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Spatial Imbalances of the Economic Development of Ukraine in War Conditions: Regional Dimension

Abstract. The article analyzes the transformation of the structure of the gross domestic product of Ukraine (by types of economic activity), which took place under the influence of full-scale armed aggression by the Russian Federation. Spatial imbalances in the performance indicators of the construction (in the field of residential and non-residential construction) and transport sectors of the national economy in the regional section are diagnosed. A detailed assessment of the dynamics of the volume of sold products of the Ukrainian processing industry, in particular, the metallurgical industry, was carried out. The vectors were established and the amount of changes in the dynamics of Ukraine's foreign economic operations, which caused a decrease in the ratio of commodity exports to imports, was calculated. The export specialization of the regions of Ukraine by main product groups was determined. Key trends in the formation and development of domestic export potential are outlined.

Keywords: economy, construction, spatial imbalances, industry, products, production, export, import, regions

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1. Introduction

Over the past decade, Ukraine has been in an extremely difficult geopolitical and socio-economic situation. The problems began in 2014 after the Russian Federation occupied 7% of the territory, where 13% of the population of Ukraine lived (2 million people in Crimea and about 4 million people in the occupied territories of Donetsk and Luhansk regions) and 13.7% of GDP was formed (in 2013) Eurasia Center (2017). Ukraine's losses from the occupation of these territories (assuming they are lost forever) are estimated at \$98.8 billion. USA, which accounted

for 88.1% of Ukraine's GDP in 2017 Aslund, A. (2018). Russia's armed aggression against Ukraine, which began on February 24, 2022, caused large-scale destruction of production capital and infrastructure, brought significant human casualties and social losses. The war led to a reduction in jobs and incomes, a decrease in purchasing power and the amount of accumulated assets. Experts from the World Bank and the European Commission estimate the economic losses from the war in Ukraine in the first year of the war in the amount of 134.7 billion dollars, and the need for reconstruction — 410.6 billion dollars World Bank Group (2022). In the total amount of recovery needs, the transport sector accounts for 22%, the housing sector — 17%, the energy sector — 11%, the social protection and livelihood sector — 10%, agriculture — 7%. The scale of Ukraine's economy and, at the same time, spatial imbalances, i.e. its deep regional heterogeneity, which deepens under the influence of full-scale military aggression by Russia, determine the relevance of scientific research in this thematic direction.

2. Analysis of Research and Publications

In the scientific and analytical publication *Ekonomika rehioniv Ukrayiny* (Storonyans'ka, 2022), the issue of identification and assessment of challenges and threats to the socio-economic development of the regions of Ukraine, which arose as a result of military aggression by the Russian Federation, is widely covered. The scientific report *Vyklyky maybutn'oho dlya promyslovoho rozvytku Ukrayiny* (Deyneko, 2022) determined the determinants of socio-economic growth of the national economy in conditions of global instability and proposed recommendations and tools of industrial policy in order to adequately respond to the challenges of modernity. Deyneko et al. (2022) states that today in most regions of Ukraine, the outdated industrial structure has increased the level of security threats to the national economy in a new generation war: hybrid, non-contact, long-range, aimed at the deliberate destruction of industrial and infrastructure facilities. Ishchuk & Zhulkanych (2023) identified the main causes of negative structural transformations in the industrial sector of the national economy during 2013–2022. The impact of Russia's military aggression on indicators of the dynamics and structure of industrial products sold in Ukraine and abroad is analyzed.

The purpose of the article is to determine the spatial imbalances in the development of Ukraine's economy caused and/or reinforced by full-scale Russian armed aggression.

3. Research Results

Full-scale Russian armed aggression caused the reduction of Ukraine's economy by 29.1% in 2022 (Table 1). The construction sector experienced the biggest drop in the Airborne Forces (-67.6%). This was the result of a decrease in business activity due to a significant reduction in investments in conditions of high uncertainty, a sharp decrease in the incomes of the population, a lack of free funds in companies, limited budget resources, as well as large-scale destruction of construction objects and structures.

Table 1. Dynamics and structure of the gross domestic product of Ukraine (in actual prices, according to the production method)

Type of economic activity	GDP growth, %	GDP structure, %		Change of structure, v.p.
		2021	2022	
Gross Domestic Product	-29.1	100.0	100.0	x
Agriculture, forestry and fisheries	-28.4	10.9	8.2	-2.7
Mining and quarrying	-32.2	6.4	5.7	-0.7
Processing industry	-43.1	10.3	7.6	-2.7
Supply of electricity, gas, steam and air conditioning	-32.5	3.3	4.5	1.1
Water supply; sewerage, waste management	-26.6	0.4	0.3	0.0
Construction	-67.6	2.8	1.2	-1.5
Wholesale and retail trade; repair of motor vehicles and motorcycles	-30.9	13.6	12.4	-1.3
Transport, warehousing, postal and courier activities	-44.3	5.4	3.9	-1.5
Temporary accommodation and catering	-40.3	0.9	0.7	-0.2
Information and telecommunications	-15.4	4.7	4.6	-0.1
Financial and insurance activities	-15.8	3.0	2.9	-0.1
Real estate transactions	-34.5	5.8	4.9	-0.9
Professional, scientific and technical activity	-46.2	2.9	1.9	-1.0
Activities in the field of administrative and auxiliary services	-47.8	1.2	0.8	-0.5
Governance; compulsory social insurance	35.4	6.2	21.1	15.0
Education	-11.4	4.3	4.2	-0.2
Health care and provision of social assistance	-17.5	2.5	2.4	0.0
Arts, sports, entertainment and recreation	-33.1	0.6	0.4	-0.1
Provision of other types of services	-31.5	0.9	0.7	-0.2
Taxes on products	-36.4	14.3	12.2	-2.1
Product subsidies	-24.4	-0.3	-0.5	-0.2

Source: Calculated by the authors based on State Statistics Service of Ukraine (2023)

According to estimates by the World Bank Group (2022), the housing construction sector suffered the greatest destruction — 38% of the total damage to the Ukrainian economy. In 2022, the total area of residential and non-residential buildings at the beginning of construction in Ukraine decreased by 51.4% (–9,749,506 m²), and those put into operation — by 41.4% (–6,779,370 m²). The volumes of new construction decreased the most in the regions of hostilities and regions adjacent to them, which caused significant spatial imbalances in the development of this segment of the Ukrainian economy. In particular, in Dnipropetrovsk, Zaporizhzhya, Mykolaiv, Odesa, Sumy, Kharkiv, Kherson regions and in the city of Kyiv, the decrease in the total area of buildings at the beginning of construction significantly exceeded the average value of the indicator in Ukraine (–51.4%) and amounted to –75.4 % to –96% (Table 2). The largest reduction in the area of buildings put into operation also occurred in the regions of hostilities and those close to them: in Dnipropetrovsk (–62.7%), Donetsk (–90.1%), Zaporizhia (–78.4%), Sumy (–59.4) and Kharkiv (–92.0%) regions. At the same time, in two oblasts (Volyn and Ivano-Frankivsk), the total area of buildings at the beginning of construction increased, and in Poltava oblast — buildings put into operation (+11.4%).

Table 2. Changes in the total area of buildings at the beginning of construction and those put into operation

Region	Total area of buildings at the beginning of construction, m ²		Growth, %	The total area of the buildings put into operation, m ²		Growth, %
	2021	2022		2021	2022	
Ukraine	18,956,564	9,207,058	–51.4	16,382,664	9,603,294	–41.4
Vinnitsia	421,671	268,630	–36.3	598,700	484,039	–19.2
Volynsk	313,319	499,267	59.3	505,074	329,940	–34.7
Dnipropetrovsk	975,299	219,044	–77.5	675,701	251,916	–62.7
Donetsk	194,879	κ/c	κ/c	106,370	10,523	–90.1
Zhytomyr	207,390	102,306	–50.7	280,965	144,879	–48.4
Zakarpattia	366,579	233,560	–36.3	567,572	396,548	–30.1
Zaporizhzhia	311,539	76,751	–75.4	152,249	32,912	–78.4
Ivano-Frankivsk	362,954	367,167	1.2	614,214	567,971	–7.5
Kyivska	3,544,362	2,562,805	–27.7	2,642,368	1,873,935	–29.1
Kirovohradsk	92,747	44,661	–51.8	112,797	84,756	–24.9
Luhansk	11,752	κ/c	κ/c	17,439	×	×
Lviv	2,349,939	1,457,127	–38.0	1,716,612	1,085,509	–36.8
Mykolayivska	159,313	6391	–96.0	190,747	×	×

Region	Total area of buildings at the beginning of construction, m ²		Growth, %	The total area of the buildings put into operation, m ²		Growth, %
	2021	2022		2021	2022	
Odesa	1,850,472	380,347	-79.4	1,315,544	804,349	-38.9
Poltava	330,094	171,378	-48.1	338,429	376,841	11.4
Rivne	325,110	249,670	-23.2	374,383	368,960	-1.4
Sumy	246,665	79,586	-67.7	184,000	74,650	-59.4
Ternopilsk	593,056	336,680	-43.2	623,061	233,451	-62.5
Kharkivska	889,487	231,180	-74.0	829,528	66,174	-92.0
Khersonsk	208,463	66,758	-68.0	209,299	×	×
Khmelnytska	806,008	445,236	-44.8	527,193	370,565	-29.7
Cherkassy	321,771	177,258	-44.9	282,974	155,821	-44.9
Chernivtsi	337,911	123,231	-63.5	462,084	257,602	-44.3
Chernihivska	264,667	126,497	-52.2	194,727	184,815	-5.1
m. Kyiv	3,471,117	976,229	-71.9	2,860,634	1,389,098	-51.4

Source: Calculated by the authors based on State Statistics Service of Ukraine (2023)

The fall of the VAT in the transport sector amounted to 44.3%. At the same time, according to estimates by the World Bank Group (2022), the losses of this sector of the economy amount to 35.7 billion dollars. USA. In the Donetsk, Luhansk, Zaporizhzhya, Kherson and Kharkiv regions, 88 railway stations, more than 400 railway bridges, 28 bridges on the state road network, 76 bridges on regional and village roads, as well as more than 250 bridges and other structures of the street and road network were damaged communal property. In total, Donetsk, Luhansk, Kherson and Zaporizhzhia regions accounted for more than 70% of the losses incurred in the transport sector. A significant reduction in transport activity and, as a result, disruption of logistics flows became one of the reasons (along with a sharp decrease in the number of consumers and their purchasing power) for the narrowing of business activity in the field of trade, the added value of which decreased by 30.9%. In 2021, in the regional structure (without the city of Kyiv) of the Airborne Forces of this sector of the economy, the share of the regions most affected by hostilities (Dnipropetrovsk, Donetsk, Zaporizhzhya, Luhansk, Kharkiv and Kherson) totaled 32.9%.

In the processing industry, according to the results of 2022, the drop in GVA amounted to 43.1%. As a result, the share of this key sector of the economy in Ukraine's GDP decreased by 2.7 percentage points (up to 7.5%). The volume of sold products of the processing industry decreased by 31.5%, and, in particular, the products of metallurgical industries — by 57.9% (Table 3). This was a direct consequence of the huge losses of production capacities of the domestic metal-

lurgy. So, on the completely destroyed PJSC Mariupol Metallurgical Plant named after “Ilyich” and PJSC “Azovstal Metallurgical Plant” in 2021 together accounted for 19.95% of sold metallurgical products in Ukraine. In total, almost 87% of metallurgical products were produced in Dnipropetrovsk (35.85%), Donetsk (32.24%) and Zaporizhia (18.61%) regions. Accordingly, in the named regions, metallurgy was the main segment of industry: in 2021, the share of metallurgical products in the total volume of industrial products sold in Donetsk region was 53.20%, in Zaporizhia — 39.50%, and in Dnipropetrovsk — 34.20%. The metallurgical industry of Ukraine has always been export-oriented, and the war hardly changed this situation. So, if in 2021 metallurgical enterprises exported ~70% of the total volume of products sold, then in 2022 the value of this indicator was 66.5%.

Table 3. Indicators of dynamics and structure of realized industrial products of Ukraine, %

Type of industrial activity	Growth rate, %	Share in industry, %	
		2021	2022
Processing industry	-31.5	61.3	53.6
Production of food products, beverages and tobacco products	-11.9	18.9	21.3
Textile production, production of clothes, leather, leather products and other materials	8.5	0.8	1.1
Production of wood products, paper production and printing activities	-11.8	3.3	3.7
Production of coke and oil refining products	-45.3	2.9	2.0
Production of chemicals and chemical products	-43.0	2.9	2.1
Production of basic pharmaceutical products and pharmaceutical preparations	-15.3	1.4	1.5
Production of rubber and plastic products	-18.6	1.9	2.0
Production of other non-metallic mineral products	-49.6	3.8	2.4
Metallurgical production	-57.9	16.0	8.6
Production of finished metal products, except for machines and equipment	-24.0	1.8	1.8
Production of computers, electronic and optical products	-35.2	0.4	0.3
Production of electrical equipment	-31.7	1.1	1.0
Production of machines and equipment, not included in other groups	-47.1	2.0	1.3
Production of motor vehicles, trailers and semi-trailers	9.2	0.9	1.3
Production of other vehicles	-10.4	1.3	1.4
Production of furniture	-22.1	0.8	0.8
Production of other products	-9.6	0.2	0.2
Repair and installation of machines and equipment	-36.6	0.9	0.7

Source: Calculated by the authors based on State Statistics Service of Ukraine (2023)

In 2022, only light industry (+8.5%) and certain machine-building industries, in particular, the production of motor vehicles, trailers and semi-trailers (+9.2%), achieved an increase in the volume of sold products. The positive dynamics of these indicators is caused by the rapid reorientation of the mentioned sectors of industry to meet military needs and the fulfillment of relevant government orders. The food, woodworking, and pharmaceutical industries showed a relatively small reduction in production volume, which is explained by the stable domestic demand for their products and the latter's export orientation.

The national economy is traditionally export-oriented. However, according to the results of 2022, the share of exports of goods and services in the GDP of Ukraine (in actual prices) decreased to 35.5% (against 40.7% in 2021). The share of commodity exports in the total volume of domestic exports is stable at ~83%. In 2022, the volume of merchandise exports from Ukraine decreased by 35.2%, in particular, as a result of a drastic disruption of logistics, primarily maritime, due to the blockade of sea ports by Russia. In 2021, sea transportation accounted for 62% of the total value of goods (in dollar equivalent) exported from Ukraine, while road transportation accounted for 23%, and rail transportation accounted for 12%.

Among the regions, the economies of Donetsk (-96%), Luhansk (-94.8%) and Kherson (-86.2%) regions experienced the greatest loss of export potential. Active hostilities led to a decrease in the share of Donetsk region in the regional structure of exports to 0.6% (versus 10.3% in 2021). At the same time, all oblasts of the western region, except for Ivano-Frankivsk, demonstrated an increase in export activity, but Cherkasy and Odesa oblasts achieved the largest increase in commodity exports during 2022. Thus, the export of oil (commodity group III) from the Cherkasy region increased more than 8 times, and the export of sunflower seeds (commodity group II.12) from the ports of Odesa region increased more than 24 times. Before the full-scale war, the economy of the Donetsk, Zaporizhia and Mykolaiv regions, compared to other regions, was the most export-oriented – the share of exports in their GRP was at the level of 60÷70%. Accordingly, the volume of loss of the export potential of these regions is closely correlated with the volume of loss suffered by their economy, and is a vivid reflection of those spatial imbalances in the development of the Ukrainian economy in general, which were caused by the war.

During 2022, commodity imports to Ukraine decreased by 24.1%. Only five regions showed an increase in this indicator: Volyn, Zhytomyr, Lviv, Khmelnytskyi and Chernivtsi regions. 39.8% of imports fell on the city of Kyiv (against 42.6% in 2021), and another 23.3% – on three oblasts: Dnipropetrovsk, Kyiv and Lviv. The share of the latter in the regional structure of commodity imports (9.7%) became the highest after Kyiv. At the same time, in terms of share in the regional

structure of commodity exports (6.9%), Lviv region in 2022 took third place after Kyiv (23.7%) and Dnipropetrovsk region (14.2%).

In general, domestic commodity exports are dominated by industrial products, however, Ukraine's integration into the global market has always had a clearly defined resource character. As a result, the commodity structure of exports shows a steady tendency to deterioration, which is manifested in a decrease in the shares of high-tech products of the mechanical engineering and chemical industry, and instead – an increase in the specific weight of agro-industrial complex products with low added value. According to the results of 2022, there were noticeable negative changes in the commodity structure of domestic exports, caused by military actions in a significant territory of Ukraine. The share of products of the metallurgical industry (commodity group XV), the volume of exports of which fell by 62.5%, experienced the largest reduction (–9.89 percentage points) (Fig. 1). Exports of chemical industry products (–54.3%) and mineral products (–48.6%) also decreased significantly. At the same time, the volume of exports of vegetable products decreased by only 13.3%, and of fats and oils – by 15.5%. The consequence of the described dynamics was an increase in the commodity structure of exports of the shares of II and III commodity groups, respectively, by 7.7 percentage points. and 3.14 percentage points.

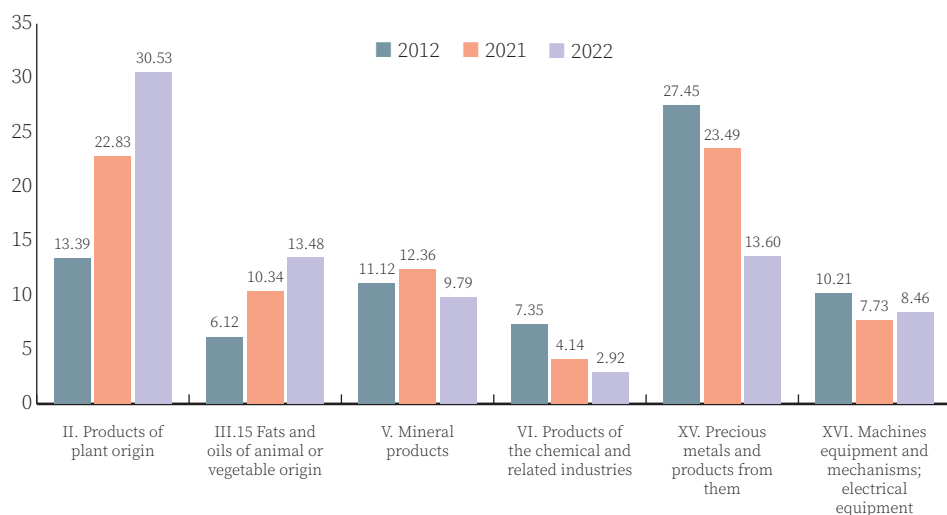


Figure 1. The structure of commodity exports of Ukraine (by main product groups), %
Source: Calculated by the authors based on State Statistics Service of Ukraine (2023)

During 2022, the export specialization of the regions of Ukraine underwent certain (but not significant) transformations. Thus, the number of regions, in the structure of commodity exports of which the share of products of plant origin

(commodity group II) exceeded 10%, increased from 14 to 17 during the analyzed year (Table 4). In particular, grain crops (commodity group II.10) dominated the exports of Vinnytsia (22.3%), Luhansk (57.3%), Mykolaiv (47.9%), Odesa (34.0%), Sumy (31, 0%), Kharkiv (22.2%), Khmelnytskyi (33.7%), Cherkasy (34.9%) and Chernihiv (49.6%) regions. At the same time, meat and edible offal (commodity group I.02) was the leading export position only in Kyiv region with a share of 26.2%, and fats and oils of animal or vegetable origin (commodity group III.15) – in Kirovohrad (40.1%).

Table 4. Export specialization of regions of Ukraine

Product group*		2021	2022
I.	Live animals; products of animal origin	Kyivska	Kyivska
II.	Products of plant origin	Vinnytsia, Kyiv, Kirovohrad, Lviv, Mykolaiv, Odesa, Rivne, Sumy, Ternopil, Kharkiv, Kherson, Khmelnytskyi, Cherkasy, Chernihiv	Vinnytsia, Volhynia, Zhytomyr, Zakarpattia, Kyiv, Kirovohrad, Luhansk, Mykolaiv, Odesa, Rivne, Sumy, Ternopil, Kharkiv, Kherson, Khmelnytskyi, Cherkasy, Chernihiv
III.15.	Animal fats and oils or plant origin	Vinnytsia, Kyiv, Kirovohradska, Odesa, Cherkassy	Vinnytsia, Kirovohrad, Mykolaiv, Odesa, Kharkiv, Kherson, Cherkasy
IV.	Ready food products	Kirovohradska, Khersonska	Khersonska
V.	Mineral products	Dnipropetrovsk, Poltava	Donetsk, Dnipropetrovsk, Lviv, Poltava
VI.	Products of the chemical and related industries	Ivano-Frankivsk, Mykolayivsk	Rivne
VII.	Polymeric materials, plastics and products from them	Ivano-Frankivsk	Ivano-Frankivsk
IX.	Wood and wood products	Vinnytsia, Volhynia, Zhytomyr, Ivano-Frankivsk, Rivne, Chernivtsi	Volyn, Zhytomyr, Ivano-Frankivsk, Lviv, Rivne, Chernivtsi
X.	Mass of wood or other fibrous cellulosic materials	Luhansk	-
XV.	Precious metals and products from them	Dnipropetrovsk, Donetsk, Zaporizhia, Kherson	Dnipropetrovsk, Zaporizhzhia
XVI.	Machines, equipment and mechanisms; electrical equipment	Volyn, Zhytomyr, Zakarpattia, Lviv, Sumy, Ternopil, Kharkiv, Chernivtsi	Volhynia, Zhytomyr, Zakarpattia, Ivano-Frankivsk, Lviv, Sumy, Ternopil, Chernivtsi
XX.	Various industrial goods	Volhynia, Lviv, Chernivtsi	Lviv

*The table presents product groups whose share in the export structure of the regions exceeded 10%.

Source: Calculated by the authors based on State Statistics Service of Ukraine (2023)

In 2022, 55.9% of the commodity export structure of the Donetsk region was mineral fuels, oil and products of its distillation (commodity group V.27), while in 2021, ferrous metals occupied 84.0% of this structure (commodity group XV.72). The latter remained the dominant export positions of Dnipropetrovsk (34.7%) and Zaporizhia (73.7%) oblasts. Wood and wood products (commodity group IX.44) prevailed in the exports of Volhynia (25.6%), Zhytomyr (21.3%), Ivano-Frankivsk (18.6%), Rivne (27.4%) and Chernivtsi (20.3%) oblasts. The generally low technological level of Ukrainian exports is evidenced by the fact that the products of the chemical industry (commodity groups VI and VII) do not dominate the product structure of any region, and the products of mechanical engineering, in particular, electric machines (commodity group XVI.85), which are made from of raw materials for tolling was key in the export of Zakarpattia (46.6%) and Lviv (17.0%) regions.

4. Conclusions

Summing up, it can be stated that the full-scale Russian armed aggression caused a significant reduction in the economy of Ukraine. The largest decline was experienced in the sphere of construction (primarily the housing sector), the sphere of transport and communication, as well as metallurgy, which was one of the basic export-oriented segments of the Ukrainian economy.

Key trends in the formation and development of Ukraine's export potential, in addition to the geographic reorientation of goods exports in the European direction (the share of EU countries in the structure of domestic exports increased 1.6 times in 2022 — up to 63% against 39.4% in 2021), are mostly negative and, at the same time, interdependent, namely:

- ▶ a decrease in the share of high-tech products in the structure of commodity exports with a deepening of the latter's raw material orientation;
- ▶ displacement of domestic producers from traditional market segments as a result of their loss of competitive advantages;
- ▶ there is little possibility of occupying new market segments with products of low-tech industry segments;
- ▶ dependence on cyclical fluctuations and external factors of not only economic, but also geopolitical origin;
- ▶ excessive energy and resource intensity of domestic production and its dependence on high-tech imports.

Prospects for further research in this scientific direction can be seen in the methodological and analytical justification of the strategic priorities of the development of the economy of the regions of Ukraine in the conditions of increasing global challenges and threats.

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Nierównowaga przestrzenna rozwoju gospodarczego Ukrainy w warunkach wojennych: wymiar regionalny

Streszczenie. W artykule poddano analizie przemianę struktury produktu krajowego brutto Ukrainy (według rodzajów działalności gospodarczej), która nastąpiła pod wpływem zbrojnej agresji Federacji Rosyjskiej na pełną skalę. Diagnozuje się dysproporcje przestrzenne we wskaźnikach efektywności budownictwa (w zakresie budownictwa mieszkaniowego i niemieszkaniowego) oraz sektorów transportowych gospodarki narodowej w przekroju

regionalnym. Dokonano szczegółowej oceny dynamiki wolumenu sprzedanych wyrobów ukraińskiego przemysłu przetwórczego, w szczególności przemysłu metalurgicznego. Wyznaczono wektory i obliczono wielkość zmian dynamiki zagranicznej działalności gospodarczej Ukrainy, które spowodowały zmniejszenie relacji eksportu towarów do importu. Określono specjalizację eksportową regionów Ukrainy według podstawowych grup produktów. Zarysowano główne trendy w kształtowaniu i rozwoju krajowego potencjału eksportowego.

Słowa kluczowe: gospodarka, budownictwo, nierównowaga przestrzenna, przemysł, produkty, produkcja, eksport, import, regiony