



Primary Sector Economics

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**STRUCTURAL DEFORMATIONS
IN THE ENTREPRENEURIAL SECTOR
AND OVERCOMING THEM:
CONTEXT OF UKRAINIAN
ECONOMIC RECOVERY**

Abstract

The Russian Federation's war of aggression against Ukraine has caused enormous destruction and damage to the national economy, prompting the search for the most effective ways and directions of rebuilding the country, eradicating poverty, and ensuring economic growth based on the principles of sustainability. This paper argues that in the present days and in the postwar period, structural transition of the economy to higher technological levels is a prerequisite for the recovery of Ukraine. Entrepreneurial sector plays an exceptionally important role in these processes in the context of the new industrial revolution, and its potential should be directed to the production of high value-added industrial products and provision of high-tech services. The most significant technological

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and sectoral structural deformations, caused by problems and crises in the national economy, are identified and summarized. The research conclusions present ways to overcome them that take into account the peculiarities of pre-war and current conditions and the country's European integration progress.

Key Words:

post-war recovery; entrepreneurial sector; structural deformations; economic resilience; industrial revolution; European integration.

JEL: H56, M21, O14, O31.

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Problem Statement and Literature Review

As a result of the full-scale military aggression of the Russian Federation against Ukraine, which began on February 24, 2022, the Ukrainian economy has suffered tremendous damage and losses. Experts believe that the economic downturn is caused by the destruction of infrastructure, attacks on energy facilities, relocation of businesses abroad, blocking of ports, damage and closure of factories. Due to the military aggression, Ukraine's economy shrank by more than 35% in 2022, according to UN experts, and the monthly budget deficit is \$5 billion (Ukrinform, 2023, Jan 26).

According to the joint assessment of the United Nations, the World Bank, the European Commission, and the Government of Ukraine for the year of war (February 2022-February 2023), the total amount of damage and direct losses of Ukraine's economy reached more than \$420 billion. The housing sector (38%), transport infrastructure (26%), energy (8%), trade and industry (8%), and agriculture (6%) were the most affected. The total reconstruction and recovery needs of Ukraine amount to more than USD 411 billion, which is 2.6 times the actual GDP of Ukraine in 2022 (Himmelfarb, 2023). Due to the destruction of industrial facili-

ties and infrastructure, forced migration (8 million people according to the National Bank of Ukraine), and the economic slowdown caused by the military invasion, the unemployment rate in Ukraine increased by 16% – from 9.8% in 2021 to 25.8% in 2022 – equivalent to 3.2 million people (The National Bank of Ukraine, 2023), consumer prices increased by 26.6% (food prices by 34.4%) (Minfin, n.d.-a), while the GDP declined by 30%, according to the Ministry of Economy of Ukraine (Ukraine Invest, 2023).

Even before the war, Ukraine was one of the poorest countries in Europe, and its population could not meet all their needs at a decent level, including receiving qualified medical care, purchasing medicines and medical devices (Libanova, 2020). In 2021, the share of food expenditures in total household consumption amounted to 41.6%. (National Research Center «Institute of Agrarian Economics», n.d.). This share is a traditional indicator of poverty: the higher it is, the poorer the country, region, or community is (Libanova, 2020). For comparison: in the US, it is 6.7%, in Germany – 12%, and the average share of food spending in the world is 25.5%. In the overall ranking of countries by this indicator, Ukraine is 92nd, between Ethiopia (41.3%) and Cambodia (42.7%) (National Research Center «Institute of Agrarian Economics», n.d.). This reflects the high overall poverty level of the Ukrainian population and is a consequence of the pre-war weakness of the economy. In wartime and post-war periods, the problem of poverty may become widespread, as the average unemployment rate is projected to reach 26.1% in 2023 (The National Bank of Ukraine, 2023), and about 60% of Ukrainians may find themselves below the poverty line (Krykunenko, 2022). The recovery of Ukraine's economy from the crisis and its post-war reconstruction will largely depend on the entrepreneurial sector.

Europe is confident that Ukraine is on its way to victory and will achieve a turning point in the war as early as 2023. Ukraine's victory will come – more than 90% of Ukrainians believe in it, according to surveys (Ukrinform, 2023, Mar 31). Will companies be ready for victory and what will the postwar period bring them? According to experts (Kovalenko, 2023), Ukrainian business has gone through many stages of change and adaptation in recent years. Those who have weathered the test of the Covid-19 pandemic seem to be ready for new challenges. But one cannot be ready for war. The hostilities have forced Ukrainian businesses to relocate, completely change logistics routes, make important decisions on employee management, product policy, etc. Business risks have significantly increased, which must be taken into account in planning. At the beginning of the war, in February-March 2022, company executives often made important decisions in a matter of hours. They saved a lot because in that situation the winner was the one who reacted faster and then – throughout 2022 – the one who adapted faster. Small and medium-sized enterprises proved to be the most adaptive and flexible. This is due not only to rapid decision-making, but also to the rapid implementation of these decisions within companies. Therefore, great hopes are placed on the categories of enterprises forming the much-needed middle stratum of society.

The war in Ukraine calls for a fundamental rethinking, a change in the economic model that has developed over the past thirty years of the country's independence, a search for solutions to the numerous problems that have arisen as a result of the war, and creation of strategic directions for the country's recovery based on the principles of resilience, taking into account current and post-war circumstances. Since the first months of Russia's military aggression, Ukrainian scholars have been discussing these issues, analyzing the causes and consequences of military aggression, defining the conditions and tasks for successful post-war reconstruction of the national economy, and proposing ways to revive the country's economy in the context of new challenges and threats.

For example, Novikova, Zaloznova, and Azmuk (2022) focused on finding opportunities and substantiating strategic directions for the restoration of Ukraine's human capital in the postwar period on the basis of digitalization. Antoniuk (2023), Lisogor, Rudenko, Ivashenko (2023) conducted studies of the higher education system as the greatest value and educational and professional potential of Ukraine under martial law. In particular, Antoniuk (2023) made a thorough analysis of the problems that faced higher education in Ukraine in the pre-war period, identified the main risks and threats of hostilities, their immediate and long-term effects on the higher education system of Ukraine, and outlined new vectors of its development in modern conditions. Shvets and Shevtsova (2022) highlighted an equally important aspect of the postwar economy development in their paper. The researchers summarized the key potential sources of external financial support for Ukraine and developed recommendations for their effective use in achieving an innovative scenario of post-war economic development, taking into account the peculiarities of decentralization and European integration. A wide range of topical issues of innovative economic recovery for the post-war modernization of Ukraine is presented in a collective monograph edited by Omel'yanenko (2023).

The category of resilience is becoming increasingly important in the context of Industry 4.0-5.0 (Schwab, 2016; European Commission, Directorate-General for Research and Innovation, Renda et al., 2022), the need to achieve stress resistance in Ukraine and other countries and regions of the world that are experiencing a crisis in many areas – from defense and energy to food security – due to Russian military aggression. Cherevatskyi (2023) offered his own view of this concept in economics for the needs of industry. In particular, he concluded that the resilience of the economy (at different levels) depends on a combination of natural, geographical, technological factors, as well as the economic and political conditions.

Kindzerskyi (2022) provided a comprehensive in-depth analysis of the key challenges that led to the pre-war depression and weakness of Ukraine's economy, and led to large-scale economic losses during the war. The scientist identified the most acute shortcomings of the Ukrainian economy and defense that influenced the country's ability to resist the aggressor, proposed strategic priorities

for Ukraine's development to be implemented through national projects, and identified the features of the post-war national industry recovery policy.

Given the results of the decentralization reform, Shlafman & Bondarenko (2022) emphasized the crucial role of local authorities in stimulating the development of micro, small and medium-sized enterprises (SMEs) in the context of the national economic recovery, as well as removing regulatory barriers and corruption to improve the performance and competitiveness of SMEs at the local level. They proposed an improved methodological approach to drafting entrepreneurship development programs at the local government level; it takes into account differences in the socio-economic and financial capacity of communities and the role of SMEs in ensuring sustainable development.

The peculiarities of the revitalization of old industrial regions and communities in the context of military challenges were discussed by Soldak (2022). The author emphasized the need to strike a balance between strategic planning for the development of such territories based on smart specialization that stresses technological innovation and on fundamental economics of socially and environmentally acceptable approaches and innovations.

Foreign experts and Ukrainian scholars who left Ukraine in search of asylum and are now working abroad have also made a significant contribution to the study of the socio-economic and environmental consequences of the Russian-Ukrainian war. In particular, they studied its impact on the welfare and health of civilians (Osiichuk & Shepotylo, 2020), the implementation of the UN Sustainable Development Goals, especially in developing countries that are vulnerable to economic shocks (Pereira et al, 2022), global commodity and financial markets (Fang & Shao, 2022; Izzeldin, et al., 2023), energy and food security (Kuzemko et al., 2022; Saâdaoui et al., 2022) and other areas of the global economy.

Although Ukrainian and international scholars have already amassed a significant research base, the extremely difficult, *force majeure* circumstances that Ukraine is facing make it necessary to continue researching ways, opportunities and directions for the country's recovery, eradicating poverty, ensuring rapid and dynamic economic growth based on the basis of resilience. We believe that a resilient economy is capable of absorbing current and future shocks and recovering from shocks, regardless of their origin – be it war, pandemic, economic crisis, etc. – while guaranteeing business continuity and protecting employees. To achieve this, Ukraine needs to structurally transform its entire economy to higher technological levels by creating a modern high-tech manufacturing, introducing advanced technologies and innovations. This also requires Ukraine to mobilize the potential of the entrepreneurial sector and direct it to the production of high value-added industrial products and provision of knowledge-intensive and high-tech services.

The study aims to (i) substantiate the role of the entrepreneurial sector in the structural transformation of the economy in the context of the new industrial

revolution, (ii) identify the most significant technological and sectoral structural deformations in the Ukrainian entrepreneurial sector, and (iii) propose ways of overcoming them that take into account the peculiarities of pre-war and current conditions and the country's European integration progress.

Methodology

The study is based on the provisions of evolutionary economics and the developmentalist tradition, and draws on the theoretical developments of Ukrainian and foreign scholars on the problems of technological and sectoral structural transformations necessary for economic recovery and reconstruction. The paper employed the methods of analysis and synthesis, systematization and generalization, comparative analysis and systematic approach.

Research Results

Role of the entrepreneurial sector in structural economic transformation in the context of the Industrial Revolution 4.0

The modern world is on the verge of new revolutionary technological transformations. The process started with development of semiconductors (1960s), personal computers (1970s-1980s) and the Internet (1990s) and accelerated in the early 21st century. According to K. Schwab (2016), these transformations are unprecedented in size and scale. Right now, a new industrial revolution is starting to unfold in the world – the fourth, according to the generally accepted periodization, characterized by the transition to renewable (alternative) energy sources and cyber-physical systems that blur the lines between the physical, virtual and biological realms (Schwab, 2016).

If we look at the evolution of industrial revolutions (the era of steam energy – the era of electricity – the information age – the current era of cyber-physical systems and talents), we can see that each era was based on technological discoveries (breakthrough technologies) and the creation of new knowledge. They affected all factors of production and led to radical structural changes. Such structural shifts have their roots in N. Kondratiev's theory of long waves, according to which «third-order» economic disturbances lasting 40-50 years are at the heart of industrial revolutions. Every industrial revolution has

its own set of breakthrough technologies. For example, the core of N. Kondratiev's fifth long wave (approximately 1970-2010) comprises microelectronic and processor technology, electronics, software, fiber optics and computing, telecommunications. Compared to the technologies of the fourth long wave, they had the following advantages: individualization of production and consumption, increased flexibility of production. Accordingly, the breakthrough technologies of the Fourth Industrial Revolution, which corresponds to the sixth long wave of N. Kondratiev (approximately 2010-2060), include artificial intelligence and machine learning, virtual and augmented reality, robotics, blockchain and big data, new advanced materials and nanomaterials, nano- and biotechnology, precision medicine and genomics, neurotechnology, cognitive technology, space technology (and the list is constantly being updated). The development of such technologies gives impetus to the emergence of new industries that produce fundamentally new – breakthrough – innovative products and services. They are also the reason for the fall of leading companies and the emergence of new market leaders. This happened, for example, with Digital Equipment Corporation, whose management failed to react in time to the emergence of the personal computer market, with Kodak, the former leader in the market of cameras and photographic supplies, which went bankrupt due to the emergence of digital photography, with Lever Brothers, which was ousted by Procter & Gamble due to the production of the first synthetic detergent Tide, and many others.

Thus, the development of breakthrough technologies and new industries, on the one hand, creates the necessary preconditions for innovative transformations of market leaders, and, on the other hand, provides opportunities for any other enterprises engaged in research and development (R&D) and implementing innovations to gain dominant market positions. For regions and countries, this opens up prospects for implementing fundamental structural economic transformations that can give a powerful impetus to economic recovery and further medium- and long-term growth. Thus, the breakthrough technologies of N. Kondratiev's sixth long wave will determine the position of regions and countries in the world economy in the near future. For example, countries such as Japan, the United States, Germany, South Korea, and China are currently leading the way in robotics, and this group has already been dubbed the Big Five of the robotics market (Ross, 2017).

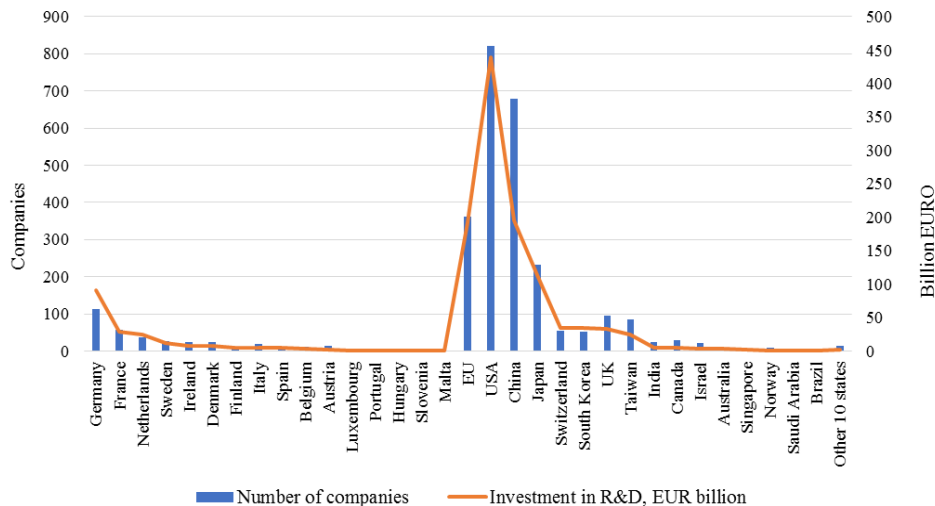
The entrepreneurial sector – a set of large, medium, small and micro enterprises that are engaged in entrepreneurial activity in the country – plays a major role in the structural transformation of the economy. The first economists to introduce the concept of *entrepreneur* into economic theory were R. Cantillon, A. Smith, J.-B. Say, A. Marshall and J. Schumpeter. In particular, Schumpeter (1939; 2011) put the entrepreneur at the center of the innovation theory of economic development, making the entrepreneur the creator of innovations («new combinations») that, in a competitive environment, displace «old combinations», accumulating all factors of production (labor, capital, land, entrepreneurial activity) step by step. Innovations give entrepreneurs a temporary monopoly on the market and allow them to make excessive profits. According to J. Schumpeter,

technological innovations are the catalyst for economic development, and their introduction leads to «creative destruction» that undermines the equilibrium of the economic system and its technological structure, causing structural shifts based on a new technological order. Therefore, entrepreneurship, investment, and innovation are the main drivers of economic development, and R&D is a crucial element of the business activity of enterprises seeking to dominate the market, increase competitiveness, and ensure sustained growth. In fact, this is confirmed by the successful practices of global leaders in their respective industries.

Thus, according to the *EU Industrial R&D Investment Scoreboard 2022*, 2500 of the world's most successful companies invested EUR 1093.9 billion in R&D in 2021, which is 14.8% more than in 2020, and is equivalent to 86% of global private investment in R&D; the figure exceeded the trillion-euro mark for the first time (Grassano et al., 2022). These 2,500 companies include 361 companies based in the European Union (EU), accounting for 17.6% of total R&D investments; 822 companies from the United States (40.2%); 678 companies from China (17.9%); 233 companies from Japan (10.4%) and 406 companies from other countries, including the United Kingdom (95 companies), Taiwan (84), Switzerland (55), and South Korea (53), accounting for 13.9% of R&D investments (Fig. 1, Table 1).

Figure 1

Global leaders and their investment in R&D, by country



Source: created using the data of Grassano et al. (2022).

Table 1

**Top 10 global leaders in terms of investment in R&D,
by country and industry (service) sector**

Rank	Company	Country	Name of the industry (service) sector*	Investment in R&D, EUR million
Top 10 companies worldwide				
1	Alphabet	USA	Software and computer services	27866,8
2	Meta	USA	Software and computer services	21768,5
3	Microsoft	USA	Software and computer services	21642,2
4	Huawei Investment & Holding	China	Technology hardware and equipment	19533,8
5	Apple	USA	Technology hardware and equipment	19348,4
6	Samsung Electronics	South Korea	Electronic and electrical equipment	16812,8
7	Volkswagen	Germany	Automobiles and parts	15583,0
8	Intel	USA	Technology hardware and equipment	13411,6
9	Roche	Switzerland	Pharmaceuticals and biotechnology	13260,8
10	Johnson & Johnson	USA	Pharmaceuticals and biotechnology	12991,3
Top 10 EU companies: EU ranking (world ranking)				
1 (7)	Volkswagen	Germany	Automobiles and parts	15583,0
2 (14)	Mercedes-Benz	Germany	Automobiles and parts	8973,0
3 (21)	BMW	Germany	Automobiles and parts	6870,0
4 (26)	Robert Bosch	Germany	Automobiles and parts	6328,0
5 (29)	Stellantis	Netherlands	Automobiles and parts	5889,0
6 (32)	Sanofi	France	Pharmaceuticals and biotechnology	5689,0
7 (33)	Bayer	Germany	Pharmaceuticals and biotechnology	5515,0
8 (37)	SAP	Germany	Software and computer services	5168,0

Rank	Company	Country	Name of the industry (service) sector*	Investment in R&D, EUR million
9 (38)	Siemens	Germany	Electronic and electrical equipment	5136,0
10 (44)	Nokia	Finland	Technology hardware and equipment	4141,0

Note*: In compiling this ranking, the third – sector – level of the Industry Classification Benchmark (ISB3) was used; the classification, developed jointly by Bloomberg and the Financial Times Stock Exchange, is used to group companies by industry and services.

Source: compiled using the data of European Commission, Joint Research Centre et al. (2022).

More than three quarters of the total R&D investments made by these companies are in the high-tech and automotive sectors (Table 2).

Table 2

Key industries (services) – leaders in terms of attracted investments in R&D by global leaders

Name of the industry (service) sector*	Companies		Their investment in R&D	
	Number	% of total	EUR billion	% of total
Total	2500	–	1093,8	–
Biotechnology; medical services; medical equipment; medical supplies; pharmaceuticals	567	22,7	235,3	21,5
Computer hardware; electronic components; production technology equipment; electronic office equipment; semiconductors; telecommunications equipment	456	18,2	246,8	22,6
Computer services; software; telecommunication services	365	14,6	216,3	19,8
Auto parts; automobiles; trucking; tires	179	7,2	152,4	13,9
Sum	1567	62,7	850,8	77,8

Note*: In compiling this rating, the fourth – subsector – level of the Industry Classification Benchmark was used, which provides a more detailed typology of industries and services compared to ISB3.

Source: compiled using the data of Grassano et al. (2022)

Notably, biotechnology is one of the leading industries in this list. Currently, it is actively used in medicine, energy, ecology, agriculture, and the food industry (Shvets et al, 2023), in particular, in cultivating new plant varieties with improved properties (high yield, increased nutritional value), developing environmentally friendly products, meeting the specific needs of consumers for gluten-free and lactose-free products, and producing dietary supplements containing useful bacteria and enzymes that have a beneficial effect on human health. The use of biotechnology in the food industry is a rather complicated process, however, this does not affect the level of technology intensity in the industry. According to the updated Nomenclature of Economic Activities of the European Community NACE Rev. 2, the food industry is classified as a low-tech industry, which uses mainly traditional technologies that do not require significant investments in R&D and/or a high concentration of personnel with higher education (Statistics Austria, 2009). This, however, does not prevent further application of biotechnology in the food industry, which may well improve the quality and safety of food products (and, consequently, the quality of life and health of people), and increase the competitiveness of the food industry as a whole.

Structural deformations in the entrepreneurial sector of Ukraine

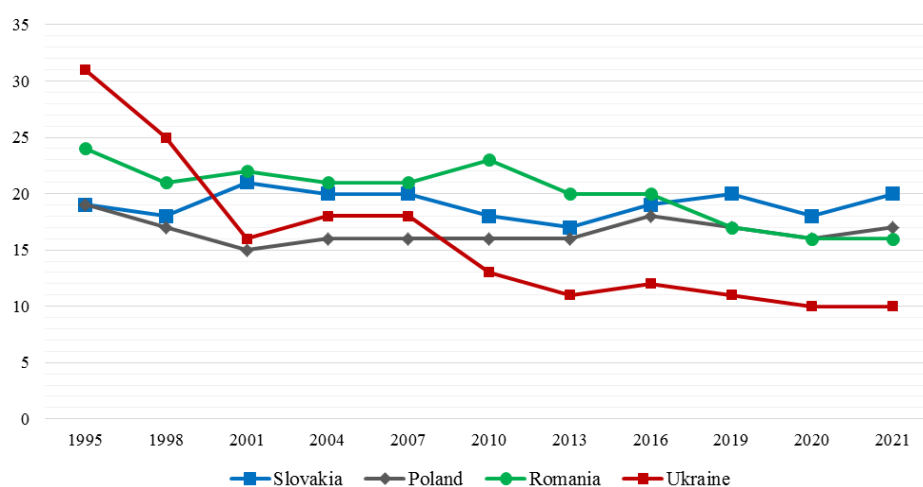
Ukraine's entrepreneurial sector, unlike those of developed countries, suffers from technological underdevelopment, structural simplification and deindustrialization of the economy, which negatively affects the competitiveness of Ukrainian producers. In Ukraine, the implementation of the Washington Consensus reforms, which envision creating a neoliberal economic policy, opening the market and banning direct state support for domestic producers, has led to premature deindustrialization of the economy. Unlike mature deindustrialization or, as defined by Yu. V. Kindzerskyi, «breakthrough industrialization» that occurs in countries with a high technological level of development (Kindzerskyi, 2021), its defining features include declining industrial production, reduced industrial employment and its share in GDP, obsolescence and depreciation of fixed assets, lack of investment, deteriorating commodity structure of exports, and slowdown in innovation processes.

In fact, the share of the manufacturing industry in Ukraine's GDP decreased more than 3 times between 1995 and 2021 – from 31% to 10%, which is 7% lower than the global average (The World Bank, n.d.-c). That is, even before February 2022, Ukraine could no longer be classified as an industrialized country. We can compare Ukraine with analogous countries (Slovakia, Poland and Romania). They had approximately the same level of economic prosperity in the early 1990s, have a developed industrial base, have successfully transitioned

from an administrative-command to a market economy and are EU member states. Ukraine is 6-10% behind them in this indicator (Fig. 2), and in terms of GDP per capita at purchasing power parity, they are 2.4-2.7 times ahead of Ukraine (The World Bank, n.d.-a).

Figure 2

Share of manufacturing industry in GDP of Ukraine and analogous countries, %



Source: created using the data of The World Bank (n.d.-b).

The share of the employed population in industry steadily declined over 2000-2021 (falling by 8%), while in the service sector it grew (by 12.5%) (Figure 3).

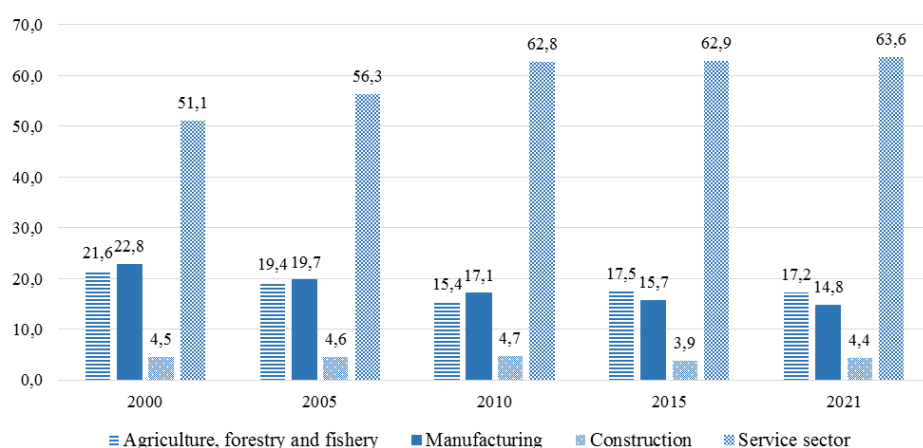
Most types of economic operations in Ukraine in the pre-war period used outdated technologies that corresponded to the third and fourth technological paradigms that dominated the world in the late nineteenth and early twentieth centuries. The level of depreciation of fixed assets was at 58.5% in the economy as a whole, and at 63% in the manufacturing industry (State Statistics Service of Ukraine, 2022).

The revenues generated by the economy were not enough to cover capital investment expenditures, which accounted for only 12.4% of Ukraine's GDP in 2021, while the final consumption rate in recent years has fluctuated between 87.3% and 95.2% of GDP (State Statistics Service of Ukraine, 2020; 2022,

March 11). With that amount of gross fixed capital, there is no point in talking about technological modernization of the economy, since almost all goods and services produced in the country were used to satisfy the end needs of society, and capital expenditures were financed on a residual basis.

Figure 3

**Employed population by type of economic activity in Ukraine,
% of all employed**



Source: created using the data of State Statistic Service of Ukraine (n.d.-b).

The innovative capacity of enterprises remains low: according to observations in 2018-2020, the number of innovatively active enterprises decreased by more than 3 times compared to 2016-2018 and amounted to 8.5% of the total number of enterprises, which is 6 times less than the EU average, where this share is more than 50%. (State Statistics Service of Ukraine, 2021; Eurostat, 2021). In the Ukrainian manufacturing, this figure also decreased by 2.3 times to 12.9% (State Statistics Service of Ukraine, 2021). From 2015 to 2020, the share of innovation spending decreased from 0.69% to 0.55% of GDP (State Statistics Service of Ukraine, n.d.-a; 2018; 2021). According to UNIDO's Competitive Industrial Performance Index, which measures the ability of countries to produce high value-added products and develop high-tech industries, Ukraine ranks 69th among 152 countries, between Kazakhstan and Colombia (United Nations Industrial Development Organization, 2021). In the commodity structure of Ukraine's

exports in 2022, cereals accounted for 20.6%, while finished food products accounted for 5.7%, ferrous metals accounted for 10.3%, and products made of them – 3.3% (State Statistics Service of Ukraine, 2023).

It is quite obvious that the industrial base of the entrepreneurial sector of Ukraine's economy in its current state is not capable of ensuring its recovery, reconstruction and sustained economic growth. This is due to large-scale destruction and losses as a result of military aggression, as well as to the overall structural weakness of Ukraine's economy, the technological lag of domestic industrial production, and its low receptivity to modern technologies, including digital ones. Despite the significant benefits of the digitalization reform, which has been actively implemented in Ukraine over the past three years (the Diia platform, which has more than 18 million users as of the end of 2022 (Himmelfarb, 2023), the electronic services portal of the Pension Fund of Ukraine, the Unified Social Information System), the level of digital penetration in business remains low. In fact, enterprises have no incentive to use advanced, in particular digital technologies, given the availability of cheap labor, unemployment and poverty in Ukraine. According to the latest available comparable data (as of March 2021), the average monthly salary in Ukraine is 4.5 times lower than in the EU (EUR 416 vs. EUR 1903) (Minfin, n.d.-a; n.d.-b). Therefore, Ukrainian enterprises find it easier to use cheap labor than to invest in expensive technologies, their implementation and development. This limits the fulfillment of the state's digital capacity, which largely depends on creating conditions for the development of digital entrepreneurship, e-commerce and the Internet.

Thus, in Ukraine, the share of enterprises with access to high-speed Internet (at least 100 Mbps) in the total number of enterprises is only 8.3% (as of 2021), while the EU average is 23%, and this latter figure has increased more than 2 times over the year to 52%. The share of enterprises that provide training to develop and improve the computer skills of their staff is not much higher in Ukraine – in 2021 and 2022, this share was 8.8% of the total number of enterprises (for comparison, in the EU it was 20.0% and 18.0%, respectively) (European Commission, & Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, 2021; European Commission, Directorate-General for Research and Innovation, Hollanders et al., 2022). This situation may become an obstacle to the country's recovery, especially in the context of the new industrial revolution and the digitalization of the world economy, in which digital technologies and platforms play an increasingly important role. The international community equates them with strategic resources of companies and countries and creates unique opportunities for them to gain global competitive advantages and overcome global challenges (United Nations Conference on Trade and Development, 2021; European Commission, 2021). At the same time, the openness of Ukrainians to new technologies, their high level of education, and the interest of venture capitalists in the development of Ukrainian technology companies (AVentures Capital, 2022) suggest that, provided that effective tools are introduced to stimulate new technologies and innovations, Ukraine can increase the technological receptivity of the entrepreneurial sector.

Solutions to overcome structural deformations

The entrepreneurial sector alone cannot lead the country out of structural and technological decline. Active participation of the state is required through the introduction of favorable taxation, lending, customs regulation, and non-tax incentives. There is an urgent need to implement measures aimed at neo-industrialization of the country. This involves a transition to a new (sixth) technological paradigm in the context of the deployment of Industries 4.0-5.0 in the world and the production of high value-added products. Such a paradigm is based on personalization, nanomanufacturing, bioengineering, increased cognition, development of modern breakthrough technologies, reindustrialization and reshoring, i.e., increasing jobs in the national economy based on these technologies.

Thus, the following key areas can be proposed as avenues for overcoming the structural deformations of the entrepreneurial sector of Ukraine.

1. Revising the legislation and adapting it to the EU *acquis communautaire* in terms of implementing the European criteria for determining the size of enterprises by amending Article 55 of the Economic Code of Ukraine (ECU). For example, in order to improve the mechanisms for supporting small and medium-sized businesses, in 2003 the European Commission proposed a new definition of the SME sector that uses three independent criteria: the number of employees, annual turnover and total annual balance sheet (value of assets). It is important to note that the number of employees is the mandatory criterion for classifying an enterprise as an SME, and the enterprise can choose one of the other two conditions (annual turnover or asset value) independently (Table 3).

Table 3

Classification of SMEs and criteria for differentiating between different size groups, according to the EU and the Economic Code of Ukraine

Enterprise category	Number of employees		Annual turnover		Or	Asset value		
	EU*	ECU	EU, EUR million	ECU, Art. 55, EUR million		EU, EUR million	ECU	Proposed in Art. 55 of ECU, EUR million
Micro	10	10	<2	<2		<2	None	<2
Small	50	50	<10	<10		<10	None	<10
Medium	250	250	<50	<50		<50	None	<50

Source: compiled using the data of Official Journal of the European Union (2003).

The EU legislators' approach means that if asset value is chosen as the second criterion, the restriction on the annual turnover is lifted, which in turn allows micro, small and medium-sized enterprises to maximize their market niche in the Ukrainian and foreign markets and increase their competitiveness.

2. Ensuring access of enterprises to financial resources.

2.1. Given that the vast majority of foreign investors have suspended their activities in Ukraine under martial law, it is of paramount importance for domestic enterprises to gain access to external financing and the market of the European Union (EU) as a strategic partner of Ukraine, which is very difficult to do in times of war. The EU's green and digital transition clearly aims to encourage European enterprises and investors to adhere to the ESG (Environmental, Social, Governance) principles, which were formulated in 2006 and presented at the New York Conference. These include (i) conducting investment analysis, making investment decisions based on an environmentally and socially responsible approach; (ii) incorporating social, environmental and governance aspects into practice and policy; (iii) requiring companies that receive investments to disclose information on the social and environmental impact of implemented investment programs and projects; (iv) promoting the adoption and implementation of established principles in the investment sector; (v) increasing the effectiveness of the implemented principles; and (vi) disclosing information on activities to implement the principles and the achieved results.

These criteria are considered promising, but at the same time carry numerous risks for enterprises, in particular, the need to revise existing strategies and business models for their development in line with ESG principles. Companies must report on their compliance with these principles, including disclosing information about partners from other countries that must also follow them. If partners have a high level of non-financial risks (compliance with international legal norms on health and environment, rational use and conservation of natural resources, etc.), cooperation with them is unfavorable and ill-advised, as it threatens responsible companies with legal problems, fines and other sanctions. This requires Ukrainian enterprises to change their thinking and philosophy of doing business, to get involved in solving environmental, social and governance problems, and to move from a short-term profit model to long-term sustainable growth. Adherence to ESG principles will ensure reliable access of Ukrainian enterprises to European investments and the EU market, otherwise it may become a serious obstacle to business development in the context of the country's post-war recovery.

2.2. In terms of reducing the impact of the high cost of credit resources for SMEs and the low level of financial and credit support for business entities implementing innovative projects, a launch of a system for guaranteeing loans to small and micro enterprises through a network of local business support funds or specialized guarantee institutions should be facilitated. This requires that appropriate amendments be made to the Budget Code of Ukraine (in terms of attracting funds from regional budgets).

2.3. The National Bank of Ukraine should issue an appropriate instruction or introduce a provision in the Law of Ukraine on Supporting the Development of Small Business to introduce a letter of credit form of payment between small and large enterprises in order to prevent non-fulfillment or delay of contractual obligations by the latter for 6-9 months.

2.4. Comparative analysis of several areas of tax revenues from the single tax, land and real estate tax, payroll tax for small businesses, and the amount of annual funding for regional programs to support small businesses from local budgets has shown that the latter accounts for no more than 3% of the above tax revenues. Therefore, the Tax Code of Ukraine should be amended to include a provision on earmarking 1-2% of the revenues from small business taxes for financing local programs for the development of SMEs to eliminate inadequate funding of these programs.

3. Stimulating the development of cooperatives in Ukraine. A new version of the Law of Ukraine on Cooperatives should be drafted to implement the Strategy for the Development of the Agro-Industrial Complex of Ukraine, taking into account the European experience and involving the population's funds in the investment processes of restoring the processing industry. This edition should provide for the stimulation of the development of this form of business by creating special regimes for the functioning of intra-regional, inter-regional and interstate clusters as potential competitors to Agri holdings.

4. Ensuring maximum use of the capabilities and potential of non-governmental mechanisms for regulating business activities through urgent amendments to the draft law On Self-Regulatory Organizations in a new wording.

5. Boosting the implementation of innovations by businesses. This can be done by stimulating the creation of a network of scientific and industrial parks within the regional innovation system under the coordination of the regional scientific centers of the NAS of Ukraine and the Ministry of Education and Science of Ukraine. Sites of enterprises whose operations cannot be restored in the current conditions should be made available for this purpose. This requires the adoption of a law on experimental incentive regulatory regimes. The experience of Ireland can be used as a model here.

6. Improving the institutional environment for the development of industrial parks and clusters. The legislation on industrial parks or state industrial policy should be supplemented with the following articles.

«Special regimes for members of industrial parks»

1. The following incentives are available to entities that are part of an industrial park: exemption from customs duties on imported machinery, equipment and components; exemption from land tax for enterprises participating in industrial parks; exemption from land duties; reduction of environmental taxes (incentives for the introduction of environmental taxation could be provided in the form

of a reduced environmental tax rate if an enterprise participating in the industrial park has innovated with an environmental component during the previous reporting period); exemption from local taxes and fees; exemption from income tax in relation to new jobs created; exemption from or reduction in real estate tax; reduction in communication costs; reduced tariffs for utilities; state coverage of social security contributions (for up to 5 years); state coverage of the interest rate on R&D loans; state reimbursement of the cost of training programs aimed at improving staff qualifications, in particular in the field of digital skills; compensation of investors' costs for connecting to utility networks (power grids); ensuring waste collection and disposal; access to various types of services (financial, leasing, lending, marketing, exhibition services, security, real estate management, etc.); refund of value added tax (VAT) incurred on construction costs; financing of the development of industrial parks; accelerated depreciation of fixed assets; provision of state guarantees to investors on maintaining current investment conditions; interaction of participants of industrial parks within the framework of a special regulatory regime «Single Window» with wide application of digital technologies.

2. In order to prevent abuse of incentives, their number is differentially limited to 5-7-10 items at the investor's discretion, depending on the amount of investment, the number of new jobs created, the level of development and the characteristics of the territory (greenfield, brownfield, small territorial community, city of regional significance, regional center, other).

«Priority areas of smart specialization»

1. The priority areas of smart specialization of the regions are defined in the Regional Development Strategies for the relevant period, developed in accordance with the regulations of the Cabinet of Ministers of Ukraine.

2. The application of incentive measures in the industries designated as priority areas of smart specialization in the Regional Development Strategies is carried out in a manner similar to that of industrial parks.

«Import substitution»

1. The state stimulates domestic production of finished goods through leasing and credit programs that apply to domestically produced goods with a high level of localization (from 30-50%). It is also important to provide such producers with loans in national currency on terms no worse than those offered to their main foreign competitors. Tax breaks should also be provided for newly established businesses and new production lines of existing companies. Increased taxation of imports and a radical increase in the rent on commodity industries should provide the funds for this.

2. The government shall reduce or completely abolish VAT on commodity products, especially those that are exported abroad by 60-80%, and sometimes even more. The absence of VAT on ores, grains or oils will reduce their cost for consumers and processors of these goods in the country and reduce the profit-

ability of their exports in unprocessed form by 20%. At the same time, the losses to the budget will be insignificant, and the effect on the Ukrainian economy, especially its industries with deeper processing, will be very significant.

«Stimulation of cluster development»

1. The laws of Ukraine, regulatory legal acts of the President of Ukraine and the Cabinet of Ministers of Ukraine have established measures that stimulate cluster development activities. These measures may be applied provided that a specialized organization of any legal form is established to provide methodological, organizational, expert, analytical and informational support for cluster development and that the cluster and the specialized organization meet the requirements set by the Cabinet of Ministers of Ukraine. The cluster and the specialized organization of the cluster shall be confirmed to meet the requirements established by the Cabinet of Ministers of Ukraine in accordance with the established procedure.

2. Measures to stimulate activities established by acts of local self-government bodies shall be applied to clusters in accordance with the procedure established by acts of local self-government bodies, provided that the cluster and the specialized organization meet the conditions established in accordance with paragraph 1 of this Article and additional requirements, if established by local self-government bodies.

3. Creation of new and development of existing clusters in Ukraine shall take into account the General Scheme of Planning of the Territory of Ukraine and planning schemes of administrative and territorial units.

Conclusions

The entrepreneurial sector plays an essential role in the structural transformation of the economy, as it is the main source of innovation, emergence of new industries and markets. A powerful, advanced, modern, competitive entrepreneurial sector improves the welfare of the population, eradicates poverty, and ensures the economic and technological security of the country, which in turn contributes to its resilient economic development.

Over the thirty plus years of independence, Ukraine's economy has accumulated problems and crises that have negatively affected the development of the entrepreneurial sector and caused its technological and sectoral structural deformations. These manifest in the predominance of low-tech industries in the sectoral structure of the economy, the inconsistency between the quality of the country's technological development and current global trends and the goals of transition to the new sixth long wave of N. Kondratiev (2010-2050), and the lack of effective tools to encourage enterprises to use advanced technologies and in-

vest in innovation. As a result, Ukraine's entrepreneurial sector has experienced a deepening of negative trends and a catastrophic technological lagging behind industrialized countries, which has affected Ukrainian defense and economic capabilities, created a direct threat to Ukraine's national security and sovereignty, and has become a significant obstacle to effectively countering the aggressor.

The entrepreneurial sector is unable to lead the country out of structural and technological decline on its own, without the active participation of the state. In view of this, targeted recommendations have been developed for the authorities on ways to overcome technological and sectoral structural deformations of the entrepreneurial sector of Ukraine, taking into account its European integration progress. They are summarized in the following six points: (i) revising the legislation and adapting it to the EU *acquis communautaire* in terms of implementing the European criteria for determining the size of enterprises; (ii) ensuring access of enterprises to financial resources; (iii) stimulating the development of cooperatives in Ukraine; (iv) ensuring maximum use of the capabilities and potential of non-governmental mechanisms for regulating business activities; (v) boosting the implementation of innovations by businesses; and (vi) improving the institutional environment for the development of industrial parks and clusters.

Implementation of these measures must begin immediately, without waiting for the end of the war, because presently Ukraine has a unique opportunity to embrace a new wave of technological change towards transitioning from a hopeless, unstable, vulnerable to external influences and challenges agrarian and raw material economy to a fundamentally new industrial and innovative model of economy. Such a transition should be based on Ukraine's advantages, namely, a skilled and competitive labor force, vast scientific potential, geographical location, abundant natural resources, industrial traditions, and cultural heritage. It should also be based on the technological and sectoral transformation of the entrepreneurial sector in the interests of resilient economic development, which will unleash the nation's innovative potential and create opportunities for increasing the technological complexity of the national economy.

Further research is needed to identify professional and qualification disproportions related to the needs of innovative transformation and digitalization of the entrepreneurial sector in the course of the post-war economic recovery of Ukraine.

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