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SCENARIO BASED MACRO ASSESSMENTS OF THE POST-WAR RECOVERY OF UKRAINE'S ECONOMY

The article outlines the long-term trends in the development of the world economy against the background of the sharp deterioration in the conditions of global growth, primarily due to the ongoing war in Ukraine, persisting inflation and tightening financial conditions.

A special place is given to the main task of the post-war reconstruction of Ukraine's economy, which is the transition from the pre-war commodity-agrarian, and import-dependent economy and ensuring economic recovery based on modern achievements in science, technology and the new technological order. Completing the task includes the restoration of infrastructure, restructuring the economic sectors and activities that should become drivers for the recovery of Ukraine's economy in the near future (defense-industrial complex, agricultural sector, construction, ICT sector, and mechanical engineering), preservation of human capital, etc.

The authors note that in 2022, a significant drop in output in all economic activities is expected, which will persist until the end of hostilities. Construction, whose activities will be limited to the restoration of destroyed critical infrastructure, and industry, which accounted for the lion's share of Ukraine's pre-war industrial production (mining,

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metallurgy, energy), will experience the biggest decline.

The starting conditions of the forecast estimates of Ukraine's post-war recovery are identified, such as investment attraction, a high rate of accumulation of fixed capital to provide a shorter period of economic recovery, and achieving a moderate inflation. Calculations show that attaining the rate of gross accumulation of fixed capital up to 30-35% of GDP would contribute to a rapid recovery of Ukraine's economy after the war.

It is shown that the main factors of the decrease in merchandise exports during the war are the drop in output and the erosion of this country's transport and logistics potential. An assessment is made of the value and physical volumes, as well as the commodity and geographical structure of merchandise exports from Ukraine in 2022. The authors also provide an assessment of the impact of the reduced physical volume of merchandise exports on output, value added and labor wages in Ukraine.

The risks of ensuring the post-war recovery of Ukraine's economy are identified, the main of which are the continuation of the military aggression by the Russian Federation after 2023 and the escalation of hostilities on the territory of Ukraine with a strengthening impact of destructive shocks from the global recession on this country's domestic economic processes⁴.

Keywords: post-war recovery of Ukraine's economy, destruction, infrastructure, restructuring, human capital, drivers of development, investments, rate of gross fixed capital formation, GDP, economic activities, inflation, merchandise export, scenario based macro estimates, forecasts and risks of economic dynamics

The military conflict on the European continent has had a serious impact on the global economy, especially on the EU countries, causing shocks to regional stability, trade, and geopolitical order, and posing new risks to GDP growth, inflation, and monetary policy. Prices for Brent crude oil increased (consensus forecasts⁵ - USD 98.1 per barrel on average) and so did the prices for natural gas. The imposition of Western sanctions against the aggressor country changed the global commodity markets.

In recent months, global growth conditions deteriorated sharply, primarily due to

⁴ The article presents the results of a study conducted within the research project on "Assessment and forecasts of endogenous growth of Ukraine's economy" (State Registration No. 0120U105803).

⁵ Brent Oil Futures - Sep 22 (LCOU2). *Investing.com*. Retrieved from <https://www.investing.com/commodities/brent-oil> (last accessed - 20.09.2022).



the prolonged war against Ukraine, persistent inflation, and tighter financial conditions. The global economy is moving ever closer to recession⁶.

The United States will experience a slight recession in late 2022 or early 2023. This period will be characterized by stagflationary characteristics with below-trend growth and above-trend inflation, and will affect the global economy as a result of weak demand and tightening financial conditions.

Growth in Europe slowed as natural gas prices rose and supply dynamics deteriorated. In the euro area, growth will be below the trend starting in the third quarter of 2022, but an outright recession is unlikely to occur.

Over the next 10 years, the global economy will grow by an average of 2.5% per annum, which is significantly lower than the average before the COVID-19 pandemic (Table 1).

Table 1

Forecast of real GDP dynamics by region and country,
average annual change, %

Country	2022	2023	2022-2026	2027-2031
USA	1.7	0.5	2.1	1.8
Europe	3.0	1.0	1.2	1.1
Eurozone	2.7	1.0	1.1	0.9
Germany	1.6	0.9	0.8	0.7
Italy	2.8	0.8	0.5	0.2
France	2.3	1.1	1.2	1.2
United Kingdom	3.5	0.5	1.1	0.9
<i>OECD countries</i>	2.5	1.1	1.7	1.5
China	2.3	3.0	3.7	3.3
India	7.4	4.6	4.0	4.1
<i>other Asian countries</i>	5.2	4.0	3.5	3.7
<i>Latin America</i>	2.3	0.9	1.6	1.7
Brazil	1.5	0.6	1.7	1.7
Mexico	1.7	0.8	1.4	1.4
<i>Middle East and North Africa</i>	3.6	2.5	2.6	2.9
<i>Russia, Central Asia, and Eastern Europe</i>	-2.8	-0.1	2.4	2.4
Russia	-5.2	-2.6	1.6	1.8
Turkey	4.2	1.7	3.6	3.1
Ukraine	-25	9.2	2.4	2.8
<i>Developing countries in general</i>	2.9	2.7	3.2	3.2
<i>World</i>	2.7	2.0	2.5	2.4

Source: compiled according to Global Economic Outlook [1].

⁶ The IMF announces a significant deterioration in the economic forecast (2022). *Vesti.ua*. Retrieved from <https://vesti.ua/uk/business-uk/finance-uk/mvf-anonsiruet-sushhestvennoe-uhudshenie-ekonomicheskogo-prognoza>

The factors that drove global growth over the past two decades, including an increase in labor supply and a rapid rise in the capital-to-population ratio, are expected to weaken significantly over the next decade, especially in emerging markets. These slowdown factors will be largely offset by a shift towards a greater contribution from sources of quality growth driven by accelerating digital transformation, productivity gains [2], and the development of advanced technologies.

Formulation of the problem. The devastating losses and consequences of the deep economic downturn caused by Russia's full-scale invasion of Ukraine are prompting a search for ways to intensify post-war reconstruction and restore growth dynamics, which will help improve the situation in the economy and social sphere as soon as possible. Currently, the global world is on the verge of a new technological order, and many studies are focused on the technological changes that will form the basis for future development.

The issues of digital transformation and technological change, which, in particular, are highlighted in the work of the UN, and IMF and studied in the World Bank's Global Economic Prospects report, etc. are extremely relevant for Ukraine [1-3]. At the same time, it is advisable to study the experience of post-war economic recovery in the world. As early as 1957, L. Ehrhardt's book "Welfare for All" revealed the policy instruments for the "German miracle" of the country's recovery [4]. Among recent works, it is worth noting the publication of Nobel Prize winners Abhijit Banerje and Esther Duflo "Good Economics for Hard Times: Better Answers to Our Biggest Problem" [5], which examines the factors of the successful recovery of European countries after the Second World War, the policies of individual countries aimed at ensuring stable growth, the causes and consequences of labor migration, etc. The experience of countries in post-war recovery is considered in the works of S. Ivanov [6], V. Novikov [7], M. Siruk [8], Ya. Zhelezniak [9], etc. The issues of Ukraine's revival were widely covered at the International Conference on the Restoration of Ukraine [10].

The purpose of the study is to identify the main tasks of intensive post-war recovery and to carry out scenario macroeconomic assessments of Ukraine's post-war economic recovery.

Some key tasks for restoring Ukraine's economy in the post-war period

Given the realities of the global economy, the *fundamental task* of today, even on the way to Ukraine's victory in the war with Russia, should be to move away from the pre-war raw material and agricultural, import-dependent economy, which, unfortunately, established Ukraine's specialization in the global world, and to ensure its post-war recovery on the basis of modern achievements in science, technology and a new technological mode, which will create conditions for a qualitative restructuring of what the war destroyed and intensive growth of the national



economy on a competitive basis, with a full integration in European and global economic space.

Reconstruction after destruction and infrastructure development should be the top priority of the wartime and post-war periods.

During the hostilities, Ukraine, according to various estimates, lost between 30 and 50 percent of its production capacity worth over USD⁷ 110.4 billion. (mainly in Chernihiv, Donetsk, Luhansk, Kharkiv, Kyiv, and Zaporizhzhia regions), while transport, industrial and social infrastructure were severely damaged. The scale of destruction is enormous and will increase every day as long as the hostilities continue.

The consequences of the destroyed infrastructure are primarily as follows:

- impossibility of functioning of the most important life support systems: a significant part of the population of Ukraine was left without housing, electricity, heating, and water supply;
- the logistics of the movement of goods and services, including food, medicines, and medical care, was disrupted, leading to the threat of real hunger and the lack of vital emergency medical care for the population in the occupied regions;
- the inability to carry out production activities as a result of both the destruction of the companies' assets, the lack of energy and water supply, and the destruction of the supply chain for raw materials and intermediate consumption products;
- the lack of the necessary labor force due to evacuation from the area of hostilities to safer regions, including abroad⁸.

The restoration of infrastructure is an urgent task that needs to be addressed without waiting for the end of hostilities. At the same time, each individual component of the infrastructure requires a specific approach to the restoration plan, taking into account the functionality of the facilities, the extent of the destruction, and possible timing of their restoration.

The restoration of critical infrastructure includes the restoration of facilities that operate and provide services in the energy, transport, and public services sectors - water supply, sewerage, heat, hot water, electricity and gas, food production, and healthcare - to ensure the full functioning of cities and towns in all regions of the country, as well as to eliminate restrictions on the supply of oil products and restore transport infrastructure (which has started in the liberated areas). The restoration of other critical infrastructure, including public utilities, must be coordinated with the

⁷ Ministry of Finance (2022, 19 May). "Russia will pay": losses from the destruction of Ukraine's infrastructure due to the war increased by \$3.1 billion. Retrieved from <https://minfin.com.ua/ua/2022/05/19/85681857/>

⁸ According to the UN, as of the end of March, 11.4 million people left their homes in Ukraine, and more than 4.4 million people went abroad (2022). *The course of Ukraine*. Retrieved from <https://kurs.com.ua/ua/novost/826990-on-iz-za-voini-svoi-doma-pokinuli-114-mln-ukraincev?source=ukrnet>



restoration of social infrastructure in the destroyed cities and territorial communities.

To restore *social infrastructure*, projects for the reconstruction of destroyed villages and towns should be developed immediately in accordance with all modern environmental standards (including waste and recycling ones), for territorial communities - with an optimal and maximally unified set and location of social (transport, environmental, medical, educational, etc.) infrastructure facilities, and, given the policy of the Russian Federation, with the mandatory availability of shelter facilities⁹ for each territorial community. Projects for large cities should include ways to improve and optimize transport networks. Local governments should be directly involved in the development and subsequent monitoring of these projects.

The restoration of social infrastructure should also be coordinated with another component of infrastructure projects, namely, the *production infrastructure*, which will be developed on the basis of an industrialization strategy, improving technologies to ensure energy efficiency, resource efficiency, and environmental friendliness of production and consumption¹⁰. Territorial communities should play an important role in this coordination (it is the production structure of a community that will determine its further development and ensure its future). On the other hand, the production infrastructure, in other words, the choice of specialization and the way of community development, will also determine the features of its social infrastructure, including environmental and medical facilities and educational institutions.

Structural transformation is the most difficult and long-term task of Ukraine's economic recovery that provides a unique opportunity to move to a new technological mode, laying the foundation for sustainable economic growth. To increase the productivity of the national economy, it is advisable, in particular, to focus on its modern restructuring (digital economy instead of a raw material-oriented one), where the lion's share should be occupied by the IT sector, including cloud computing, big data analytics, the Internet of Things, cybersecurity, artificial intelligence, virtual reality technologies, and 3D and 4D printing and modeling). By the way, according to the World Economic Forum, the demand for the use of these technologies will grow from year to year [11].

At the same time, *human capital* is the driver of the new technological order. And ensuring its preservation is also an extremely important task, without which Ukraine's recovery is impossible. Since the beginning of the war, more than 9 million Ukrainians (mostly women and children) have gone abroad, and this number continues to grow¹¹. The longer the refugees stay abroad, the more likely it is that, motivated by the desire to provide normal living conditions for their children, they will find jobs,

⁹ Underground parking lots for city buildings.

¹⁰ It is advisable to use the examples of Japan and South Korea.

¹¹ About 2 million children.



improve their lives and not return to Ukraine after the end of hostilities¹². The inability to return home for a long time will also encourage internal migrants to go abroad, as the western regions of Ukraine, which received the lion's share of internally displaced people, have their own specialization and economic activities and are unable to provide them with even temporary work¹³.

The *company relocation* program will improve the situation to some extent: as of April 22, 2022, 400 companies from areas where active hostilities were taking place (Kyiv, Kharkiv, Zaporizhzhia, Dnipro, Kramatorsk, and other cities) had moved their production facilities to safer regions, and 190 of them started operating. If these enterprises and the ones submitted for relocation (about 1000) start operating on a permanent basis, the internally displaced people employed by them will need permanent housing, which should also be taken into account in social infrastructure restoration projects¹⁴. In order *to preserve and further develop Ukraine's human capital*, it is necessary to: create appropriate conditions for the early return of internally displaced people to Ukraine; start rebuilding heavily damaged cities beginning with the suburbs, creating one- and two-story satellite towns where people can return to normal life, and, if possible, build mobile housing complexes for those who will be waiting for the reconstruction of their damaged homes; and engage internally displaced people in remote work at Ukraine's facilities and in Ukraine's projects on a larger scale. In the future, it is necessary to radically change *the state policy on the formation and use of human capital*: reforming the education system, especially vocational education, introducing dual education, providing higher education institutions with modern equipment, creating modern industrial parks, research hubs, etc.

The development of activities that should become drivers of the country's post-war recovery

The defense industry should be in the first place to provide Ukraine with powerful weapons at a sufficient level. During military operations, Ukraine receives the necessary weapons for the defense and offensive mainly from partner countries thanks to enormous efforts of the Office of the President of Ukraine. The state, without waiting for the end of hostilities, should organize Ukraine's production of at least the most necessary types of weapons in safe territories or abroad, as well as

¹² According to a DOU study, 60% of IT professionals left their homes and 54% of them moved outside Ukraine and 90% of them left Kharkiv and Chernihiv.

¹³ The employment rate of those who moved from the occupied territories of Luhansk and Donetsk regions to the non-occupied territories of these regions in 2014-2016 was 9-15% lower than that of residents. Employment was lower even though IDPs had better education and were more active in the labor market. Even two years after resettlement, these people did not have any advantages, with 15% less employment.

¹⁴ For example, to build a town in the suburbs of Kharkiv to relocate Kharkiv IT Cluster and other IT professionals, 90% of them left the city.



continue to create enterprises for the repair and maintenance of the equipment supplied by partners.

Ukraine's military-industrial complex has demonstrated the ability to produce modern, effective, and diverse weapons: the world knows Ukrainian missile systems such as "Neptune", "Vilkha", "Stugna", and "Corsair"; "Spectator" and "Leleka" drones; sniper and long-range rifles; and so on. At the same time, active military operations have clearly revealed those "gaps" in Ukraine's military-industrial complex that need to be "filled" to ensure a high level of defense capability. The need to maintain the military-industrial complex at a proper level serves as a powerful incentive for the development of high-tech production, the creation of innovative technologies and new materials, the development of science, education, communications, information, and communication technologies, and such types of processing industry as metallurgy and metalworking, machine building, light industry, and food processing. And not only for large businesses but also for medium and small ones. In particular, there will be a growing demand for information IT services such as the Alarm app, and a growing demand for professional online consultants, which will drive further development of *small businesses in information and communication technologies*.

An additional incentive for the development of the *textile industry* will be the need not only to produce ammunition for the military but also to create various militaristic clothing brands with Ukrainian symbols, including for export, in which *small businesses will participate*.

For the *food industry*, a new area of development will be the production of products with a long shelf life and such that do not require cooking: canned food, freeze-dried food, various snacks, and bars, etc. not only for the needs of the Armed Forces but also for the population, as the creation of certain stocks of this type of food will remain relevant for many years. *The location of this business will be appropriate in territorial communities*, which should be taken into account in projects to restore the infrastructure of villages and towns.

To improve defense capabilities and self-defense, it is advisable to turn to the experience of Israel, which promotes cooperation between public and private defense companies, supports the transfer of defense technologies, conversion, and production of dual-use goods for Ukraine's consumption and export, and has the world's highest level of investment spending on research and development (R&D) - 4.5% of GDP for the development of military technologies and startups¹⁵.

¹⁵ Lytvyn, O. (2022, Sept. 11)/ The Cabinet of Ministers developed a plan for the transformation of Ukraine's economy: the transition will last ten years. *Obozrevatel*. Retrieved from <https://news.obozrevatel.com/ukr/economics/u-kabmini-rozrobili-plan-transformatsii-ekonomiki-ukraini-perehid-trivatime-desyat-rokiv.htm>



Another powerful driver of economic development during the recovery period should be *construction*, which was increasing its role in Ukraine's economy in recent years, primarily due to the state program "Big Construction". In 2019, before the pandemic, construction accounted for 6.4% of gross output of goods and services, ranking fifth among Ukraine's economic activities. Given the scale of the destruction and the need to restore infrastructure as soon as possible, the volume of all types of construction work will grow rapidly in the near future (primarily new construction, repair, reconstruction, and technical re-equipment).

It should be noted that the industry itself must change significantly: any construction, both residential and infrastructure, including repairs, must meet modern standards of energy efficiency, environmental friendliness, resource conservation, and quality of life, which will require and stimulate relevant research on the creation of new materials, technologies for the use of alternative energy sources (including waste recycling) and the development of construction projects (primarily social infrastructure facilities for territorial communities: schools, kindergartens, medical facilities, post offices, trade facilities, shelters, transport stops, etc.). Today, construction companies should prepare for the manufacture and installation of mobile temporary houses and develop enterprises for the construction of low panel-frame houses (in particular, modular houses¹⁶ will be useful for residents of the affected regions at the first stage). A separate type of construction work should be the creation of shelter projects, their modernization, and creation of equipment for cities and territorial communities¹⁷, based on the experience of Israel, where the construction of a shelter room is mandatory in an apartment or private house. An important area of construction work, which became necessary in wartime, is the construction of logistics infrastructure to ensure access to vital goods (food, medicine, personal care products, etc.) even when main transportation routes are destroyed¹⁸.

The high dynamics of construction has a significant multiplier effect on the development of many economic activities: mining, construction materials, metallurgical products, machine building, furniture, wholesale and retail trade, transportation, energy, etc.

The *agricultural sector* will remain the undisputed driver of economic recovery

¹⁶ Modular houses from the United States will appear in Bucha, Irpin, and Hostomel (2022, April 5). *Focus*. URL: <https://focus.ua/uk/ukraine/511469-v-buche-irpene-i-gotomele-poyavyatsya-modulnye-doma-iz-ssha-foto>

¹⁷ Germany is already producing armored private garage shelters.

¹⁸ In the Kyiv region alone, 21% of the total warehouse space (325 thousand square meters) was completely or partially destroyed. These are food and pharmaceutical warehouses and warehouses of distributors of essential goods. The facilities located near highways suffered the most (<http://www.fixygen.ua/news/20220419/stolichnyj-region.html>).



in the postwar period, primarily as the main source of foreign exchange earnings from exports: in 2021, agricultural products accounted for almost 35% of Ukraine's exports of goods, and almost 51% when taking into account processed agricultural raw materials. Agriculture accounted for about 10% of Ukraine's gross output of goods and services and about 9% of its GDP. The hostilities had a negative impact on the potential of Ukraine's agricultural sector: this year, one third of Ukraine's sown areas may remain unseeded (some territories are temporarily occupied, and in the liberated areas, the soil is contaminated and polluted: there are many damaged military vehicles, shell and missile fragments, unexploded ordnance, and mines left by the occupiers in the fields). The most difficult situation is with the sowing of crops that are a significant part of Ukraine's exports: wheat, barley, sunflower, and corn. Russia's aggression caused more than USD 4 billion in direct losses to the Ukrainian agricultural sector. Initially, about USD 500 million will be needed to restore the agro-industrial complex, and in total, more than USD 30 billion will be needed to restore losses in the agricultural sector¹⁹.

The postwar recovery of Ukraine's economy should also include an unconditional reorientation of the agricultural sector from raw material specialization to ensure Ukraine's food security, in other words, the transformation of this sector into a full-fledged agro-industrial complex capable of meeting the needs of food, primarily by helping to reduce imports of finished food products (dairy, meat, fish, and grain) by stimulating the processing of agricultural raw materials into finished products.

The agricultural sector should become a driver for the development of both Ukraine's productions of agricultural machinery, special agricultural production technologies (e.g., greenhouses, including vertical urban greenhouse farms), and the food industry (including the development of processing enterprises in local communities). The food industry has strong development potential, including the export component, which will be facilitated by the National Food Security Platform (developed and implemented by the State Food and Consumer Service with the support of the Office of the President of Ukraine to unite the efforts of food producers, international organizations, territorial communities, and retail chains to develop the Ukrainian economy in times of war and post-war)²⁰.

Possibilities for expanding agricultural production are seen in the growth of its productivity, which is primarily due to the need to increase the financial capacity of

¹⁹ The Ministry of Agrarian Policy announced the amount of damage to the agricultural sector from the Russian invasion. (2022). *Ekonomichna Pravda*. URL: <https://www.epravda.com.ua/news/2022/09/20/691667/>

²⁰ Investpotik: what the Cabinet of Ministers wants to attract those who want to rebuild Ukraine (2022). *Vesti.ua*. URL: <https://vesti.ua/strana/investpotok-chem-kabmin-hochet-privlech-zhelayushhih-vosstanavlivat-ukrainu>



producers and the introduction of modern technologies.

The information and communications technology (ICT) sector is currently one of the main drivers of Ukraine's economy, ranking third in terms of export earnings after agriculture and metallurgy. The ICT sector developed quite rapidly and before the outbreak of hostilities, its share in the gross output of goods and services increased from 2.7% in 2010 to 4.1% in 2019, and its contribution to Ukraine's GDP increased from 3 percentage points in 2010 to 5 percentage points in 2021.

Given the need to innovate Ukraine's economy, the role of the ICT sector as a driver of its recovery and development will only grow, as the sector has proved itself in the global market in such "breakthrough" areas as artificial intelligence, machine learning, neural networks, virtual and augmented reality, as well as a number of other technologies based on *Data Science*.

The implementation of digital technologies, primarily *Starlink* satellite technologies provided to Ukraine in connection with Russia's military aggression, will help ensure the operation of critical infrastructure and services in medicine, finance, and energy, and will be a key focus in the policy of the fastest possible recovery of Ukraine's economy. In terms of digital skills, Ukraine entered the TOP 30 countries in 2021, ranking 26th among 64 countries [12]. Given the approval of the draft law on cloud services²¹, in 2020, as well as the requirement in operators' license agreements to provide 5G coverage in Ukraine's five largest cities²², by 2025, Ukraine is creating the preconditions for a digital state based on EU principles.

Machine building should also be a driver of recovery. Dynamic development of machine building in Ukraine was observed only during 2000-2007. After 2008, a period of instability followed, and since 2012 the industry was mostly depressed. Between 2013 and 2021, machine building lost 35% of its output to the level of 2000. The production of motor vehicles, agricultural machinery, construction machinery and equipment, household electronic equipment, and radiological, electro medical, and electrotherapeutic equipment decreased the most (by 70-80%), which made the situation with providing care to patients during the COVID-19 pandemic extremely difficult.

At the same time, over the past seven years, the production of military vehicles increased by 62%, household appliances by 27%, and electrical distribution and control

²¹ Ministry and Committee of Digital Transformation of Ukraine (2020, June 16). The draft law "On Cloud Services" was approved. Retrieved from <https://thedigital.gov.ua/news/skhvaleno-zakonoproekt-pro-khmarni-poslugi>

²² Ministry and Committee of Digital Transformation of Ukraine (2021, March 4). Mykhailo Fedorov: 5G test centers will appear in Ukraine this year. Retrieved from <https://thedigital.gov.ua/news/mikhaylo-fedorov-v-ukraini-vzhe-tsogo-roku-zyavlyatsya-testovi-tsentri-5g>



equipment by 90%. Ukrainian machine building (military and civil engineering) produces items that can be used on a large scale in the restoration of infrastructure in the postwar period (in particular, for energy production and energy saving), including a wide range of biofuel boilers used by households, small businesses, and in boiler complexes for territorial communities. Ukraine has factories with a full cycle of solar panel production (growing silicon, cutting it, assembling the panels themselves, distribution, and warranty) and wind power generation (Ukrainian company Sirocco Energy). Eurolamp, Iskra, Roilux, ELECTRUM, and other companies produce energy-saving lighting equipment, etc. The development of Ukraine's machine building should become the basis for the modernization and innovative development of Ukraine's economy, ensuring its defense capability, and restoring infrastructure based on energy-efficient and environmentally friendly technologies.

All of the above tasks require huge financial resources, which are beyond the reach of war-torn Ukraine (the European Commission estimates the recovery plan at 500-600 billion euros), while the Ukrainian government has begun to develop a large-scale plan to restore and modernize the national economy²³.

Ukraine is counting on international technological and financial support. Already, many countries - the United States, France, Italy, Portugal, and Germany. Finland, Turkey, and others have expressed their willingness to participate in the restoration of destroyed landmarks in Ukrainian cities and towns²⁴.

On May 5, 2022, the EU established the Solidarity Trust Fund for Ukraine, which is intended to become a tool for mobilizing funds for Ukraine's recovery, including frozen and confiscated assets of the Russian and Belarusian elite and oligarchs. Ukraine hopes for the participation of the World Bank, the International Monetary Fund, the European Investment Bank, and the European Bank for Reconstruction and Development in filling this fund, as well as for the assistance of large international companies and charitable foundations²⁵.

At the same time, the task of attracting investments, financial support, loans, and financial management in the interests of Ukraine is emerging. This will require institutional support - the creation of an institution that would become a single center

²³ Ivanitskiy, A. (2022, May 18). Shmyigal voiced the EU's assessment of Ukraine's recovery. *Korrespondent*. Retrieved from <https://korrespondent.net/ukraine/politics/4479101-shmyihal-ozvuchyl-otsenku-es-vosstanovleniya-ukrayny>

²⁴ Ukrainian cities will be restored by the United States, Turkey, and the EU. Retrieved from <https://news.obozrevatel.com/ukr/economics/ukrainski-mista-vidnovlyat-ssha-turechchina-ta-kraini-es-hto-ta-komu-dopomozhe.htm>

²⁵ Rebuilding Ukraine after the war: who, how, and for whose money (2022, May 19). *Ekonomichna Pravda*. Retrieved from <https://www.epravda.com.ua/columns/2022/05/19/687200/>



of communication between the Ukrainian government and donor countries (organizations) in creating multi-year capital modernization programs, combining complementary and interrelated programs, and ensuring effective budgeting and financing of capital infrastructure programs.

Scenario-based macroeconomic assessments of Ukraine's post-war recovery prospects

The assumptions for the forecasts of Ukraine's post-war recovery include (a) significant external support to help with its recovery, attracting investment, and successful implementation of the Marshall Plan for Ukraine; and (b) achieving a high rate of gross capital formation, which will ensure a shorter timeframe for economic recovery, moderate inflation, etc.

The economic history of the 1950s shows that after the Second World War, it was the rate of fixed capital formation (FCF) that became an important factor in the dynamic development of European and global countries (Table 2).

Table 2

The rate of gross fixed capital formation in the countries of the world in 1950-1958, % of GDP

Country	1950	1951	1953	1956	1957	1958
United Kingdom	15.2	–	16.2	17.4	17.8	17.8
United States of America	20.7	–	19.3	21.3	21.3	20.0
Austria	19.0	–	18.4	22.1	22.2	22.6
Germany	18.8	–	20.4	23.2	22.2	22.4
Italy	20.0	–	21.8	23.9	25.1	23.6
Netherlands	22.8	–	23.8	27.5	27.6	24.7
Denmark	16.6	–	18.1	17.0	17.5	17.8
Norway	29.2	–	32.3	30.1	31.0	–
Greece	19.8	–	13.4	18.0	17.5	20.3
Portugal	–	–	15.3	15.4	16.3	17.0
Canada	–	23.9	25.8	28.9	30.4	28.7
Japan	–	23.1	26.6	28.0	31.7	–
Israel	–	–	27.3	29.0	–	–

Source: calculated according to Yearbook of National Accounts Statistics [13].

During the years of Ukraine's independence, high GERD rates were observed in 2001-2008, namely: in 2001 - 19.8%, 2002 - 19.2%, 2003 - 20.6%, 2004 - 22.4%, 2005 - 21.9%, 2006 - 24.4%, 2007 - 27.1%, 2008 - 25.9%²⁶, which demonstrated the dynamic development of the national economy during this period with the highest GDP indicators in 2003 (9.5%) and in 2004 (12.1%). The highest value of the NERC during 2009-2021

²⁶ Calculated according to the State Statistics Service of Ukraine.



was observed in 2012 (19.4%), and the lowest - in 2021 (12.4%). In 2022-2023, due to Russia's full-scale invasion of Ukraine, the NEC may drop to 7-10%.

The prospects for Ukraine's post-war development were assessed under two scenarios that differ in the timing of the end of hostilities. The forecast horizon is 2035. Under both scenarios, in 2022-2025, the main components of gross capital expenditures will be external borrowing and an increase in inventories of material working capital, primarily in construction in progress. But later, in 2026-2035, when construction projects are put into operation, the level of gross capital formation and gross fixed capital formation will gradually increase.

The first scenario was developed under the assumption that the active phase of hostilities on the territory of Ukraine will end by the end of this year. Projected periods: 2022, 2023-2025, 2026-2030, and 2031-2035. It is projected that the gross fixed capital formation rate will reach 30% by the end of 2030 (Table 3).

Table 3

Estimated dynamics of the main macroeconomic indicators of Ukraine in 2022-2035 according to the first scenario

First scenario	Fact	Forecast estimates			
		average for the period			
	2021	2022	2023–2025	2026–2030	2031–2035
Gross domestic product, %	3.4	-35.2	10.9	8.2	7.5
Final consumer expenditures, %	7.7	-33.1	10.0	6.6	5.8
Gross fixed capital formation, % of GDP	7.5	-47.4	27.6	23.7	13.1
Gross fixed capital formation rate, % of GDP	12.4	10.1	14.3	28.2*	35.3
Consumer price index inflation, annual average	9.4	22.5	10.1	7.5	4.5

* 30% at period end.

Source: estimated by the authors.

Under this scenario, Ukraine's GDP is expected to fall by 35.2% in 2022. In 2023, the economy will begin to recover, and GDP growth in 2023-2025 will be 10.9% on average over the period. Subsequently, the economic growth rate will slow down slightly: to 8.2% in 2026-2030, and to 7.5% in 2031-2035. The GDP level of 2021 will be reached in 2027. Other key macroeconomic indicators will also show positive dynamics starting in 2023. The NBU's gross capital formation rate will grow rapidly, which will support the necessary high rates of modernization for Ukraine's economy.

In 2022, value added is expected to decline in all major economic activities. In particular, construction will experience the largest decline - over 45%, industrial production - over 42%, trade - about 42%, and agricultural production - over 35%. The economic recovery from 2023 onwards will be quite rapid: in 2023-2025, the gross value added of the agricultural sector is expected to grow by 14.1%, construction by 30.4%, and industry by 11.8% on average over the period (Table 4).



Table 4

Average annual growth (decline) in value added by major economic activities according to the first scenario, % in 2019 prices

First scenario	Forecast			
	2022	average for the period		
		2023–2025	2026–2030	2031–2035
Agriculture	-35.5	14.1	5.9	4.2
Industry	-42.4	11.8	9.9	9.5
including the supply of electricity, gas, steam, and air conditioning	-37.5	10.7	9.6	7.1
Construction	-45.8	30.4	23.1	12.5
Wholesale and retail trade	-41.5	11.5	8.2	7.3
Transportation, logistics	-25.1	16.7	7.6	6.9
Programming and information services	-0.3	13.1	9.0	7.9
Other types of economic activity	-31.0	6.1	5.1	5.5
Gross value added TOTAL	-35.2	10.9	8.2	7.5

Source: estimated by authors.

Changes in the overall structure of gross value added will occur in line with the growth dynamics of certain activities. Since the rate of decline in transportation and agriculture is expected to be lower than in other activities, their share in the structure of this indicator will grow significantly in 2022-2025. Gradually, this trend will be reversed by the development of other activities, with the contribution of construction to total gross value added increasing significantly (Table 5).

Table 5

The structure of gross value added by major economic activities according to the first scenario, %, in 2019 prices

First scenario	Actual	Forecast			
	2021	2022	2025	2030	2035
Agriculture	10.6	10.6	11.5	10.4	8.9
Industry	22.0	19.6	20.0	21.6	23.7
including the supply of electricity, gas, steam, and air conditioning	3.6	3.5	3.5	3.7	3.6
Construction	3.5	2.9	4.8	9.1	11.4
Wholesale and retail trade	16.0	14.4	14.6	14.6	14.5
Transportation, logistics	6.7	6.9	8.1	7.8	7.6
Programming and information services	3.7	5.8	6.1	6.3	6.4
Other economic activities	37.4	39.9	34.9	30.1	27.5
Gross value added total	100	100	100	100	100

Source: estimated by the authors.

The second scenario was developed under the assumption that the active phase of hostilities on the territory of Ukraine will end by the end of 2023. Projected periods:



2022, 2023, 2024-2025, 2026-2030, and 2031-2035. The gross fixed capital formation rate of 30% is expected to be reached by the end of 2035 (Table 6).

Table 6

The assessment of the dynamics of Ukraine's main macroeconomic indicators in 2022-2023 according to the second scenario

Second scenario	Actual	Forecast estimates				
		2022	2023	Period average		
	2021			2024–2025	2026–2030	2031–2035
Gross domestic product, %	3.4	-45.0	-5.5	9.3	7.4	5.8
Final consumer expenditures, %	7.7	-41.3	-5.1	9.0	6.2	4.1
Gross fixed capital formation, % of GDP	7.5	-67.5	-4.4	24.7	21.2	17.6
Gross fixed capital formation rate, % of GDP	12.4	7.3	7.4	9.2	16.8	24.8*
Consumer price index inflation, annual average	9.4	30.7	19.5	12.0	8.1	5.0

* 30% at the end of the period.

Source: estimated by authors.

Under this scenario, Ukraine's GDP is expected to decline by 40-45% in 2022. In 2023, the decline will continue, but the rate of decline will slow significantly to 5.5%. Starting in 2024, growth is expected in all types of economic activity, which will ensure an average annual GDP increase of 9.3% in 2024-2025, 7.4% in 2026-2030, and 5.8% in 2031-2035. The 2021 level will be reached in 2032. Other macroeconomic indicators will also show positive dynamics starting in 2024.

A significant drop in production is expected in all types of economic activity, which will continue until the end of hostilities. Construction, which will be limited to the restoration of destroyed critical infrastructure, and industry, where the activities that accounted for the lion's share of Ukraine's industrial output - metallurgy, mining, and energy – were severely damaged, will experience the largest drop.

The forecast for the average annual decline in industrial production in 2022-2023 is almost minus 34%. With the cessation of hostilities in 2024, Ukraine's industry will begin to recover, primarily driven by the mining, food, chemical, construction materials, and machine-building industries. The average annual decline in construction is expected to reach 47% in 2022-2023. However, this type of activity will be the main driver of Ukraine's economic development in the post-war period. The agricultural sector, which is expected to decline by 24.5% in 2022-2023, will also show significant growth from 2024.

The projected dynamics of value added by main types of activity is shown in Table 7.



Table 7

**Average annual growth (decline) in value added by major economic activities
under the second scenario, % in 2019 prices**

<i>Second scenario</i>	<i>Forecast</i>			
	<i>Period average</i>			
	2022–2023	2024–2025	2026–2030	2031–2035
Agriculture	-24.5	16.7	4.9	2.5
Industry	-33.6	9.6	8.7	8.1
including the supply of electricity, gas, steam, and air conditioning	-29.2	8.9	7.2	6.5
Construction	-47.3	25.5	21.0	16.8
Wholesale and retail trade	-27.6	9.3	6.6	5.0
Transport, logistics	-33.4	10.2	7.7	5.8
Programming and information services	-10.6	12.5	7.9	6.1
Other economic activities	-26.7	5.3	6.9	3.9
Gross value added total	-27.9	9.3	7.4	5.8

Source: estimated by authors.

For the vast majority of key activities, positive dynamics is expected to start in 2024 (after the end of the war) according to *the second scenario*. Differences in dynamics will result in changes in the structure of gross value added: the share of agriculture will increase compared to 2021. Also, in 2023, the share of transport and, especially, computer programming, consulting, and information services will increase (Table 8).

Table 8

**The structure of gross value added by major economic activities under the
second scenario, % in 2019 prices**

<i>Second scenario</i>	<i>Actual</i>	<i>Forecast</i>			
	2021	2023	2025	2030	2035
Agriculture	10.6	11.6	13.2	11.7	9.6
Industry	22.0	18.6	18.8	19.3	22.2
including the supply of electricity, gas, steam, and air conditioning	3.6	3.5	3.5	3.4	3.5
Construction	3.5	1.9	2.5	4.5	7.4
Wholesale and retail trade	16.0	16.1	16.1	15.5	15.0
Transport, logistics	6.7	7.3	7.4	7.5	7.5
Programming and information services	3.7	5.8	6.1	6.2	6.3
Other economic activities	37.4	38.7	35.9	35.2	32.2
Gross value added total	100	100	100	100	100

Source: estimated by the authors.

Overall, the depth of the recession in the Ukrainian economy will be determined primarily by the duration of hostilities and the extent of the temporarily occupied territories of Ukraine. The high probability of Russia's prolonging the war in Ukraine is the main risk for the deterioration of the socio-economic situation in Ukraine and globally. This forecast option is not currently considered.

Encouraging Ukraine's investment demand in the postwar period will require:



investment growth rates exceeding those of GDP, largely due to increased innovation component; accelerated growth of investment in the modernization of fixed assets and their accumulation on a new technological basis, which will curb inflation; and increased real household income in line with GDP dynamics; moderate development of public consumption in the budget funded sector; narrowing the gap between the growing dynamics of real wages and labor productivity; price and exchange rate stability; and financial and credit coverage of the projected investment based growth of the economy and intensive replacement of economic entities' own resources with credit resources in the structure of sources of investment financing (increasing the share of credit resources and foreign investment). Calculations show that the implementation of these measures will help maintain the high pace of postwar recovery in the face of slowing export dynamics and growing tensions in foreign markets.

Scenario based estimates of the impact of the decline in commodity exports on output, gross value added and labor compensation in Ukraine in 2022

To make forecast based estimates of the dynamics of merchandise exports from Ukraine in 2022, the regions of Ukraine are divided into two groups:

- the first group includes regions where military operations are ongoing (or previously took place) or are under temporary occupation (surrounded): Donetsk, Zaporizhzhia, Luhansk, Mykolaiv, Kharkiv, Kherson, Kyiv, Sumy, and Chernihiv regions²⁷;
- the second group is the rest of Ukraine's regions.

At the end of 2021, the share of the first group of regions in total agricultural production was 42.9%²⁸ (this group accounted for 34.4% of available grain corn at enterprises engaged in its storage and processing, and 61.5% of available wheat)²⁹, and accounted for 37.0%³⁰ of total sales of industrial products (with Dnipropetrovsk, Donetsk, and Zaporizhzhia oblasts accounting for 86.7% of sales of metallurgical and finished metal products).

The value of merchandise exports in March-June 2022 decreased by USD 10 billion (minus 47%) to USD 11.4 billion compared to the same period in 2021 (a 34.3% increase in merchandise exports in the first two months of the year could not compensate for the decline in March-June).

In March-June 2021, the regions of the first group accounted for 52.5% of

²⁷ For some time, two territorial communities in the Odesa region were on this list (according to the Ministry of Reintegration of the Temporarily Occupied Territories of Ukraine, <https://minre.gov.ua/documents>).

²⁸ Data from the State Statistics Service of Ukraine. Retrieved from http://www.ukrstat.gov.ua/operativ/operativ2022/sg/psg_pc/pcg_pc_21_ue.xlsx

²⁹ Data from the State Statistics Service of Ukraine. Retrieved from http://www.ukrstat.gov.ua/operativ/operativ2021/sg/nkzzo/nkzzo1221_xl.xls

³⁰ Data from the State Statistics Service of Ukraine. Retrieved from http://www.ukrstat.gov.ua/operativ/operativ2021/pr/orp_reg/orp_reg_2021_ue.xls



Ukraine's merchandise exports, and in March-June 2022, they already accounted for 38.5% due to a 68% decrease in the supply of metallurgical products (USD 3.6 billion)³¹; and a 42% (USD 0.9 billion) decrease in fats and oils of animal or vegetable origin. Exports of grain crops (the main export commodity group) decreased by 57% (USD 1.8 billion), ore by 51% (USD 1.5 billion), machinery by 29.4% (USD 0.6 billion), and agriculture, food, beverages, and tobacco products by 40% (USD 3 billion).

The geographical structure of merchandise exports also changed dramatically: while in March-May 2021, the main trading partners were China, Poland, and Turkey (28.7% of total exports), in March-May 2022, they were Poland, Romania, and Hungary (39.1% of exports). Moreover, due to significant logistical problems, exports from Ukraine to neighboring European countries increased sharply, namely: Poland - 46%, Romania - 125%, Hungary - 60%, and exports to Bulgaria, Moldova, and Slovakia increased significantly.

Scenario based estimates of the dynamics and structure of Ukraine's merchandise exports depend primarily on the output and structure of production, as well as on logistics. Thus, the main reasons for the dramatic decline in Ukraine's exports of goods in 2022 were: an output decline as a result of the Russian military aggression; significant losses of production as a result of hostilities and the occupiers' export of products outside Ukraine; the rapid growth of logistics problems, the full solution of which is possible only in 2023 according to *the first scenario* and in 2024 according to the *second scenario* (in 2022, logistics will be restored only partially); significant growth of inventories of material working capital as a result of the logistics crisis; falling external demand for Ukraine's products due to the slowdown in the global economy); decline in prices on global commodity markets - grain crops (wheat and corn), sunflower oil, iron ore, etc.

In 2022 - as a result of Russia's full-scale war against Ukraine - the Ministry of Agrarian Policy of Ukraine predicts a 30-60% decrease in winter crops compared to last year and a 25%³² decrease in agricultural land. In the 2022/2023 marketing year, Ukraine expects to export about 65-70 million tons of grains and oilseeds (22 million tons of the last year's crop residues and 38-43 million tons of this year's crop)³³.

The growing gap in 2022 between the cost of one ton of exports (USD 0.45 thousand) and imports (USD 2.21 thousand), which also indirectly demonstrates the

³¹ In particular, exports of flat products dropped by more than 6 times, and semi-finished iron and non-alloy steel products by 5 times. This was primarily due to the loss of production capacity and the suspension of production.

³² The Ministry of Agrarian Policy predicts that the acreage will be reduced by up to 60% in the fall (2022). *Agropolit*. Retrieved from <https://agropolit.com/news/24211-u-minagropolitiki-prognozuyut-scho-posivni-ploschi-voseni-skorotyatsya-do-60>

³³ Ukraine expects to export up to 70 million tons of grains and oilseeds this year (2022). *UNN*. Retrieved from <https://www.unn.com.ua/uk/news/1992713-ukrayina-rozrakhovuye-na-eksport-do-70-mln-tonn-zernovikh-ta-oliynikh-tsogo-roku>

growing gap between the technological level (quality) of exports and imports, indicates significant logistical problems for the export of goods from Ukraine (Figure 1).

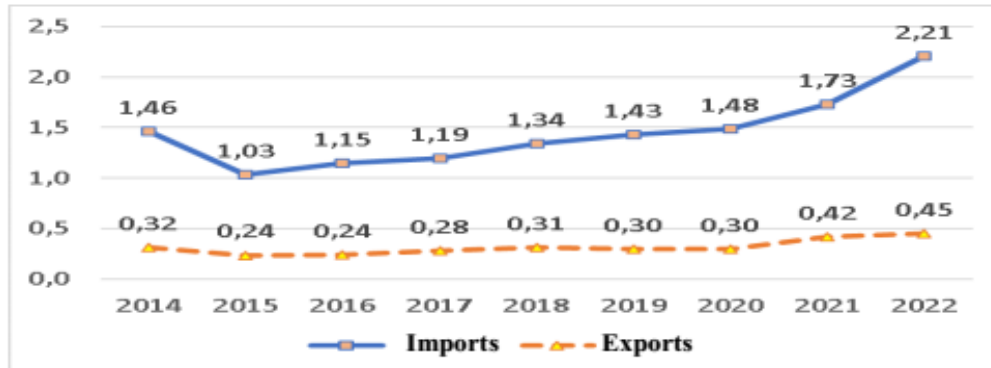


Figure 1. Cost of one ton of exports and imports of goods, thousand USD, excluding commodity groups 27, 97.98, in 2022 - data for January-June

Source: calculated by authors according to the State Statistics Service of Ukraine

The dynamics of physical exports of goods is positively influenced by the partial unblocking of grain exports from the ports of Greater Odesa to the EU, as well as the acceleration of the pace and volume of grain harvesting in the territory controlled by Ukraine. In August 2022, Ukraine exported almost 4.6 million tons of grain (including sea routes). About 3 million tons were transported by road, rail, and the Danube³⁴ (before the war, agricultural exports amounted to 5-6 million tons per month)³⁵. In the medium term, the Ukrainian-Polish project to build a pipeline for the transportation of vegetable oil from Yahodyn (Volyn Oblast) to Gdansk³⁶. may play an important role.

Opening Ukrainian seaports to export steel products, similar to the arrangements for grain exports, would provide Ukraine with a steady inflow of foreign currency, which would help stabilize the hryvnia. It would also help to restore production in the metallurgical industry, which is currently experiencing a severe crisis³⁷.

³⁴ Ukraine increases grain exports by 20-30% every month in 2022. Retrieved from <https://usm.media/ukrayina-zbilshuye-eksport-zerna-na-20-30-shhomisyaczya/>

³⁵ Ukraine expects to export up to 70 million tons of grains and oilseeds this year (2022). UNN. Retrieved from <https://www.unn.com.ua/uk/news/1992713-ukrayina-rozrakhovuye-na-eksport-do-70-mln-tonn-zernovikh-ta-oliynikh-tsogo-roku>

³⁶ Mykola Solskyi spoke about the technical characteristics of the oil pipeline to Gdansk (2022). Retrieved from <https://www.growhow.in.ua/mykola-solskyy-rozpoviv-pro-tekhnichni-kharakterystyky-oliynoho-truboprovodu-do-hdanska/>

³⁷ The opening of ports for metal exports will stabilize the hryvnia and help restore the steel industry (2022). Retrieved from <https://gordonua.com/ukr/news/money/vidkrittja-portiv-dlja-eksportu-metalu-stabilizuje-grivnju-ta-dopomozhe-vidnoviti-metallurgijnu-galuz-zmi-1625246.html>



According to our calculations, the physical volume of exports of goods in 2022 will decrease by 37.5-42.5% compared to 2021. A significant change in the structure of exports (in previous year prices) is predicted, primarily a decrease in the share of ferrous metals, chemical products, iron ore, and an increase in the share of sunflower oil, clothing and footwear, wood, electrical machinery, ferrous metal products, and pharmaceutical products.

To assess the impact of the decline in the physical volume of merchandise exports on macroeconomic dynamics (based on the Input-Output table in basic 2019 prices), we use the contribution of the following indicators: the direct contribution to output, value-added, and wages of employees from that foreign economic activity (FEA) where export goods are produced; non-direct contribution from the intermediate consumption of domestically produced goods and services; and mediated contribution to the amount of remuneration of employees in the respective FEA from household consumption expenditures (Table 9).

Table 9

Contribution of certain economic activities to output, value-added, and remuneration of employees in Ukraine in 2019, %

Economic activity	Output	Gross value added	Remuneration of employees	Exports of goods and services
Agriculture, forestry, and fishing	10.3	10.4	4.7	20.3
Manufacture of food products; beverages and tobacco products	7.9	3.5	3.7	14.7
Extraction of metal ores, other minerals and quarrying; provision of auxiliary services in the field of mining and quarrying	2.5	2.7	1.7	6.1
Metallurgical production	4.9	1.7	1.7	14.8
Four economic activities	25.6	18.3	11.8	55.9
Total	100	100	100	100

Source: Authors' estimates based on data from the State Statistics Service of Ukraine. Retrieved from http://www.ukrstat.gov.ua/druk/publicat/kat_u/2021/zb/05/zb_tvv_2019.zip

According to Table 9, four economic activities play a significant role in the country's economy. In 2019, manufacturing output accounted for 25.6% of total output of goods and services in Ukraine's economy (at basic prices), value-added - 18.3%; and wages and salaries - 11.8%. At the same time, their share in total exports of goods and services amounted to 55.9%.

Below are scenario based calculations of the impact of the full contribution (*direct, indirect, and mediated*) of the decline in physical exports of goods from Ukraine in 2022 on output, value-added, and real wages in Ukraine (Table 10).

Table 10

The impact of full contribution of the decline in physical exports of goods on output, value-added, and labor compensation in Ukraine in 2022, % to previous year.

	Gross value added, %	Output, %	Remuneration of employees, %
Scenario 1: Decrease in physical exports of goods from Ukraine by 37.5%			
Total in the economy	-8.8	-10.9	-7.8
Industry	-19.2	-19.8	-18.9
Mining and quarrying	-21.7	-23.0	-22.4
Processing industry	-19.8	-20.5	-19.8
Scenario 2: 42.5% decline in physical exports of goods from Ukraine			
Total in the economy	-10.7	-12.3	-8.8
Industry	-21.6	-22.3	-21.4
Mining and quarrying	-24.3	-25.8	-25.1
Processing industry	-22.4	-23.2	-22.6

Source: Authors' estimates based on data from the State Statistics Service of Ukraine. Retrieved from http://www.ukrstat.gov.ua/druk/publicat/kat_u/2021/zb/05/zb_tvv_2019.zip

According to scenario based estimates. a drop in physical exports of goods by 37.5-42.5% in 2022 compared to 2021 will lead to a decline in Ukraine's gross domestic product by 8.8-10.7%. in output by 10.9-12.3%. and in wages and salaries by 7.8-8.8%.

Given the ongoing full-scale war in Ukraine. it is necessary to be aware of the key *risks to the implementation* of projects for the restoration and development of the national economy, namely: uncertainty about the duration of hostilities and the timing of the end of the active phase of the Russian Federation's war against Ukraine; high rates of migration, a decline in the economically active population and labor force; accelerating inflation due to higher energy prices, the blockade of agricultural exports from Ukraine. and the destruction of logistics infrastructure; Ukraine's crucial dependence on external financial injections to accumulate resources in the investment sector; widespread corruption in the bureaucratic system of Ukraine; further slowdown in the global economy, which may lead to a decrease in demand for certain exports from Ukraine; falling global prices for wheat, corn, sunflower oil, and iron ore and the non-renewal of the Istanbul agreements or even early termination of the signed agreement may lead to a sharp decline in projected exports in 2022-2023.

Conclusions

Among the possible *sources of successful post-war reconstruction* of Ukraine's economy, which can simultaneously take advantage of inter-sectoral relations and minimize external influences are the following: moving away from the pre-war raw material and agricultural import-dependent economy and ensuring its recovery after the war based on modern achievements of science, technology and a new technological mode, development of high-tech economic activities, primarily in the military-



industrial complex, the preservation of human capital through a radical change in the state policy of its generation and use and state regulation of creating a sufficient number of jobs, a significant injection of financial resources and their effective use; creation of proper conditions for investment in agriculture, in particular in the construction of buildings and structures for agricultural purposes, the formation of a modern production infrastructure of the agro-industrial complex (as evidenced by the dynamics of agriculture in recent years, the return on such investments is quite fast and the demand is steady); realization of the investment potential of available financial resources in the restoration and development of destroyed infrastructure and logistics, housing construction, modernization of housing and communal services, and implementation of projects for the restoration and modernization of industry (primarily machine building and metallurgical production to reduce energy consumption in general and natural gas in particular).

Ukraine's economic recovery is facing the challenge of attracting significant amounts of investment for the development of virtually all activities, financial assistance, loans, and institutional support for financial management in the interests of Ukraine. However, the scale of corruption in almost all areas of Ukraine's bureaucratic system is a significant obstacle to the necessary financial and investment support for Ukraine's postwar recovery. If the government's efforts to eliminate corruption risks arising during the war are not effective, this will pose a major risk to attracting the necessary investment resources for post-war reconstruction and further development of the Ukrainian economy, its European integration, and the implementation of international practices and standards.

Scenario based macroeconomic assessments show that achieving gross fixed capital formation rate of 30-35% of GDP, moderate inflation, and macroeconomic stability can ensure accelerated economic recovery in Ukraine at the level of 7.4-8.2% on average in 2026-2030 and, respectively, 5.8-7.5% in 2031-2035.

The decline in exports of goods from Ukraine as a result of Russian aggression, which caused a drop in output, losses, removal of manufactured goods by the occupiers outside Ukraine, and disruption of transport and logistics potential, will lead to a decline in Ukraine's GDP by more than 10 percentage points. The most important areas of post-war recovery of Ukraine's export potential are the following four sectors of the economy: agriculture, forestry, and fisheries; food production; metal ore mining; and metallurgy. In the medium term, a significant change in the structure of merchandise exports is expected due to an increase in the volume of exports of highly processed goods. To restore Ukraine's place in global value chains and increase exports of goods, the development of transit potential and logistics is crucial.

In general, ideological and value differences require a new model of the world's neighborhood to overcome geopolitical tensions. The war in Ukraine (the emergence

of local "hotbeds" of escalation of Russia's large-scale invasion of Ukraine and the "freezing" of the military conflict for a long time), the sanction based isolation of Russia and the international focus on energy and even food self-sufficiency create new obstacles to international trade and investment, and deepen the risks to Ukraine's and global prospects, such as fragmentation of supply chains, technological standards, and payment mechanisms, further price spikes in energy, food, and other items that will be difficult to bring back under control; devaluation of the national currency, which will negatively affect the cost and quality of life, public financial management, future debt servicing, etc. In addition, there are threats of food, humanitarian and pandemic disasters on a global scale, as well as economic consequences of destructive climate and environmental changes.

Under the circumstances, prospective areas for future research should include studying the impact of policy options for building the national economy (tax initiatives, interest rates, public investment, loans, overcoming import dependence, etc.), and assessing transformational changes based on a high-tech model of Ukraine's economic development.

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СЦЕНАРНІ МАКРООЦІНКИ ПІСЛЯВОЄННОЇ ВІДБУДОВИ ЕКОНОМІКИ УКРАЇНИ

У статті окреслено довгострокові тенденції розвитку світової економіки на тлі різкого погіршення умов глобального зростання через тривалість війни в Україні, зростання інфляції та більш жорсткі фінансові умови.

Особливе місце відведено головним завданням післявоєнної відбудови економіки України, передусім відходу від довоєнної сировинно-аграрної, імпортозалежної економіки та забезпеченню її відновлення на фундаменті сучасних досягнень науки, високих технологій та нового технологічного укладу, а також відновленню інфраструктури, сучасній реструктуризації за секторами економіки та видами економічної діяльності, що мають стати

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драйверами відновлення економіки України у найближчій перспективі (це –оборонно-промисловий комплекс, агросектор, будівництво, сектор ІКТ, машинобудування), забезпеченню збереження людського капіталу тощо.

Зазначено, що у 2022 р. очікується значне падіння виробництва по всіх видах економічної діяльності, що зберігатиметься до завершення воєнних дій. Найбільшого падіння зазнає будівництво, діяльність якого обмежиться відновленням зруйнованої критичної інфраструктури, та промисловість за видами діяльності, на які припадає лівова частина промислового виробництва України (добувна промисловість, металургія, енергетика).

Визначено вихідні умови прогнозних оцінок повоєнного відновлення України: залучення інвестицій та досягнення високої норми нагромадження основного капіталу, що забезпечить більш стислі терміни відновлення економіки, а також дотримання помірної інфляції. Розрахунки показали, що досягнення норми валового нагромадження основного капіталу до 30–35% ВВП сприятиме швидкому відновленню економіки України після війни.

Показано, що основними чинниками зменшення обсягів експорту товарів у воєнний період є падіння обсягу виробництва та порушення транспортно-логістичних зв'язків. Здійснено оцінку вартісних та фізичних обсягів, а також товарної і географічної структури експорту товарів з України у 2022 р. Оцінено вплив скорочення фізичного обсягу експорту товарів на випуск продукції, створення доданої вартості та оплату праці в Україні.

Наведено ризики забезпечення повоєнної відбудови економіки України, основними серед яких слід відзначити продовження воєнної агресії РФ після 2023 р. та ескалацію воєнних дій на території України з посиленням впливу руйнівних шоків глобальної рецесії на внутрішні економічні процеси⁴¹.

Ключові слова: післявоєнна відбудова економіки України, руйнування, інфраструктура, структурна перебудова, людський капітал, драйвери розвитку, інвестиції, норма валового нагромадження основного капіталу, ВВП, види економічної діяльності, інфляція, експорт товарів, сценарні макрооцінки, прогнози та ризики економічної динаміки

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