

<https://doi.org/10.36818/2071-4653-2025-4-1>

UDC 338.45

JEL E23

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CHALLENGES IN THE DEVELOPMENT OF UKRAINIAN INDUSTRY

The study provides a comparative assessment of changes in the export orientation and innovative activity of industrial enterprises. It also determines the causes and factors behind the decline of the domestic metallurgical industry. A number of protectionist measures aimed at supporting and further developing this segment of the industry are substantiated. The research findings demonstrate that Ukrainian industry is showing positive dynamics in its key performance indicators. Resolving the issues facing the domestic metallurgical industry requires the application of state regulatory mechanisms to ensure a stable foundation for modernizing metallurgical production in line with new environmental standards. To stabilize the metallurgical industry as a strategic segment of the national economy, it is necessary to introduce appropriate protectionist measures in the following areas: restricting exports of raw materials that are strategic for metallurgy, namely ferrous metal scrap; introducing a moratorium on increases in rail transport tariffs or introducing financial compensation for enterprises; postponing the introduction of the Carbon Border Adjustment Mechanism in Ukraine.

Keywords: *industry, production, volume of sold products, metallurgy, export orientation, innovative activity, development.*

Ішук С. О. ПРОБЛЕМНІ ПИТАННЯ РОЗВИТКУ УКРАЇНСЬКОЇ ПРОМИСЛОВОСТІ

Промисловість відіграє незмінно ключову роль у забезпеченні інноваційного та соціально-економічного розвитку країни. Від того, наскільки ефективно функціонує цей сектор економіки та які закладено пріоритети його розвитку, залежить не тільки фінансове становище окремих суб'єктів господарювання, але й технологічна та національна безпека держави. Посилення цієї безпеки є безапеляційним пріоритетом у контексті протистояння повномасштабній збройній агресії та подолання її наслідків. Стратегічне значення промисловості для забезпечення соціально-економічного розвитку, особливо в умовах повномасштабної війни, робить наукові дослідження в цій галузі особливо актуальними. Метою статті є діагностування трансформаційних процесів у промисловому секторі економіки України в умовах великої війни. На підставі аналізу динаміки розвитку ключових виробництв встановлено вектори трансформації структури переробних промисловості України; проведено порівняльне оцінювання зміни рівня експортної орієнтованості переробних виробництв, а також інноваційної активності промислових підприємств; визначено причини і чинники падіння вітчизняної металургії, майже 87% продукції якої до великої війни сумарно виготовлялось у Донецькій, Дніпропетровській і Запорізькій областях; аргументовано низку протекціоністських заходів, спрямованих на підтримку й подальший розвиток цього сегмента промисловості. За результатами проведеного дослідження доведено, що попри понесені значні прямі втрати, а надто непрямі (найбільші серед усіх секторів економіки), українська промисловість демонструє позитивну динаміку ключових показників функціонування, а зростання потреб оборонно-промислового комплексу стимулює трансформацію структури цього сектору національної економіки в напрямі активного зростання у ній частки передусім машинобудівних виробництв. Поглиблення стратегічного співробітництва в галузі досліджень і розробок між Україною та ЄС сприятиме поступовій інтеграції української оборонної промисловості в європейську оборонну технологічну та промислову базу, а також у ринок оборонної техніки ЄС. Водночас вирішення проблем вітчизняної металургії вимагає використання державних регуляторних механізмів, що дасть змогу забезпечити стабільну основу для стимулювання модернізації металургійних виробництв відповідно до нових екологічних стандартів. Для стабілізації роботи металургії як стратегічного сегмента національної економіки необхідно запровадити відповідні протекціоністські заходи за такими напрямками: обмеження експорту сировини, що є стратегічною для металургії, а саме брухту чорних металів; запровадження мораторію на підвищення тарифів на залізничні перевезення або запровадження фінансової компенсації підприємствам; відтермінування впровадження механізму транскордонного вуглецевого коригування (СВАМ) в Україні.

Ключові слова: *промисловість, виробництво, обсяг реалізованої продукції, металургія, експортна орієнтованість, інноваційна активність, розвиток.*

Problem statement. As a result of full-scale Russian armed aggression, Ukrainian industry has suffered enormous losses. According to the results of a new Rapid Damage and Needs Assessment (RDNA4), as of December 31, 2024, approximately 500 industrial enterprises in Ukraine had been destroyed or significantly damaged, 70% of which were state-owned [1]. Direct losses (or asset losses) to industry amounted to \$14.7 billion. At the same time, indirect losses (or losses

of enterprise income) amounted to \$142.3 billion. This is the largest amount of indirect costs among all sectors of the Ukrainian economy. The total needs for restoration and reconstruction in industry amount to \$43 billion, of which \$23 billion is for restoration and \$20 billion is for reconstruction. However, despite significant destruction and losses, industry remains a key sector of the national economy, accounting for 17.34% of Ukraine's gross domestic product (GDP) in 2024 (compared to 11.81%

for trade and 7.11% for agriculture). The strategic importance of industry for ensuring socio-economic development, especially in the context of full-scale war, makes scientific research in this area particularly relevant.

Analysis of recent research. The article [2] demonstrates the exceptional importance of industry for ensuring economic stability in both peacetime and wartime; it identifies the main shortcomings of Ukraine's economic policy that led to deindustrialization and technological backwardness, which essentially boiled down to the liberalization and deregulation of economic relations while denying the active role of the state in economic transformations. The study [3] presents the results of an analysis of how the dynamic and structural development of domestic industrial production complies with global and European trends; it examines the processes of implementing SDG-9 sectoral goals in national industry as a set of tasks within the concept of sustainable and inclusive production development. A conceptual approach to the selection of a system of leading indicators for the development of national industry is outlined in article [4]. The study [5] proves the feasibility of developing export-oriented production of machinery and equipment based on the modernization of the domestic metallurgical base during the post-war recovery of Ukraine's economy. The work [6] is devoted to revealing the basic scenario for the development of Ukraine's industry until 2035, taking into account the factor of digitalization. The directions for optimizing the structure of the industrial sector of the economy are modeled in [7].

The paper purpose is to diagnose the transformational processes within Ukraine's industrial sector during the full-scale war.

Major research findings. Despite the enormous losses incurred, Ukrainian industry is gradually returning to its pre-war performance levels. In 2024, industrial output reached 101.9% of the 2021 level, with manufacturing output reaching 99.7% (Table 1).

According to the results of the first quarter of 2025, the increase in the volume of industrial output in general was 15.6%, and in manufacturing – 17.7% compared to the same period last year. All processing industries showed growth, except for the production of coke and refined petroleum products (-24.4%).

The recovery of Ukraine's industrial sector is primarily due to an increase in the production of defense products. The highest growth during 2022-2024 was naturally demonstrated by industries directly or indirectly related to the defense industry. In particular, the volume of weapons and ammunition sales increased almost 15 times, and aircraft production increased more than 3.6 times. It would be noted that before the war, in 2021, sales of the latter decreased by 9.28%, and the growth in weapons and ammunition production accounted for only 16.75%.

During 2022-2024, the share of weapons and ammunition production in the structure of finished metal products production increased by 35.91 percentage points (pp.) to 41.56%. The production of finished metal products in 2024 showed the highest growth rate of sales – 72.8%. As a result of this positive trend, the share of this production in the structure of the manufacturing industry increased to 3.9% (compared to 1.8% in 2021). In the first quarter of 2025, the production of finished

metal products increased the volume of sales by 49.2% compared to the same period last year.

The constant growth in the needs of the defense industry stimulated the accelerated development of machine building, primarily the production of other transport vehicles (code 30). Compared to 2021, the sales volume of this production increased by 120.2%, and, in particular, the production of aircraft – by more than 3.6 times. At the same time, the technical and economic efficiency of other transport equipment production also increased: the share of added value in production costs in the volume of manufactured products (goods, services) in this industry reached 39.59% in 2023 (compared to 32.60% in 2021).

Relatively high growth rates during 2022-2024 were demonstrated by: the manufacture of computers, electronic and optical products (code 26) and the manufacture of motor vehicles, trailers, and semi-trailers (code 29): +108.7% and +75.3%, respectively. The volumes of products sold by individual manufacturers belonging to the two groups mentioned (codes 29 and 30) increased from 1.3 times to 1.8 times. As a result of this dynamics, the total share of machine-building industries in the structure of industrial products sold increased to 7.8% in 2024 (compared to 5.7% in 2021). In the first quarter of 2025, the positive trends in the growth of machine-building production continued and intensified, especially in the production of other transport vehicles, where the volume of products sold increased by 95.2% compared to the same period last year.

The need to meet defense needs stimulated the active development of light industry in Ukraine. Thus, the volume of sales of textile products, clothing, leather, leather goods, and other materials during the period of full-scale war increased by a total of 67.4%, and clothing production, in particular, by 143%. According to the results of January-March 2025, light industry production accounted for 27.2% of the increase in sales.

On the other hand, the domestic metallurgical industry suffered the greatest decline as a result of the full-scale war, losing more than 40% of its production capacity directly from steel production and part of its coke chemical production. 52.5% reduction in the volume of metallurgical products sold in 2022-2024 led to a more than twofold decrease in the share of this basic segment in the structure of Ukrainian industry (to 7.5%). At the same time, the metallurgical industry saw the largest reduction in the number of full-time employees among all manufacturing industries (-46.50% during 2022-2023) and 30.56% decline in labor productivity during this period. The technical and economic efficiency of this industrial segment also decreased 3.2 times – the share of added value in production costs in the volume of manufactured products (goods, services) in metallurgy in 2023 decreased to 7.81%. The negative dynamics of all these indicators was a direct consequence of the huge losses of production capacities located in the south-eastern regions. Thus, in 2021, the completely destroyed Mariupol Metallurgical Plant and Azovstal Metallurgical Plant accounted for a total of 19.95% of metallurgical products sold in Ukraine.

Before the war, almost 87% of metallurgical products were manufactured in the Dnipropetrovsk (35.85%), Donetsk (32.24%) and Zaporizhzhia (18.61%) regions. Accordingly, metallurgy was the main industrial segment in these regions: in 2021, the share of metallurgical

products in the total volume of industrial products sold in the Donetsk region was 53.20%, in Zaporizhzhia region – 39.50%, and in Dnipropetrovsk region – 34.20%. At the end of 2023, Zaporizhzhia and Dnipropetrovsk regions accounted for 25.29% and 61.14% of the domestic metallurgical industry, respectively. However, the increase in the share of Dnipropetrovsk region in the structure of metallurgical products sold in Ukraine (despite 37.27% decrease in sales of these products in the region compared to 2021) was the result of an even greater decline in Zaporizhzhia region (-46.56%) and the destruction of enterprises in Donetsk region.

Despite irreversible losses in production capacity, in 2024 Ukraine retained its 20th place among 40 countries in terms of steel production and 13th place in terms of pig iron production in the global ranking compiled by the World Steel Association [9]. In the first four months of 2025, compared to the same period in 2024, pig iron production in Ukraine increased by 8.1%, and steel production by 1%. At the same time, the capacity of the domestic rolled metal market grew by 19.1% and amounted to 1.19 million tons. However, despite certain positive trends in the functioning of metallurgical production, the further development of this traditionally basic segment of Ukrainian industry is hampered by many factors, including:

1) high energy intensity of production. In the cost of domestic metallurgical industry products, the share of fuel and energy resources is twice as high as in the EU. The more than twofold increase in electricity tariffs for industry and rail freight transport since the start of the full-scale war has caused the cost of metallurgical products to rise to a level that has reduced their competitiveness in foreign markets. As a result, in 2023, losses in financial results (balance) before taxation in the metallurgical industry amounted to 84,425 million UAH (compared to +89,985 million UAH in 2021);

2) outdated and environmentally unfriendly technologies. In recent years, before the full-scale invasion, metallurgical enterprises were more actively financing the modernization of their production facilities, but this pace did not correspond to the global level of technological development and innovation implementation. Thus, in 2020, the share of innovative products in the total volume of metallurgical production was 3.5%, and in the production of finished metal products, in particular, only 1.5%. At the same time, the activities of metallurgical plants in Ukraine have very negative environmental consequences – the environment is polluted during technological processes (with slag or coke combustion products). The solution to this problem lies in the introduction of the latest technologies and production methods aimed at reducing emissions. However, the construction of such plants is very time-consuming (5-10 years) and requires significant capital investments;

3) decline in global prices for metallurgical products. Compared to the third quarter of 2024, the average export price of Ukrainian ferrous metals (code 72 «Iron and steel», according to the Standard International Trade Classification (SITC)) decreased by 11% (to \$490 per ton) [10]. The main importers of Ukrainian steel are other European countries (57.9% in 2025) and the EU-27 (24.3%), where there has been a decline in the engineering and construction sectors, which are the main consumers of metallurgical products;

4) a significant reduction in the production of coke and coking coal. During 2022-2024, coke production in Ukraine decreased by 44.1%, and in the first quarter of 2025 – another 28.8% compared to the same period last year. The actual cessation of coking coal production due to the shutdown of PJSC «Pokrovsk Mine Management» led to an increase in imports of this raw material for metallurgical production. As a result, the cost of Ukrainian metal products will increase (by at least \$50 per ton), which, in turn, will further reduce their competitive position in the global market.

Metallurgy has traditionally been the most export-oriented segment of the national economy: in 2021, the share of metallurgical products sold outside Ukraine accounted for 63.2% of the total sales of these products. Accordingly, the reduction in exports of metallurgical products by a total of 70% during 2022-2024 (with a 52.5% decrease in total sales) led to 23.3 pp. decline in the export orientation of metallurgical production to 39.9% (Table 1).

Compared to 2021, the volume of industrial products sold outside Ukraine decreased by 33.1% overall, and manufacturing products, in particular, decreased by 30.1%. At the same time, the export orientation of industry, i.e., the share of products sold outside the country in total sales, decreased by 9.8 pp. (to 18.6%) during the period. In the manufacturing industry, this decrease was 11.3 pp. (to 26.5%). The most export-oriented segments of the Ukrainian manufacturing industry in 2024 were: furniture production – 60.1% of its products were sold outside the country (compared to 55.3% in 2021) and the production of motor vehicles, trailers, and semi-trailers – 45.8% (compared to 64.5%). However, the total share of these industries in the total volume of industrial products sold is traditionally insignificant – in 2024, it amounted to only 2.6% (compared to 1.7% in 2021).

Currently, the food industry has the greatest export potential, with production in 2024 accounting for 23.4% of industrial sales in Ukraine (compared to 18.9% in 2021) and achieving relatively high growth rates in total sales (+17.2%), as well as products sold outside the country (+33.2%). Only the production of computers, electronic and optical products (code 26) showed a higher value of the latter indicator (increase in product exports) in 2024 – 98.3%.

The gradual increase in industrial processing was the result of the stabilization of a significant number of enterprises, the completion of relocation processes, the formation of new logistics links, and the establishment of systematic production. Therefore, the total share of manufacturing in the structure of industrial output is gradually returning to its pre-war level – 60% in 2024 compared to 61.3% in 2021. However, the share of this type of industrial activity in Ukraine's GDP has fallen to 8.41% (from 10.25%), while according to the recommendations of the Organization of Economic Cooperation and Development (OECD), it would be at least 20%.

Compared to 2021, capital investment growth (excluding small enterprises) in the manufacturing industry was only 0.03%, and in industry as a whole – 9.4%. At the same time, the share of capital investment in the GDP of the manufacturing industry in 2024 decreased to 12.87% (compared to 14.78% in 2021), and in industry as a whole – to 15.74% (compared to 17.2%). Insufficient

investment (among other factors) led to a decrease in the share of gross value added in manufacturing output to 19.16% in 2023 (compared to 19.99% in 2021), and in industry as a whole – to 24.84% (compared to 25.47%).

The negative impact of full-scale war has been the most evident in the innovative activity of enterprises. Thus, during 2022-2023, spending on innovation in industry fell by 31.29% (in manufacturing by 23.91%), and the number of innovation-active enterprises decreased by almost 22%. The 47.39% reduction in the volume of innovative industrial products sold during the period under review led to a decrease in the share of these products in the total volume of products (goods, services) sold by industrial enterprises to 0.51% (compared to 0.93% in 2021 and 9.4% in 2000). In contrast, in the manufacturing industry, this indicator even increased slightly, from 0.92% to 0.96%. For comparison, in Poland, it is ~10%, and in Germany, ~20%. Compared to 2021, the share of innovation-active enterprises in the total number of industrial enterprises in Ukraine decreased by 0.68 pp. in industry as a whole and by 0.6 pp. in manufacturing. In 2023, this indicator stood at 8.92% and 9.90%, respectively.

Conclusions. Despite huge direct and indirect losses, i.e., losses of assets and revenue from product sales (the largest among all sectors of the national economy), Ukrainian industry continues to function actively and is gradually returning to its pre-war performance levels. The recovery is mainly taking place through an increase in the production of defense products. The constant growth in the needs of the defense industry has stimulated the accelerated development of the production of finished metal products (primarily the production of weapons and ammunition), as well as all segments of mechanical engineering, the largest of which are the production of other transport vehicles and the production of motor vehicles, trailers, and semi-trailers.

Deepening strategic cooperation in the field of research and development between Ukraine and the EU will contribute to the gradual integration of the Ukrainian defense industry into the European defense technology and industrial base, as well as into the EU defense equipment market. This creates a basis for optimistic forecasts regarding the structural transformation (in the medium and long term) of the industrial sector of the national economy towards an increase in the share of high-tech industries, primarily machine building. This will allow Ukraine to restore and further increase its industrial and, in particular, defense potential on a new technological basis.

In parallel with machine building, sectors related to the defense industry are actively increasing production, in particular, the food, light, woodworking, and pharmaceutical industries. On the other hand, the problems facing the metallurgical industry (the sector that suffered the greatest losses as a result of the full-scale war) are deepening against the backdrop of a steady decline in coke production and the virtual halt in coking coal mining in Ukraine. To stabilize the operation of this strategic segment of the national economy (metallurgy), it is necessary to introduce appropriate protectionist measures in the following areas:

1) restricting exports of raw materials that are strategic for metallurgy, namely ferrous metal scrap. The export of a ton of scrap metal provides minimal tax deductions and about \$350 in foreign exchange earnings, while a ton of

steel from scrap metal brings in 15,000 UAH in taxes and 1,200 UAH in foreign exchange earnings. In addition, Ukraine loses budget revenues from shadow export schemes. According to GMK Center, in 2024, 529,000 tons of ferrous metal scrap were exported from Poland to Turkey (2.3 in times more than in 2023), of which 251,000 tons were brought in from Ukraine [11]. As a result of such operations, the Ukrainian budget has already lost more than 2 billion UAH;

2) imposing a moratorium on increases in railway transport tariffs or introducing financial compensation for enterprises. Since the start of the full-scale invasion, the share of logistics in the cost of metal products has increased fourfold, as mining and metallurgical enterprises has switched to rail transport, the cost of which has risen to 60%. To produce a ton of metal, 3 tons of raw materials must be delivered. Accordingly, further increases in freight tariffs will lead to a significant increase in the cost of domestic metallurgical products, which, in turn, will make them uncompetitive on the world market;

3) postponement of the introduction of the Carbon Border Adjustment Mechanism (CBAM) in Ukraine. Unlike their European counterparts, domestic producers of metallurgical products do not have access to investment funds. Therefore, the introduction of CBAM in 2026 will effectively make economic recovery and the implementation of plans to modernize and decarbonize metallurgical production in Ukraine impossible.

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Надійшло 10.11.2025 р.