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ECONOMIC AND FINANCIAL CONSEQUENCES OF WAR IN UKRAINE: ANALYSIS OF DEVELOPMENT SCENARIOS

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Abstract

The war affects the socio-economic state of Ukraine and is the cause of the deterioration of the economic situation of neighboring countries. Under such conditions, there is a need to carry out assessments of economic losses from the conduct of military operations and forecast the main economic indicators for the nearest period, taking into account the impact of the war. The purpose of the study is to calculate the losses to the economy, the destruction of residential facilities and critical infrastructure facilities in the first 100 days of the war, the assessment of the potential volume of the fall in GDP and the calculation of projected fiscal losses. The calculation of GDP reduction was based on the forecasts of the International Monetary Fund, the World Bank Group and the Government of Ukraine. The expected amount of GDP reduction is calculated using the GAP-analysis method, based on the forecasts made by these institutions in the pre-war period, and the calculation of the level of GDP during the war. Based on the results of the conducted research, it was established that the economic losses from the war consist not only of the losses incurred and the reduction of GDP volumes, but also of the lost opportunities for development and unearned profits. In addition to the reduction in GDP, Ukraine's losses are manifested in the increase in the level of public debt, the depreciation of the national currency, the reduction of gold and currency reserves, and the outflow of foreign direct investments[3].

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[3]This article is an outcome of the second edition of the conference dedicated to prof. J. Winiecki: II Ogólnopolska Konferencja Naukowa im. prof. Jana Winieckiego. Gospodarka bez ekonoma – którędy do dobrobytu?

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Introduction

For more than 100 days, Ukraine has been struggling for its independence and integrity. As of June 3, 2022, 20% of the territory of Ukraine is under occupation, in an area of 125 km^2. As the President of Ukraine notes: "Almost 12 million Ukrainians have become internally displaced. More than 5 million went abroad "(Zelensky, 2022). The impact of the war on an economy is obvious.

However, losses from the war are not only about direct losses, but also about lost income and lost prospects, the narrowing of development opportunities. In addition to causing material destruction, military conflicts can lead to a deep economic recession, high level of inflation, and deterioration of the fiscal and financial situation. The instability of the domestic market (caused by the war) reduces the level of both investor and consumer confidence, destroys trade chains (Rother et al., 2016), and it negatively affects a country's long-term productivity (Jong-A-Pin, 2009), investment attraction (IMF, 2019), tourism (Neumayer, 2004), and tax revenue (IMF, 2019).

The armed aggression of the Russian Federation highlighted the threats and challenges to Ukraine's economic sovereignty: violation of the economic and customs space of the state; expropriation of state property, property of individuals and legal entities in the occupied territories, property losses due to hostilities; creation of obstacles to sustainable economic development; creation of physical barriers to financial and economic activities in domestic and foreign markets; disruption of national critical infrastructure through physical, economic and informational impact; use of economic dependence to gain political control, etc. Ukraine's losses from military aggression are difficult to estimate, as not all of them can be estimated in monetary terms. Nevertheless, the goal of this article is to assess both the real (direct) and potential losses of Ukraine.

Literature review

Wars are a major shock to the economies of the participating countries. Despite some positive aspects of short-term stimulus and long-term reconstruction, war generally hampers economic development and undermines prosperity (Goldstein, 2003). Some scholars consider the presence or absence of natural resources, and the transparency of their redistribution by the state as the main cause of war (Sherman, 2001). A team of scholars in economics, political science, sociology and political research conducted a thorough analysis of why wars begin, how wars are fought, what happens after the end of the war and various alternatives to war. The subject of the study was wars and revolutions, arms trade in various economic and political systems, as well as post-conflict reconstruction (Coyne & Mathers, 2011).

Another area of research shows the negative impact of war on the economy. Some scholars have studied the response of financial markets to military events and began by studying the impact of the US civil war on currency value (Weidenmier, 2002; Willard et al., 1996). The results of the research made it possible to measure and predict the impact of the war on a list of financial instruments. There is a unanimous opinion among researchers of the economic consequences of war regarding the negative impact of war on the volume of GDP generated. Researchers have shown that coups and killings worsen per capita GDP growth (Barro, 1991). Murdoch and Sandler (2004) found that civil wars negatively affected GDP growth per capita. Tees and Baum (2020) note that conceptually the total cost of war includes three parts: the opportunity cost of the resources used to wage war, the loss of life and destruction of physical and human capital during the war, and the reduction in GDP per capita, measured during and after the war.

As to the financial consequences of war, the research can be divided in two directions - those, who were researching fiscal consequences of war (Gupta et al., 2004; Rother et al., 2016) and those who were researching the reaction of the banking sector to the war (IMF, 2020). The researchers of the first group explain the impact of war on the budget deficit through reduction of economic activity and decreasing of the base for taxation (Gupta et al., 2004; Rother et al., 2016). Authors estimated the amount of uncollected taxes using the war in Afghanistan in 2005-2015 (Barrett, 2018) and in Yemen in 2015 (Rother et al., 2016) as an example. The reaction of the banking sector to the war is manifested in the inability to perform the role of a financial intermediary and ensure the operation of payment systems (Rother et al., 2016), the narrowing of private lending (IMF, 2019), the outflow of deposits and assets (Gobat & Kostial, 2016), and a decrease in the efficiency of the operating activities of banks (Hasanov, 2019).

Common to all these studies is that they were conducted after the end of the military conflict, and the conclusions were drawn based on the analysis of statistical data. The purpose of our research is to carry out a forecast calculation of the economic losses (both direct and indirect), based on the forecast scenarios made by the Ukrainian Government, the International Monetary Fund and the World Bank.

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Methodology

Our goal is a comprehensive assessment of losses, which can be carried out based on the results of the first 100 days of the war. This assessment includes a calculation of recorded losses, and a calculation of foregone benefits and lost potential. The calculation of direct damage was carried out on the basis of data from open sources and data from the public project "Russia will pay" (KSE, 2022). When assessing the losses of the Ukrainian economy from military aggression, the method of strategic analysis - GAP analysis - was used. GAP analysis involves the calculation and comparison of the potential volume of GDP and the volume of GDP that will be obtained in war conditions. The potential volume of GDP embodies prospective opportunities reflected in the values obtained by transferring the trends achieved in the previous period to the future. Tactical indicators of the volume of GDP predict the ability to obtain results that can be achieved under the influence of military actions. To calculate the tactical volumes of GDP, the use of expert assessment methods or forecast calculations of international institutions is assumed. The gap between desired and expected indicators is made up of tactical (operational) and strategic gaps.

In academic circles, it is believed that potential GDP is not an observable quantity and cannot be used for comparison. However, this statement does not apply to potential GDP calculated using production function or statistical methods (Garin et al., 2019). The first method, the method of calculation based on the production function, involves assessing the impact of all factors on the projected volume of GDP. This approach works best in more developed countries, where the statistical base is broader and more detailed in terms of production factors (such as capital, labor employed, labor market segment, hours worked) (Orphanides & Norden, 2002). In the conditions of war, it is impossible to obtain complete statistical information on all factors affecting the level of GDP. Therefore, the application of this method is limited. The second group of methods, statistical methods, already take into account existing relationships between macroeconomic indicators and require only actual GDP data for previous periods. However, statistical methods have such disadvantages as low evaluation and forecasting efficiency (Powers & Xie, 2014).

The calculation of the forecast level of GDP is carried out by means of extrapolation of the trend based on the assumption that the achieved development trends will take place in future and are based on the conducted statistical analysis of the series of dynamics.

Trend extrapolation is one of the main methods of forecasting market dynamics. The essence of extrapolation is to study the history of the process, to identify certain regularities, and to transfer these regularities in the past and present to the future (Yarenko, 2015). Therefore, this method can be used to forecast potential GDP volumes. The information base on which the extrapolation method is based is data on the volume of GDP for a certain time interval (previous years), which are called time series. Based on these data, a trend is determined - the general trend of changes in indicators over a certain period of time. The purpose of such a forecast is to demonstrate what results can be reached in the future if moving towards it with the same speed or acceleration as in the past. Extrapolation methods are classified into simple and complex, depending on the characteristics of the level change in the series of dynamics. Simple methods of extrapolation (in particular, on the average level of the series of dynamics and on the average growth rate of the series) are based on the assumption that certain characteristics of the series will not change in the future (Chubukova, 2016). To do this, when making forecasts, we will proceed from the trends of GDP changes obtained as a result of the analysis of dynamic series.

When analyzing dynamic series, the trend is presented in the form of a smooth trajectory and described by a certain function:

$$y = f(t) \qquad (1)$$

Where: t is a time variable.

On the basis of such a function, the dynamic series is aligned and the further development of the process is predicted.

Extrapolation based on the average absolute growth is carried out when it is necessary to consider the tendency of the development of the phenomenon to be linear. In order to calculate the forecast value of the level, it is necessary to determine the average absolute increase. After that, knowing the level of the dynamics series taken as the base of extrapolation, we can add the absolute increase.

$$Y_T = Y_n + \overline{\Delta\,Y_{t/t-1}} * (T - n) \qquad (2)$$

Where:

Y_n is the level of the series taken as the basis of extrapolation (in time "n");

$\overline{\Delta Y_{t/t-1}} = \dfrac{Y_n - Y_1}{n-1}$ is average absolute growth between period "1" and period "n";

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Y_T is the predicted value of the level of the dynamic's series (in time "T").

To obtain objective results, the absolute increase will be calculated using the basic and chain substitution methods, according to which the absolute increase will be determined by the following formulas.

According to the basic method:

$$\Delta Y_{t/0} = Y_t - Y_0 \qquad (3)$$

According to the chain method:

$$\Delta Y_{t/t-1} = Y_t - Y_{t-1} \qquad (4)$$

Forecast values of the volume of GDP based on the statistical characteristics of the dynamic series are determined by the following formulas:

To calculate forecast values based on average absolute growth :

$$Y_{n+T} = Y_n + \overline{\Delta Y_{t/t-1}} * (T - n) \qquad (5)$$

To calculate forecast values based on the average growth rate

$$Y_{n+T} = Y_n * (K_p)^{T-n} \qquad (6)$$

Where:

Y_{n+T} is the forecast value of the indicator for the period n + T (T = 1; 2; 3; 4; 5);

Y_n is the actual value of the studied indicator for the last period preceding the forecast period;

T is the number of periods for which the forecast is compiled;

$K_p = \sqrt[n-1]{\dfrac{Y_n}{Y_1}}$ is the average growth rate for the period preceding the forecast period (between period "1" and period "n");

$\overline{Y_{t/t-1}}$ is the average absolute growth for the period preceding the forecast period (between period "1" and period "n").

The year 2021 was chosen as the basis for the calculations, which served as the base year for further calculations. This study uses a set of actual macroeconomic indicators for the period 2017-2021. To forecast the tactical level of Ukraine's GDP in 2022-2023, forecast data from the International Monetary Fund, the World Bank, the Ukrainian Government, and official statistics were used.

RESULTS

Economic losses from the war include losses in the financial sector, production, export potential, and other components. They can be divided into property and non-property, capital and current, real and potential components. Assessment of economic and tax losses should be carried out in three directions.

ASSESSMENT OF LOCAL ECONOMIC LOSSES

The Institute of Economics and Peace has been calculating the Global Peace Index (GPI) annually since 2007. This indicator is based on a comprehensive analysis of the 23 identifiers for each of the 163 countries included in the list. The ranking of countries according to this index is based on the share of violence expenditures in the country's GDP, expressed as a percentage. The highest ranking with the largest share of war expenditures in 2022 is occupied by Syria, where war expenditures account for 80% of GDP, South Sudan - 41% and the Central African Republic - 37%, respectively. According to the results of 2020, Ukraine ranked 29th with a rate of 12% of GDP for the war. In 9 years, the cost of war per capita in Ukraine has increased 10 times, and the share of GDP used to finance violence has increased almost 4 times from 3.3% to 12% of GDP. Reducing the level of violence by only 10% would save $1.6 trillion, the equivalent of the Russian economy's contribution to the world economy (Institute for Economics & Peace [IE&P], 2022). Russia's aggression has dramatically changed the budget policies of the world's leading countries, which have already announced an increase in their defense budgets. The rupture of food supply chains and the increase in military spending have caused inflation to rise. The projected inflation rate in the US is 8% and in the European Union - 7% per year (IE&P, 2022).

Ukraine has suffered heavy losses of human capital. In addition, internally displaced people are a serious problem. According to the International Organization for Migration, as of the end of May 2022, the number of internally displaced persons in Ukraine approached 7.7 million.

Infrastructure losses from hostilities are extremely difficult to determine, as information can only be obtained from liberated territories. To assess the loss of infrastructure, the Russia Will Pay project was launched, which focuses on assessing the direct loss of Ukraine's physical infrastructure due to the war (destruction of residential buildings, utilities, roads, railways, educational and medical facilities, etc.) and assessing the financial value of these losses. (KSE,

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2022). The main disadvantages of this method are the inability to take into account the loss of infrastructure in the occupied territories until their release. In addition, within the framework of the Russia Will Pay project, it is impossible to calculate the real and potential losses of the economy associated with the closure of a significant number of enterprises; failure to receive tax revenues to the budgets of various levels, loss of hundreds of thousands of homes and jobs; freezing of investment projects, reduction of consumer demand of citizens, etc.

Forecast assessment of the fall in the gdp of Ukraine

In the conditions of war an estimation of a level of potential GDP and a gap of GDP becomes rather acute. The study of GDP gaps will provide an opportunity in the short term to quickly adjust macroeconomic policy measures, and in the medium and long term to make systematic decisions on the implementation of state structural policy (Skrypnychenko & Yatsenko, 2018). The GDP gap is calculated as the difference between the actual GDP level and its potential level. Unlike the main macroeconomic indicators (nominal and real GDP, inflation, unemployment, public debt, etc.), the values of potential GDP and GDP gaps are not reflected in official statistics, and therefore require quantitative and qualitative assessment based on statistical methods.

The results of calculations of statistical characteristics of the time series of Ukraine's GDP during 2017-2021 and their forecast for 2022-2023 are shown in Table 1.

Table 1: Analytical characteristics of the time series of GDP

Years	Volume of GDP (mln USD)	Absolute growth (mln USD)		Growth rate (%)	
		Basic	Chain	Basic	Chain
2017	112,154.0	-	-	-	-
2018	130,832.0	18,678.0	18,678.0	117	117
2019	153,781.0	41,627.0	22,949.0	137	118
2020	155,582.0	43,428.0	1,801.0	139	101
2021	197,097.0	84,943.0	41,515.0	176	127
Average value	149,889.2	21,235.75		115	
Forecast data (mln USD)					
2022		218,333.00		224,691.00	
2023		239,569.00		256,147.00	

Source: Calculated by the authors, based on the IMF data.

The forecasting results show that in Ukraine there is a tendency to a gradual qualitative growth of GDP. After the crisis of 2014-2015, associated with the annexation of Crimea and the occupation of Donetsk and Luhansk regions, in 2017-2019 the basis was formed in Ukraine for further qualitative economic growth. The general situation in the economy at the end of 2019 testified to the gradual formation of the basis for further progressive economic development. However, in 2020, Ukraine faced the COVID-19 pandemic. The measures taken by the government have yielded results, which have manifested themselves in the form of real GDP growth of 4% in 2021. The economic situation in the country as of the end of 2021 tended to gradually recover. Positive dynamics are indicated by the upward direction of the trend line (Figure 1).

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Figure 1: Calculation of the forecast level of the "peaceful" GDP of Ukraine for 2022-2023

$$y = 19464t + 91498$$
$$R^2 = 0{,}9323$$
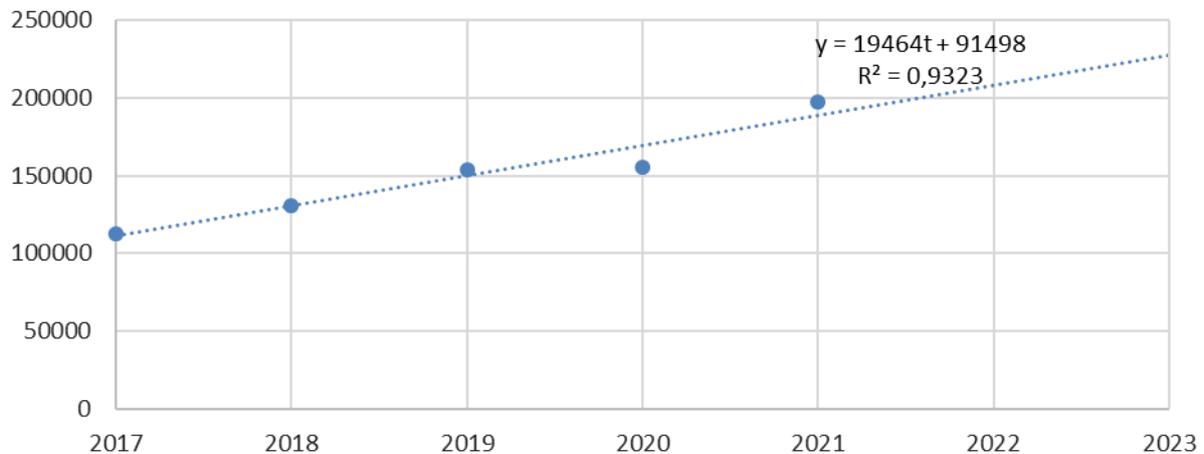
Source: Calculated by the authors.

The war made significant adjustments to the economic situation in the country, which will certainly be reflected in the reduction of GDP. There is still no single approach to the expected level of GDP decline in 2022. Thus, the World Bank group in its review "Prospects for the World Economy" forecasts a reduction in Ukraine's GDP in 2022 by 45% (The World Bank [WB], 2022). The International Monetary Fund forecasts a 35% decline in Ukraine's economy in 2022 (International Monetary Fund [IMF], 2022). The Ukrainian government predicts a drop in Ukraine's gross domestic product due to Russia's full-scale war against Ukraine in 2022 in the range of 30 to 50% (The Economist, 2022). Ukrainian investment company Dragon Capital expects Ukraine's GDP to fall by 30% in 2022 under a protracted war by the end of the year (Interfax-Ukraine, 2022). Each of the above institutions uses its own forecasting methodology, so the results are so different. However, the war

continues. Therefore, any predictions made at this stage of events cannot be considered accurate.

When assessing the possible volume of GDP decline, it is advisable to take into account the regional structure of its formation, taking into account the territories under occupation. The analysis showed that the territories that were occupied and are currently under occupation account for about a third of total GDP production. Given the regional structure of GDP production and taking into account the rupture of production chains, distribution schemes and logistics links, we believe that the expected volume of GDP decline will be close to the International Monetary Fund forecast and will be 35% (IMF, 2022).

The tactical assessment of GDP will be based on the forecasts of the Government of Ukraine, the IMF and the World Bank, made in the pre-war period and taking into account the impact of the war (Table 2).

**Table 2: Real and forecast GDP data in Ukraine during 2021-2023**

Characteristics	Real GDP growth rates (%)			Forecasted GDP level (mln USD)		Expected losses of GDP from the war (mln USD)	
	2021	2022	2023	2022	2023	2022	2023
Forecast of the Government of Ukraine							
Excluding the war	4.1	3.8	4.7	204,586.2	214,201.8	106,038.0	113,584.0
Given the impact of the war	3.4	-50.0	2.1	98,548.3	100,617.8		
Forecast of IMF							
Excluding the war	4.2	3.4	3.6	208,713.9	2162,276.0	77,511.0	82,269.0
Given the impact of the war	3.4	-35.0	2.1	131,203.2	133,958.4		
Forecast of the World Bank							
Excluding the war	3.8	3.4	3.1	208,113.4	214,564.9	98,053.0	102,194.0
Given the impact of the war	3.4	-45.1	2.1	110,060.0	112,371.2		

Source: Calculated by the authors based on the data (IMF 2019. 2022, The World Bank 2022, The Economist 2022).

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According to the GAP analysis method, at the first stage the expected indicators are calculated in order to identify discrepancies between the volumes of "peaceful" GDP projected without military action and the volumes of GDP in the conditions of war. The forecast of expected indicators is performed on the basis of forecasts of previous years using data from 2021 as a base. In order to assess real economic losses, Ukraine's real GDP in hryvnias is converted into the dollar equivalent at the average annual official exchange rate. After calculating all the indicators, gaps are established between the indicators of "peaceful" GDP and the volume of GDP calculated taking into account the impact of the war. In order to visualize the obtained results, they are presented in the form of graphs (Figure 2).

Figure 2: Projected volumes of "peaceful" and "military" GDP in Ukraine during 2021-2023 (mln USD)
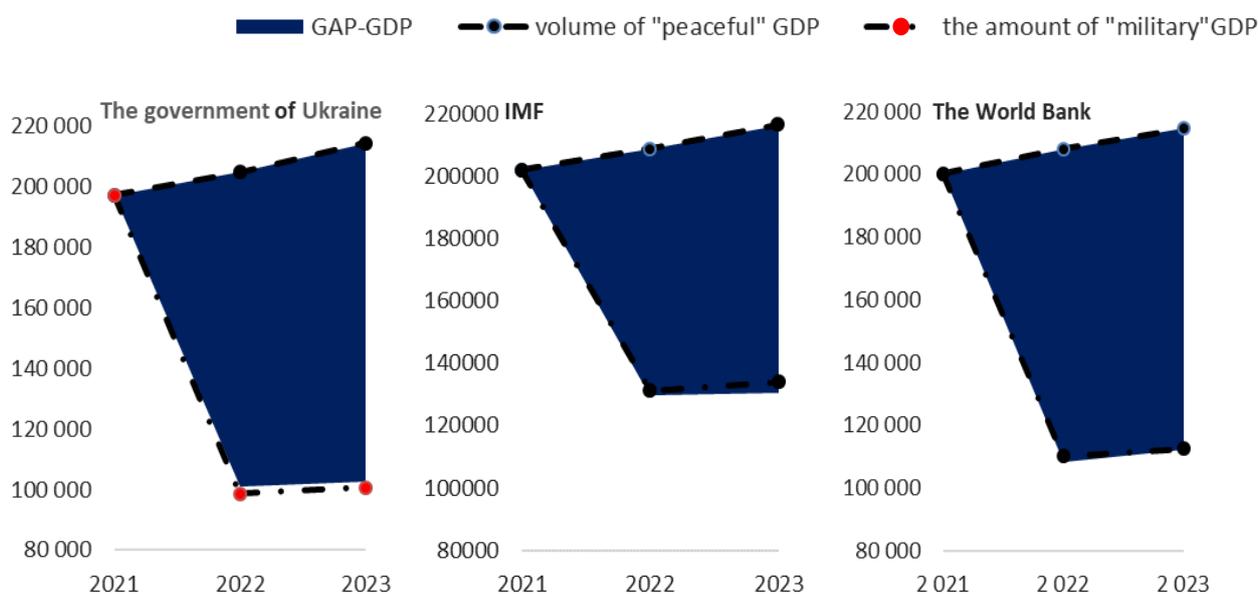
Source: Calculated by the authors based on the data (IMF 2019. 2022, The World Bank 2022, The Economist 2022).

The forecast of the expected indicators is performed on the basis of data from previous years. The forecast of GDP volumes is based on the forecasts of real GDP growth for 2023 and the GDP growth rate in all subsequent years at the level of 5% annually. Even with the implementation of optimistic forecasts, Ukraine will be able to reach GDP at the level of 2021 only according to the forecasts of the Ukrainian Government in 2036, the IMF - in 2032, the World Bank Group - in 2034.

Assessment of the impact of war on the main macroeconomic indicators

The decline in real GDP has multiple consequences for the economy, manifested in a reduction in tax reve-nues to budgets at various levels, public sector revenues and the consolidated budget. In order to calculate them, assumptions were made about the possible growth of GDP in 2022 in dollar terms at the level of pre-war assumptions made by the relevant institutions the Government of Ukraine - 3.8%, the IMF and the World Bank - 3.4%. When calculating the projected fiscal volumes in 2022, we extrapolated the relevant data for 2021. Thus, the share of redistribution through revenues of the general government sector was 39.98%; incl. consolidated budget revenues - 30.45%; incl. tax revenues of the consolidated budget - 26.63% (Official website of the Ministry of Finance of Ukraine, 2022) (Table 3).

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Table 3: Calculation of potential fiscal losses of Ukraine in 2022 (mln USD)

Name of the institution	Expected amount of GDP losses	Potential losses in 2022		
		General government	Consolidated budget	Tax revenues of the
Government of Ukraine	-106,038.0	-42,394.0	-32,289.0	-28,238.0
International Monetary Fund	-77,511.0	-30,989.0	-23,602.0	-20,641.0
World Bank Group	-96,853.0	-38,722.0	-29,492.0	-25,792.0

Source: Calculated by the authors based on the data (IMF 2019. 2022, The World Bank 2022, The Economist 2022).

The reduction in GDP is the reason for the reduction of financial resources redistributed through the public sector in the range of 30 to 42 billion USD, Consolidated Budget revenues from 23.6 to 32.3 billion dollars. US dollars and tax revenues from 20.6 to 28 billion USD. Taking into account the fact that Ukraine is still at war and every day 2 billion hryvnias are spent on financing military actions from the state budget, and losses to the country's economy amount to 4 billion USD, the burden on the budget will only increase. The increased risks associated with hostilities have necessitated a reformatting of Ukraine's financial system in order to strengthen the foundations of financial stability.

Due to the impossibility of increasing the amount of tax revenues to the budget, the role of official creditors is increasing. Since the beginning of the military invasion, Ukraine has received financial assistance from international financial creditors and donors through two types of programs: programs aimed at general support of macro-financial stability in the country (IMF Rapid Financing Instrument and EU macro-financial assistance), and programs aimed at developing links to specific sectoral problems in the areas of security, health care, procurement of food, fuel, medicines, etc. (Bogdan, 2022). An important macroeconomic impact of the war is the increase in government debt. Today, military spending is almost entirely financed by loans. The amount of public debt in the first four months of 2022 increased by UAH 183.65 billion, including domestic public debt of UAH 33.81 billion, external public debt - by UAH 159.79, and state-guaranteed debt decreased by UAH 9.91 billion.

Figure 3: Public internal, external and guaranteed public debit during 2017-2021 and January-April 2022 (bln UAH)
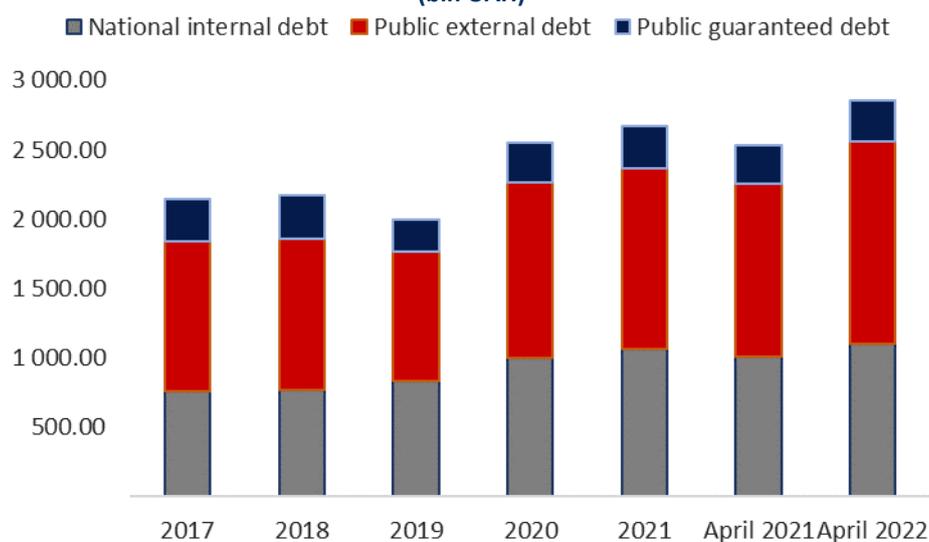
Source: Calculated by the authors according to the data (Official website of the Ministry of Finance of Ukraine).

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Since the war is still going on, and the costs of the war are financed by debts, the costs of paying off public debt will only increase. The consequence of the growth of public debt and payments on it is not only rising inflation, rising interest rates, but also limiting future decisions on public spending - because the state's obligations are significant, the ability to spend budget funds on industrial investment, energy, infrastructure, and education is limited.

The fall in GDP is inevitably accompanied by a simultaneous fall in the value of the national currency. The IMF does not forecast the possible level of inflation in Ukraine in 2022, the World Bank group in April forecast inflation at 15%, and in early May worsened it to 20%. The NBU notes that inflation in 2022 may exceed 20%, but will remain controlled. According to the results of May 2022, inflation increased by 2.7%, which in annual terms is equivalent to 18%.

Figure 4: Projected and real values of CPI in Ukraine during 2020-2022 (in %)
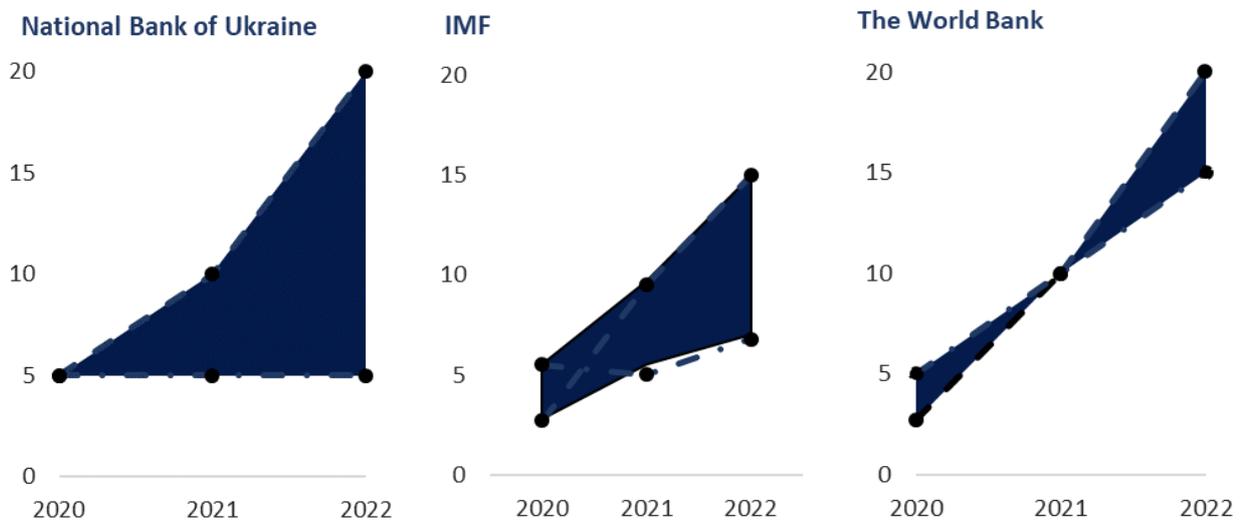
Source: Calculated by the authors based on the data (IMF 2019. 2022, The World Bank 2022, The Economist).

The pressure on the value of the national currency is exerted by external and internal factors. Among the external are the global trends affecting the value of the hryvnia, the greatest impact is exerted by rising energy costs. Internal factors are related exclusively to the war, and the most influential are the rupture of logistics chains, the destruction of manufacturing enterprises, rising production costs, and the growing demand from the population for certain groups of goods. The dynamics of consumer inflation indicates pressure from consumers. In addition, Russia's deliberate destruction of food warehouses, shops, port blockades and infrastructure damage leave inflation risks high. It should be noted that the aggression of the Russian Federation has caused the acceleration of inflation not only in

Ukraine but also around the world. The revision of the world's leading countries in their budgets in the direction of increasing defense budgets and providing military support to Ukraine is the reason for the devaluation of national currencies (Peltier, 2022).

The high level of uncertainty and panic among citizens led to an increase in demand for the currency, which, in turn, naturally led to the devaluation of the hryvnia. Given the high import dependence of the Ukrainian economy, exchange rate fluctuations have become another significant factor in rising inflation. At the same time, the hectic demand for currency from enterprises and the population led to a significant reduction in country's international reserves (Figure 5).

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Figure 5: Official Foreign Reserves of Ukraine (mln USD)

■ Gross international reserves   ■ Net international reserves
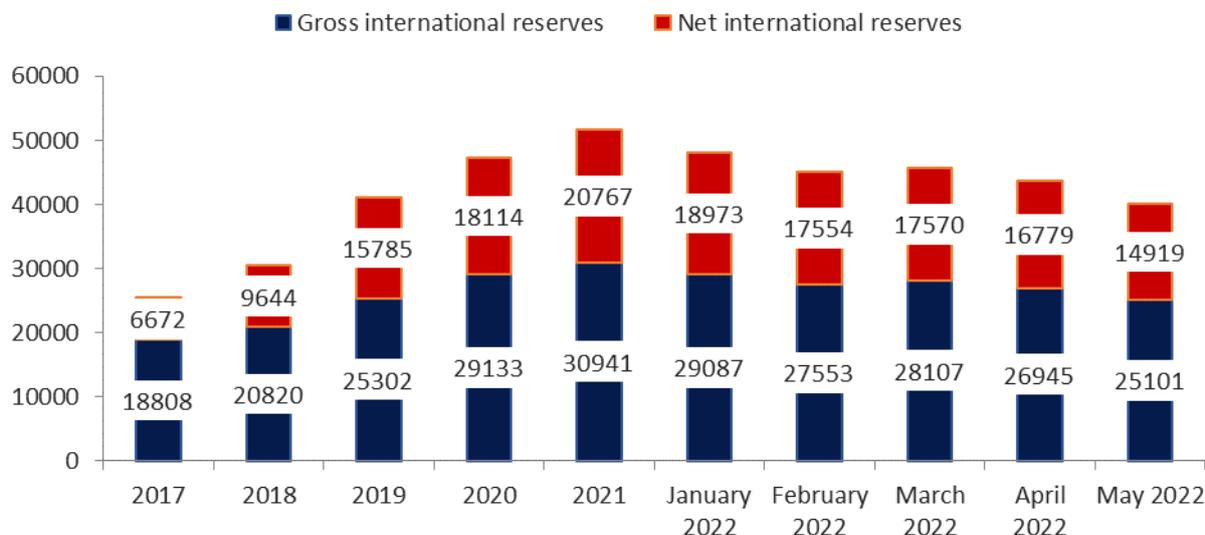
Source: Calculated by the authors based on data (NBU, 2022).

Only the financial support of international partners during this period allowed Ukraine to avoid financial collapse and gradually restore the positive dynamics of international reserves. In general, in January-April 2022, net lending from the outside world amounted to 3.2 billion USD, for comparison for the same period in 2021 - 0.4 billion USD.

Figure 6: Volumes of exports, imports and trade balance of Ukraine (bln USD)

■ Export   ■ Import   ▲ Trade balance

Source: Calculated by the authors based on data (NBU, 2022).

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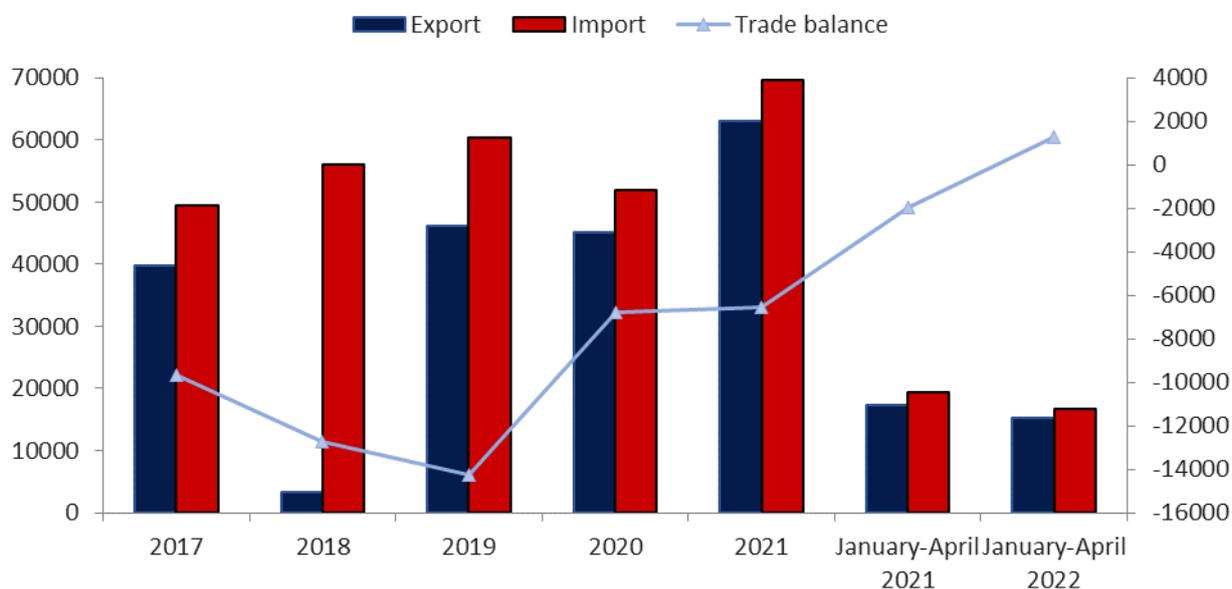
During January-April 2022, exports of goods decreased by $ 2.4 billion USD (or 51%), and imports of goods, respectively, 2.7 billion USD (by 45.7%). The largest decrease in exports was observed in the following groups of goods: food products - by 52.8%, ferrous and non-ferrous metals - by 71.3%, chemical products - by 45.7%, mineral products - 41.9%, engineering products - by 35%, industrial products - 44.5%.

External aggression and the general information background on the escalation of military risks have a fundamental negative impact on the business expectations of domestic entrepreneurs and foreign investors, and significantly worsen the mood of Ukrainian citizens and households. This dramatically increases financial risks, lowers Ukraine's credit ratings, and worsens access conditions and borrowing costs. The consequence of high investment risks was a significant deterioration in the dynamics of foreign direct investment (Figure 7).

Figure 7: The volume of foreign direct investment in Ukraine during 2017-2021 and in January-April 2021-2022 (mln USD)
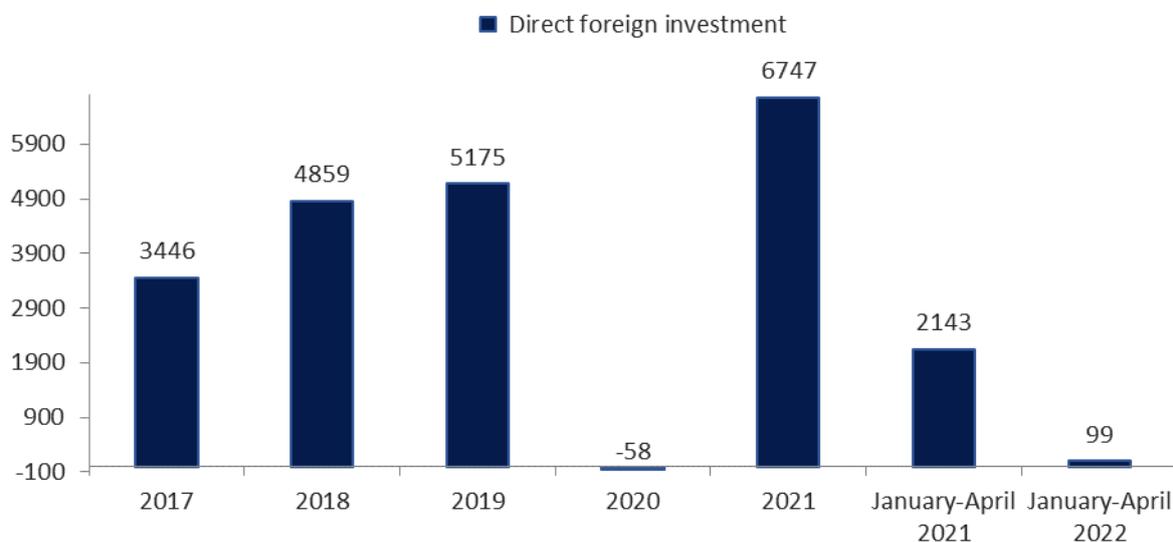
Source: Calculated by the authors based on data (NBU, 2022).

The trend of direct investment inflows during 2017-2019 indicates their gradual increase after the crisis of 2014. The weakening of security risks in subsequent years has helped to improve investor sentiment. In 2021, Ukraine managed to resume investment activity and ensure the inflow of foreign direct investment in the amount of 6.7 billion dollars. USA. Military aggression caused a reduction in investment in the first 4 months of 2022 by 21.6 times compared to the same period in 2021, which is extremely insufficient to achieve the goals of structural modernization of the national economy.

Conclusions

This paper is devoted to the forecasting assessment of Ukraine's losses from the war. Total estimates of Ukraine's economic losses, made by various expert groups differ significantly, however, according to most researchers, the losses for 100 days of the war amounted to at least 600 billion USD. Existing forecast esti-

mates of Ukraine's losses from military aggression differ significantly among themselves due to methodological inconsistencies in calculations. In order to obtain reliable results of economic and derivative losses from the war, we suggest carrying out an assessment in three directions: an assessment of local economic losses, an assessment of the projected fall in the volume of Ukraine's GDP during the period of military invasion, and an assessment of potential economic losses, which include a possible but unrealized amount of growth GDP provided there is no armed military conflict on the territory of Ukraine. The assessment of local losses showed that in the first 100 days of the war they exceeded more than 100 billion USD without taking into account the losses of infrastructure facilities located in the occupied territories. However, the declared amount is underestimated due to the time delay in obtaining data and the impossibility of assessing all losses (in particular, human losses). Therefore, such an estimate is quite approximate and inaccurate.

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The conducted statistical analysis of the data proved that during 2017-2021 a positive trend towards GDP growth was observed. Estimates of GDP losses from the war in 2022 alone are in range from 35% to 50% of GDP. According to optimistic forecasts, Ukraine will be able to reach the pre-war level of GDP no earlier than 2032. The impact of war is complex, and the negative effect is synergistic. The war reduces foreign direct investment, spins up the inflationary mechanism, limits the financial capabilities of the state, promotes the growth of the state's debt level, cuts jobs, and worsens the business environment.

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