in aggregate output in Ukraine in parallel. In particular, it is necessary to create a framework for expanding the production of high-tech products and developing new technologies, including military ones, to continue implementing programs to create regional IT clusters, to restore industrial enterprises in Ukraine and to apply innovative production methods and technologies. This will increase labor productivity and in its turn lead to an increase in added value even without an additional increase in the number of economically active population.

Analysis of other consequences of forced migration and ways to overcome it will be the focus of our further research.

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Аналіз впливу вимушеної міграції на економічну стійкість України

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Мета. Характеристика наслідків вимушеної міграції з України до країн Європи, кількісна оцінка її впливу на економічне зростання, чисельність, доходи економічно активного населення, інвестиції та промисловість України, а також розробка рекомендацій щодо подолання негативного економічного ефекту міграції.

Методика. Використані методи аналізу й синтезу, наукової абстракції, статистичного аналізу, економіко-математичного моделювання, графічного аналізу.

Результати. У роботі досліджені чинники, що спричинили вимушену міграцію з України до країн Європи, а також обґрунтовані основні відмінності міграційних процесів, спровокованих війною Росії проти України. Проаналізовані економічні ефекти й наслідки її впливу на українську економіку. Дослідження базується на статистичних даних, що характеризують економічне зростання (ВВП) і фактори, що його визначають (капітальні інвестиції, економічно активне населення). На основі виробничої функції Кобба-Дугласа з нейтральним науково-технічним прогресом або науково-технічним прогресом Хікса та використання методів лінійного регресійного аналізу встановлено взаємозв'язок між зміною чисельності економічно активного населення та економічним зростанням.

Наукова новизна. Розраховано прогноз зміни ВВП під впливом вимушеної міграції економічно активного населення України у 2023 році й розроблені три основні сценарії динаміки ВВП відповідно до цих прогнозів. Кожен із них передбачає суттєве падіння обсягів виробництва під впливом міграції.

Практична значимість. У роботі запропоновані шляхи вирішення проблеми вимушеної міграції в економіці України й наслідків її негативного впливу на сталий розвиток на основі досвіду європейських країн. Обґрунтовані шляхи відновлення промисловості й залучення інвестицій в Україну.

Ключові слова: *виробнича функція Кобба-Дугласа, вимушена міграція, зайнятість населення, біженці, сталий розвиток*