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The Impact of War on Cross-Border Trade: The Case of the Ukraine Conflict and Exports From the Lublin Metropolitan Area

ABSTRACT

The paper focuses on the impact of war on foreign trade in a region bordering a conflict zone, using the example of merchandise exports from the Lublin Metropolitan Area (LOM) to Ukraine. The effects of military conflicts on trade have been relatively under-researched in global literature. Inthe case of Poland, there is a clear research gap that this analysis aims to partially address. The main objective of this paper is to investigate the exports of companies located in the LOM amid the dynamic changes triggered by the war in Ukraine.

The research covers the period from 2015 to 2023, allowing for the identification of trends over a longer timeframe and an assessment of changes potentially caused by the war in Ukraine in the years 2022–2023. The data was primarily sourced from the National Revenue Administration in Poland.

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Our findings indicate that the war had a relatively limited impact on the decline of exports from the Lublin Metropolitan Area. In 2023, the decrease in exports to Ukraine was lesser than the overall decline in exports. Furthermore, there was a significant increase in Ukraine's share as an export market for the LOM-based enterprises. Additionally, the merchandise structure of LOM exports to Ukraine underwent substantial changes during the analysed period. Notably, there was a 22.03 percentage point increase in the share of Section XVII. *Transport equipment* and a 17.65 percentage point decrease in the share of Section II. Vegetable products. However, it is challenging to directly and unambiguously attribute these shifts to the armed conflict.

KEYWORDS: exports; Lublin Metropolitan Area; war in Ukraine; structural changes in foreign trade

INTRODUCTION

The set of conditions under which economic entities operate is generally referred to as their environment. In the literature, it is common to distinguish between the immediate environment (microenvironment, competitive) and the broader environment (macroenvironment, external) (Wściubiak, 2014). It is important to note that economic entities have the ability to influence their immediate environment. On the other hand, changes in the macro-environment occur independently of their actions., so they must adapt. The causes, nature, and effects of changes in the external environment may differ. The terms to describe them are also different. Depending on the approach, they are called environmental turbulences, disturbances, or black swans (Taleb, 2007). In a broader context, these changes are dubbed VUCA, which stands for volatility, uncertainty, complexity, and ambiguity. This term is a reference to the leadership theory of Bennis and Nanus (1985). Although initially it was mainly referred to the theory of strategy in the military, it has since been generalized to describe the variability and complexity of the

environment in which organizations operate (Wolf, 2006). In conditions of volatility, uncertainty, complexity and ambiguity of the environment, economic entities adjust their strategies and operational methods. It should be noted that in the modern economy, the frequency and intensity of such changes are increasing. Regardless of the concepts or terms used, any changes in the external environment can have a significant impact on various areas of the economy, with foreign trade being one likely to experience substantial effects.

The research period of 2015–2023 we adopted for this paper was characterised by a multitude of vital phenomena in the world economy that noticeably affected Polish exporters, including those from the Lublin Metropolitan Area (Lubelski Obszar Metropolitalny, LOM). Some significant factors shaping the international environment of enterprises involved in foreign trade were: fluctuating economic situation, the COVID-19 pandemic, the war in Ukraine, increasing geopolitical and geoeconomic risks, and Brexit. Thus, a characteristic of modern economies, especially in Europe, has become volatility, understood as a prolonged state of unpredictability.

Unexpected turbulences caused by the COVID-19 pandemic revealed how strongly unexpected phenomena can affect the economy. Another confirmation of growing uncertainty stemmed from the outbreak of the Ukraine war. The turmoil induced by the pandemic, disrupting the supply chains and complicating many countries' financial policies, was exacerbated by an energy crisis caused by soaring fossil fuel prices. Russia's war on Ukraine, which began on February 24, 2022, with Russia's full-scale invasion, is the most significant military conflict in Europe since World War II. Although the conflict started in 2014, when Russia annexed Crimea and supported separatists in Donbas, it was the 2022 invasion that sparked a large-scale open war. The economic consequences of the war on the exporters' situation manifested themselves in the disruption of supplies of raw

materials, particularly oil and gas, as well as aluminium, steel, and agricultural products, necessitating a rapid shift in sources of supply for almost all buyers. It also resulted in a marked increase in the prices of energy products. For exporters, this meant elevated costs and decreased competitiveness. The level of political risk has also increased, limiting the possibility of concluding transactions. This risk can also lead to issues with collecting export receivables, negatively affecting exporters' liquidity. At the same time, the war boosted Ukraine's demand for products from certain sectors (chemical, arms, energy equipment). Difficulties in transportation via the Black Sea ports increased transhipment at the Polish-Ukrainian border crossings. Other opportunities also emerged, such as shipping goods as part of humanitarian aid programmes and, in the longer term, for Polish companies to participate in post-war reconstruction. In the context of the changes caused by the war in Ukraine, it seems interesting to analyse its effects on the exports of enterprises from the Lublin Metropolitan Area, a region located in the immediate vicinity of the country at war. Lublin Metropolitan Area has long held a strategic position in fostering Polish-Ukrainian relations, serving as a hub for cross-border cooperation, including political dialogue, local government partnerships, academic collaboration, etc. The region's established history and ongoing commitment to collaboration with Ukraine form a crucial rationale for selecting this area as the focus of the analysis.

The LOM territory does not fully correspond to the NUTS 3 classification of subregions used in the European Union. Nevertheless, it is an interesting example of a quasi-region of key importance for the economy (including exports) of the Lubelskie Voivodeship (Szmytkie, 2013). The Association of Lublin Metropolitan Area (LOM) was formally established in 2022. The Association comprises 22 communes (gminas) and four counties (powiats) in the voivodship.

The paper aims to analyse the changes in enterprises' exports from the LOM area under dynamic changes stemming from the Ukraine war. In this context, the authors pose the following research questions:

- Were there significant changes in the geographical and merchandise structure of LOM exports that the war can explain?
- How have LOM enterprises' exports to Ukraine changed during the period under review?

The research period covered in the paper spans from 2015 to 2023. This timeframe was intentionally extended to include the years preceding the discussed disturbances in the external environment, so that trends occurring over a longer horizon could be identified. It is only against this background that the changes that may have been caused by the war in Ukraine in 2022–2023 were indicated.

The paper employed a quantitative analysis based on detailed statistical data regarding merchandise exports from the Lublin Metropolitan Area (LOM) to Ukraine, set against the background of total LOM exports from 2015 to 2023. This analytical approach examined changes in the value, dynamics, and structure of exports from the Lublin Metropolitan Area, both by commodity and destination. The analysis is conducted on a high level of product detail, going beyond general CN[1] sections to highlight specific commodity groups produced in the region. This level of detail enabled the identification of leading product categories and provided insights into Ukraine's role as an export destination for enterprises based in LOM. The methodology facilitated the observation of long-term trends and allowed for the assessment of

[1] The Combined Nomenclature (CN) is a tool for classifying goods for customs and statistical purposes in the European Union. It is an extension of the six-digit Harmonized System (HS) of the World Customs Organization. https://taxation-customs.ec.europa.eu/customs/calculation-customs-duties/customs-tariff/combined-nomenclature_en

structural shifts in trade patterns that the ongoing war in Ukraine may have influenced.

The data used in this paper were obtained from the National Revenue Administration (Krajowa Administracja Skarbowa, KAS) in Poland. The institution provides highly disaggregated trade data and thus remains the only available resource for analysing exports at the regional level. We are aware that the statistical database provided at the regional level by the KAS is imperfect. According to 2019 data, as much as 25.5% of the Polish export value was assigned to the "unclassified region" category (Pangsy-Kania et al., 2023). Such a high share of the unclassified category is due to the presence of exporting enterprises that operate across multiple regions. As a result, it is difficult to accurately assign the directions and shares of exports from individual areas, including exports from LOM.

1. LITERATURE REVIEW

Every geopolitical conflict – war being one of them – has economic consequences (Góes & Bekkers, 2022; Keynes, 2019). The outbreak of an armed conflict affects not only the economies of the countries directly involved but also indirectly impacts those countries that do not engage in warfare. In the literature on the subject, the economic consequences of war are researched mainly in the areas of foreign trade, investment, and economic growth. The effects on the countries directly involved as well as on the global economy are analysed. At the same time, the connections between war and the economy are examined in two main approaches: the first highlights primarily the adverse effects on economies (directly involved and neutral, as well as national and global) while the second emphasises how the establishment and development of trade and the strengthening of economic ties become a measure preventing the outbreak of an armed conflict.

Glick and Taylor (2010) analysed the effects of war on trade since 1870. Using the gravity model, the authors showed a significant and long-lasting negative impact of wars on the participating countries' foreign trade, national income, and world welfare. This means that the costs of war include not only the countries directly participating in the warfare but also economic losses affecting neutral countries and, thus, the world economy. From this point of view, war generates negative externalities through its restrictive impact on international trade. Che et al. (2015), using the example of the war waged by Japan and China in 1937–1945, conclude that the adverse effects of war on bilateral trade and investment have persisted to this day, despite the passage of many decades. The conflict, in which the world's second and third largest economies were involved, caused not only direct economic losses during the fighting in China, but also long-term consequences. The regions of China that Japan invaded have remained less interested in developing trade with the former aggressor and accepting Japanese foreign direct investment. Historical animosities between countries constitute a significant barrier to the development of bilateral economic ties. Similar results were presented by Long (2008), who statistically confirmed that armed conflicts have a lasting impact on the level of mutual trade between countries. The author proved that escalating interstate conflicts, even those that did not take the form of warfare, significantly weakened trade relations between the involved parties.

Krpec and Hodulak (2019) analysed the impact of wars on international trade, focusing on the Napoleonic Wars and World Wars I and II. The authors showed that as a result of war operations, trade flows in the world change, leading to permanent changes and shifts in the structure of trade and the position of countries in the international economic system. The outcome of the war for individual countries is not the decisive factor. The impact of war on trade will be observed not only in countries

and regions directly involved in the armed conflict, but also in regions that remained uninvolved.

Blomberg and Hess (2006) conducted comparative studies of trade barriers, including war as one of the variables. Based on panel data covering 177 countries over more than 30 years, the authors estimated the effect of peace on the development of trade, which in their analysis exceeded the conclusion of multilateral and bilateral trade agreements or the introduction of the Generalized System of Preferences (GSP). Blomberg and Hess found that war has a much greater negative impact on trade than language differences or border barriers. Additionally, the results held for all regions and periods, regardless of the level of development of the countries.

Some authors challenge the conviction that growing economic interdependence is a guarantee of fostering international peace. Barbieri (2002) questions the negative impact of wars on trade development and the liberal approach, emphasizing the importance of economic interdependence between countries for maintaining peace. In her opinion, countries that have developed bilateral trade links are more likely to engage in military conflicts than those that do not demonstrate a high degree of linkages. Similar conclusions were drawn by Martin et al. (2008). They point out that even growing bilateral trade does not automatically translate into peaceful relations. What matters is the geographical structure of trade and the balance between bilateral and multilateral openness. In the first case (bilateral openness), war increases the opportunity cost, thus discouraging countries from engaging in military action. On the other hand, in the case of multilateral openness, the opportunity cost of war with any single country decreases, which weakens the willingness to grant concessions during negotiations and, consequently, increases the risk of war breaking out between any pair of countries.

As the full-scale war in Ukraine has been on for three years, an increasing number of studies on the current military conflict

initiated by Russia have emerged in the literature. Steinbach (2023), using an empirical model at the product level, estimated that imports from Ukraine were almost 50% below their potential level for February–August 2022, and the war also led to significant changes in the structure of Russia's trade. While the war had a substantial impact on the Ukrainian and Russian economies, it had relatively limited effects on the economies of other countries. These effects included the need for adjustments in production and in the geographical orientation of Ukraine's trade (Palinchak et al., 2023). The war-affected regions of the country will not only have to be rebuilt, but they should also seek new specializations, building links with reliable partners, particularly in the European Union. One of the sectors most heavily affected by the Russian-Ukrainian war is the agri-food sector. Zhang et al. (2024) examined international production and trade networks for maize, rice and wheat, concluding that the Russia–Ukraine conflict seriously threatens regional and global food security. In turn, Korovkin and Makarin (2022) analysed the impact of the Russian-Ukrainian conflict, which has been ongoing since 2014, on production and trade networks within Ukraine. They showed that the war led to significant trade disruptions – firstly, between the regions where the war was taking place and, secondly, between those Ukrainian regions where at least one trading partner operated in a conflict zone.

The literature reviewed above highlights that the consequences of war on the economy, particularly trade, are quite complex. Most authors agree that this impact is significant, long-lasting, and predominantly negative. The adaptation measures taken in response lead to changes in the position of countries in the international economic system and affect changes in the size and structure of trade links.

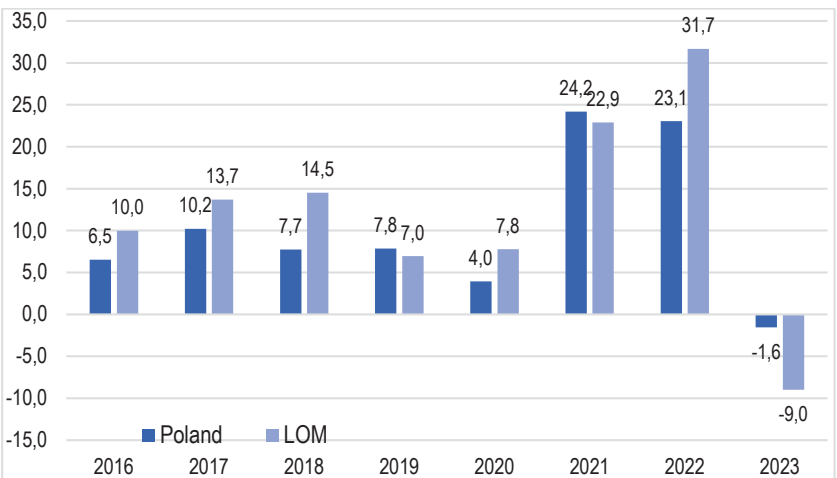
2. MAIN TRENDS IN LOM MERCHANDISE EXPORTS

2.1 Value and growth rate

In the analysed period of 2015–2023, the value of the Lublin Metropolitan Area merchandise exports increased from PLN 5.5 billion to PLN 13.3 billion. An exceptionally high growth rate occurred in the years 2021–2022. Until 2020, the average annual growth did not exceed PLN 1 billion. In 2021, exports increased by PLN 2.1 billion; in 2022, they surged by PLN 3.5 billion. In 2023, the only decline in the value of exports occurred in the analysed period (KAS, 2024).

Comparison of export dynamics in LOM and Poland revealed that in almost the entire analysed period (except for 2019 and 2021), the average growth rate of LOM export value was higher than the dynamics of Poland's exports. The average annual growth rate for LOM was 12.3%, and the rate for Poland was 10.2%. In

Figure 1. LOM growth rate and Poland's export value in 2016–2023 (per cent).



Note. Own elaboration, based on data from the National Revenue Administration (KAS, 2024).

2015–2018, LOM exports were characterised by intensive growth, significantly higher than the national average. In 2019–2020, there was a short-term decline in dynamics, which reached a record level in subsequent years, but ended with a decrease in export value in 2023 (Figure 1).

2.2 Changes in the merchandise composition of exports

Innovation and effective use of the region's advantages are the basis for achieving a competitive advantage and strengthening the export position. The Regional Innovation Strategy of Lubelskie Voivodeship 2030 defines five smart specialisations: high-quality food, green economy, healthy society, digital society, material technologies, production processes and logistics. These areas were made more specific for Lublin in the Lublin 2030 Strategy and include seven economic specialisations: automotive and machinery industry, healthy society, intelligent networks and ICT, automated food processing and functional food, chemical processes and speciality chemical products, modern business services and innovative logistics.

In 2015, exports from the Lublin Metropolitan Area were dominated by the following HS sections: XVII. *Vehicles, aircraft, and transport equipment*, XVI. *Machinery and mechanical appliances, electrical and electronic equipment*, VI. *Products of the chemical industry*, IV. *Prepared foodstuffs*, and XV. *Base metals and articles of base metal*. These remained as the top sections in 2023. However, certain changes in their rank of importance have occurred over the years. Section XVII. *Vehicles* noted the largest decrease in share with a drop of 12.2 percentage points. Section VI. *Chemical industry* also noted a clear downward trend. In contrast, the export of prepared foodstuffs (Section IV) increased by 5.4 p.p., so did machinery and equipment (Section XVI) by 4.6 p.p.

Thus, by the year 2023 the following changes had occurred in the merchandise composition of LOM exports (see Table 1): the primary Section XVII. *Vehicles, aircraft, and transport equipment*,

remained the highest with 17.8% of total export value, while Section XVI. *Machinery and mechanical appliances*, moved up with a 15.4% share. The next three sections had very similar shares: VI. *Chemical industry products* (12.8%), IV. *Prepared foodstuffs, beverages and tobacco* (12.7%), and XV. *Base metals* stood at 12.5%.

Table 1. The main sections in the merchandise structure of LOM exports in 2015 and 2023 (per cent).

Section	2015	2023
I. Live animals; animal products	6.70	6.48
II. Vegetable products	6.64	6.37
IV. Prepared foodstuffs; beverages, spirits and vinegar; tobacco and manufactured tobacco substitutes	7.58	12.67
VI. Products of the chemical or allied industries	16.01	12.78
XV. Base metals and articles of base metal	11.70	12.49
XVI. Machinery and mechanical appliances; electrical equipment; parts thereof	9.78	15.36
XVII. Vehicles, aircraft, vessels and associated transport equipment	29.41	17.84

Note. Own elaboration, based on data from the National Revenue Administration (KAS, 2024).

The key commodity sections identified in the export structure of the Lublin Metropolitan Area in the years 2015–2023 corresponded to those with the highest shares in Poland's overall exports. The differences lay primarily in their ranking positions, which resulted from the varying shares of specific sections in total trade volume.

In Poland's national export structure, Section XVI. *Machinery and mechanical appliances; electrical equipment; parts thereof*, had significantly greater importance, accounting for 25.4% of total exports in 2023. Conversely, Sections XVII. *Vehicles, aircraft, vessels and associated transport equipment*, VI. *Products of the chemical or allied industries*, and IV. *Prepared foodstuffs; beverages, spirits and*

vinegar; tobacco and manufactured tobacco substitutes, played a notably larger role in LOM exports than nationally. In 2023, these sections represented 10.8%, 7.5%, and 6.8% of Poland's total exports, respectively (Pasierbiak et al., 2024, pp. 33–34).

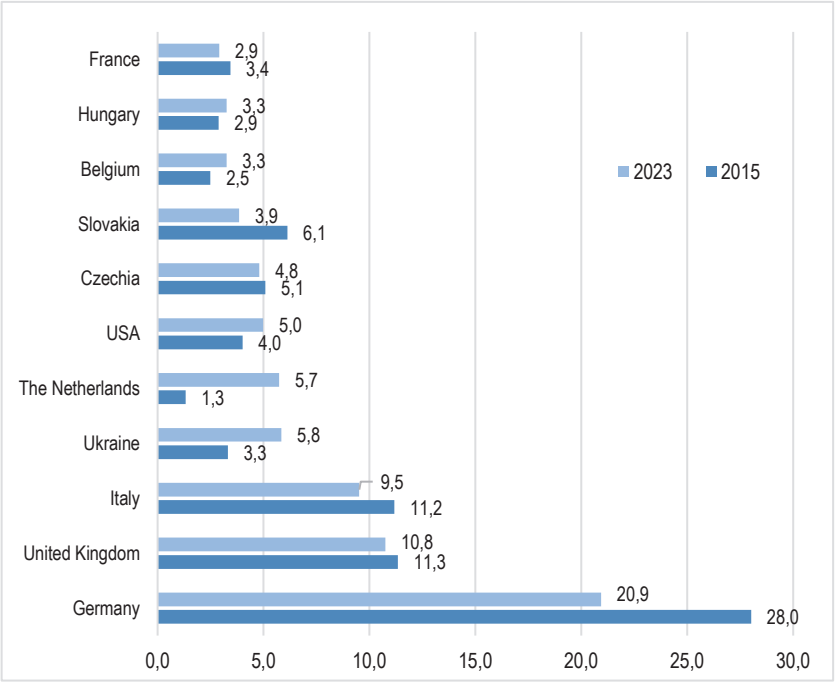
2.3 Changes in the geographical composition of LOM exports

The major destinations for Lublin Metropolitan Area exports were European countries. However, their share continued to decline (from 81.6% in 2015 to 77.7% in 2023) (Pasierbiak et al., 2024). Between 2015 and 2023, Germany was the main export destination for goods from the Lublin Metropolitan Area, maintaining a share that significantly surpassed that of other major trade partners. However, during the analysed period, the reliance on the German market decreased, dropping its share from 28% to 20.9%.

Following Germany, the United Kingdom and Italy ranked next, although both also saw slight decreases in their shares. Notably, the Netherlands and Ukraine experienced the most significant growth among the leading export destinations, with increases of 4.4 percentage points and 2.5 percentage points, respectively. As a result, both countries moved into the top five export destinations for enterprises based in the Lublin Metropolitan Area (Figure 2).

Germany also remained the most significant market for Polish exports in 2023, accounting for 27.8% of the total. Czechia and France followed suit. Notably, Ukraine did not rank among the top five target markets, as its share of Polish exports was considerably lower compared to that of LOM (Pasierbiak et al., 2024).

Figure 2. Share of the most important destination markets in LOM exports in 2015 and 2023 (per cent).



Note. Own elaboration, based on data from the National Revenue Administration (KAS, 2024).

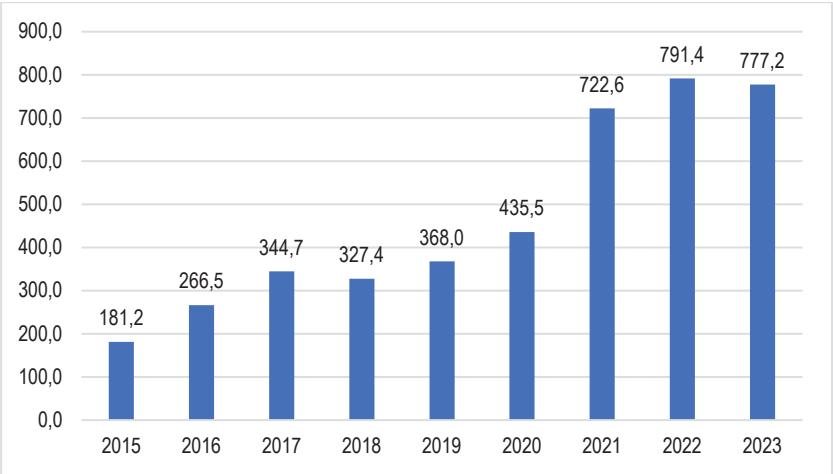
3. CHANGES IN LOM EXPORTS TO UKRAINE

3.1 Value and growth rate

Data from the National Revenue Administration database was used to analyse trade development between enterprises from the Lublin Metropolitan Area and Ukraine. Between 2015 and 2023, the value of LOM exports surged more than fourfold, increasing from PLN 181.2 million to PLN 777.2 million, and peaking at a remarkable PLN 791.4 million in 2022. Noteworthy growth

was observed from 2019 to 2022, during which exports doubled. Interestingly, the outbreak of Russia's war onUkraine in 2022 had a relatively limited impact on the value of LOM exports to Ukraine. While there was a slowdown in 2022 compared to 2021, and a slight decline in 2023, it was modest and comparable to the one seen in 2018.

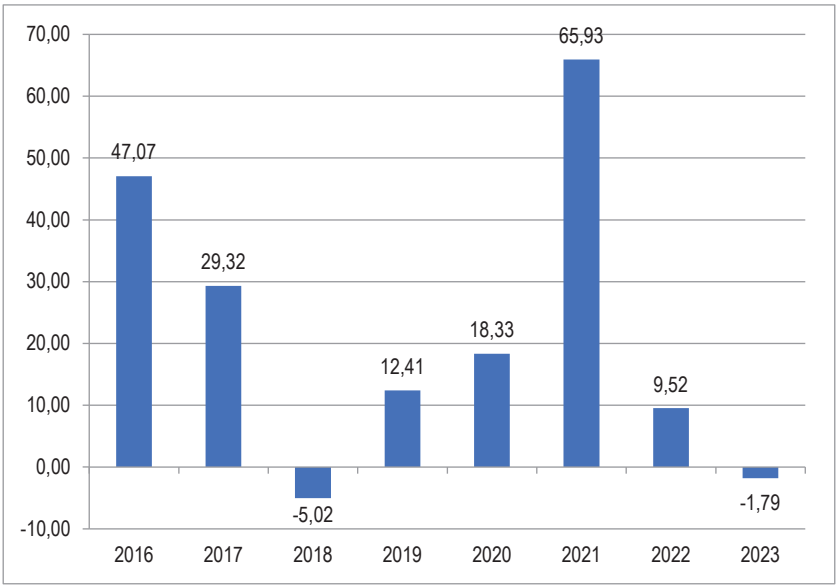
Figure 3. Value of LOM exports to Ukraine in 2015–2023 (PLN million).



Note. Own elaboration, based on data from the National Revenue Administration (KAS, 2024).

The dynamics of LOM exports to Ukraine have been marked by significant annual fluctuations. Notably, there were phases of rapid growth in 2016–2017 and 2020–2021, with a record growth rate of 65.93% in 2021. In 2022, the growth rate fell to 9.52%, and in 2023, exports experienced a decrease of 1.79%. Slower growth of less than 20% was observed during the period of 2019–2020, and the fastest decline occurred in 2018 (5.02%).

Figure 4. Growth dynamics of LOM exports to Ukraine in 2016–2023 (per cent).



Note. Own elaboration, based on data from the National Revenue Administration (KAS, 2024).

A comprehensive analysis of growth dynamics, taking into account the changes across individual sections, leads to several key conclusions. Firstly, export values showed considerable volatility, marked by considerable annual fluctuations, which at times reached several hundred percent. In contrast, the average yearly growth rate, with a few exceptions, can be regarded as high. The most pronounced fluctuations were observed in the following HS sections: III. *Fats and oils*, V. *Mineral products*, VIII. *Raw hides and skins, articles thereof*, XIII. *Articles of stone, ceramic products, glass*, XIV. *Pearls, precious stones and metals, articles thereof*. However, when examining the three primary sections together responsible for around 60% of total LOM exports to Ukraine: VI. *Products of*

the chemical industry, XVI. *Machinery and mechanical appliances, electrical and electrotechnical equipment*, XVII. *Transport equipment*, the extent of the fluctuations was considerably less pronounced. The export dynamics of section XVII. *Transport equipment* were

Table 2. Dynamics of LOM exports to Ukraine in 2016–2023 by main HS sections (per cent).

	2016–2019	2020–2021	2022–2023
I. Live animals; animal products	92.93	16.77	21.97
II. Vegetable products	16.35	–7.04	15.62
III. Fats and oils	106.15	153.64	–72.48
IV. Prepared foodstuffs	10.54	–4.55	111.37
V. Mineral products	471.27	3126.84	–59.38
VI. Products of the chemical industry	16.86	22.18	35.79
VII. Plastics and rubber and articles thereof	14.55	27.54	17.34
VIII. Raw hides and skins, articles thereof	162.14	453.73	73.77
IX. Wood and articles of wood	11.87	18.10	–47.89
X. Pulp of wood, paper, paperboard and articles thereof	–17.42	24.04	63.58
XI. Textiles and textile articles	23.15	12.81	31.12
XII. Footwear, headgear, etc.	22.74	55.97	21.93
XIII. Articles of stone, ceramic products, glass	–14.07	–0.35	313.27
XIV. Pearls, precious stones and metals, articles thereof	–40.49	–89.70	915.70
XV. Base metals and articles thereof	28.16	17.33	2.92
XVI. Machinery and mechanical appliances, electrical and electrotechnical equipment	45.16	31.43	7.93
XVII. Transport equipment	72.52	71.71	26.18
XVIII. Optical, photographic, measuring, checking instruments, etc.	7.43	19.03	16.54
XX. Miscellaneous manufactured articles	34.97	94.63	18.76

Source: Own elaboration, based on data from the National Revenue Administration (KAS, 2024).

notably high, surpassing 70% between 2016 and 2021. However, following the onset of the war, this figure plummeted to 26.18% during the period of 2022–2023. In contrast, exports in Section VI. *Products of the chemical industry* showed a steady increase – from 16.86% in 2016–2019 to 22.18% in 2020–2021, and ultimately reaching 35.79% in 2022–2023. Conversely, Section XVI. *Machinery and mechanical appliances, electrical and electrotechnical equipment* faced adverse trends, with a marked decrease from 45.16% in 2016–2019 to 31.43% in 2020–2021 and further dropping to just 7.93% in 2022–2023.

3.2 Changes in the merchandise composition of exports from the Lublin Metropolitan Area to Ukraine

The analysis of changes in the merchandise composition of exports from the Lublin Metropolitan Area to Ukraine in 2015–2023 has yielded several conclusions. Firstly, there was a relatively high concentration of exports in a few key sections. In 2023, the most significant shares of total exports to Ukraine were attributed to the following sections: XVII. *Transport equipment* (25.24%), VI. *Products of the chemical industry* (21.12%), XVI. *Machinery and mechanical appliances, electrical and electrotechnical equipment* (12.87%), II. *Vegetable products* (10.82%), and XI. *Textiles and textile articles* (9.81%). Collectively, these five top sections accounted for nearly 80% of total exports. Additionally, three other sections were significant: XV. *Base metals and articles thereof* (9.48%), VII. *Plastics and rubber and articles thereof* (4.24%), and V. *Mineral products* (1.75%). The remaining 13 sections contributed less than 1% of total exports.

Secondly, considering the changes observed in the main sections – those that accounted for the highest shares during the analysed period – it becomes evident that Section VI. *Products of the chemical industry* has been the most stable. Its share ranged from 13.25% in 2021 to 21.12% in 2023. Section XI. *Textiles and textile articles* also displayed only minor year-to-year changes in its export share. In contrast, there was a clear upward trend in

Section XVII. *Transport equipment*, whose share increased significantly from 3.21% in 2015 to 25.24% in 2023. Very high annual fluctuations occurred in Section V. *Mineral products*, with its share ranging from as low as 0.19% in 2018 to as high as 22.48% in 2016. Smaller, though still notable, fluctuations characterised Section II. *Vegetable products*, whose share in LOM exports varied between 8.76% in 2021 and 28.47% in 2015.

Thirdly, since the outbreak of the war in 2022, it has been challenging to identify which sections experienced significant structural changes, owing to the previously high annual volatility. Sections XV. *Base metals and articles of base metal* and XVI. *Machinery and mechanical appliances; electrical and electrotechnical equipment* recorded decreases of several percentage points, but it is worth noting that these declines began as early as 2021, a year prior to Russia's invasion. Meanwhile, Section VI. *Products of the chemical industry* experienced a sharp increase in its share – by seven percentage points.

Table 3. The merchandise structure of LOM exports to Ukraine in 2015–2023 (per cent).

Section	2015	2016	2017	2018	2019	2020	2021	2022	2023
I. Live animals; animal products	0.04	0.09	0.19	0.22	0.18	0.15	0.12	0.22	0.11
II. Vegetable products	28.47	15.46	13.93	12.40	20.34	13.66	8.76	10.02	10.82
III. Fats and oils	0.28	0.10	0.52	0.53	0.03	0.03	0.07	0.02	0.00
IV. Prepared foodstuffs	1.81	1.16	0.94	1.43	1.25	1.39	0.50	1.73	0.74
V. Mineral products	2.11	22.48	11.48	0.19	1.07	0.55	21.23	13.23	1.75
VI. Products of the chemical industry	19.30	15.43	14.92	17.96	17.65	16.16	13.25	20.78	21.12
VII. Plastics and rubber and articles thereof	7.18	4.56	6.62	6.87	4.80	5.16	3.98	6.00	4.24

Section	2015	2016	2017	2018	2019	2020	2021	2022	2023
VIII. Raw hides and skins, articles thereof	0.02	0.02	0.02	0.15	0.00	0.02	0.03	0.05	0.09
IX. Wood and articles of wood	1.63	1.69	1.27	1.08	1.12	1.08	0.80	0.37	0.20
X. Pulp of wood, paper, paperboard and articles thereof	3.71	2.11	0.80	0.35	0.49	0.38	0.36	0.71	0.79
XI. Textiles and textile articles	8.91	8.47	9.34	11.70	9.49	8.85	6.15	7.03	9.81
XII. Footwear, headgear, etc.	0.32	0.20	0.26	0.25	0.31	0.47	0.37	0.49	0.50
XIII. Articles of stone, ceramic products, glass	0.91	0.69	0.47	0.42	0.22	0.25	0.10	0.64	0.84
XIV. Pearls, precious stones and metals, articles thereof	0.04	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00
XV. Base metals and articles thereof	12.28	12.03	15.73	17.66	14.59	17.43	9.80	10.43	9.48
XVI. Machinery and mechanical appliances, electrical and electrotechnical equipment	8.09	9.84	16.18	16.49	13.55	15.21	11.92	12.38	12.87
XVII. Transport equipment	3.21	4.45	6.12	10.76	13.52	16.80	19.88	14.26	25.24
XVIII. Optical, photographic, measuring, checking instruments, etc.	1.27	0.83	0.85	0.82	0.80	0.88	0.57	0.81	0.64
XIX. Arms and ammunition	0.00	0.00	0.00	0.00	0.01	0.00	1.50	0.00	0.00

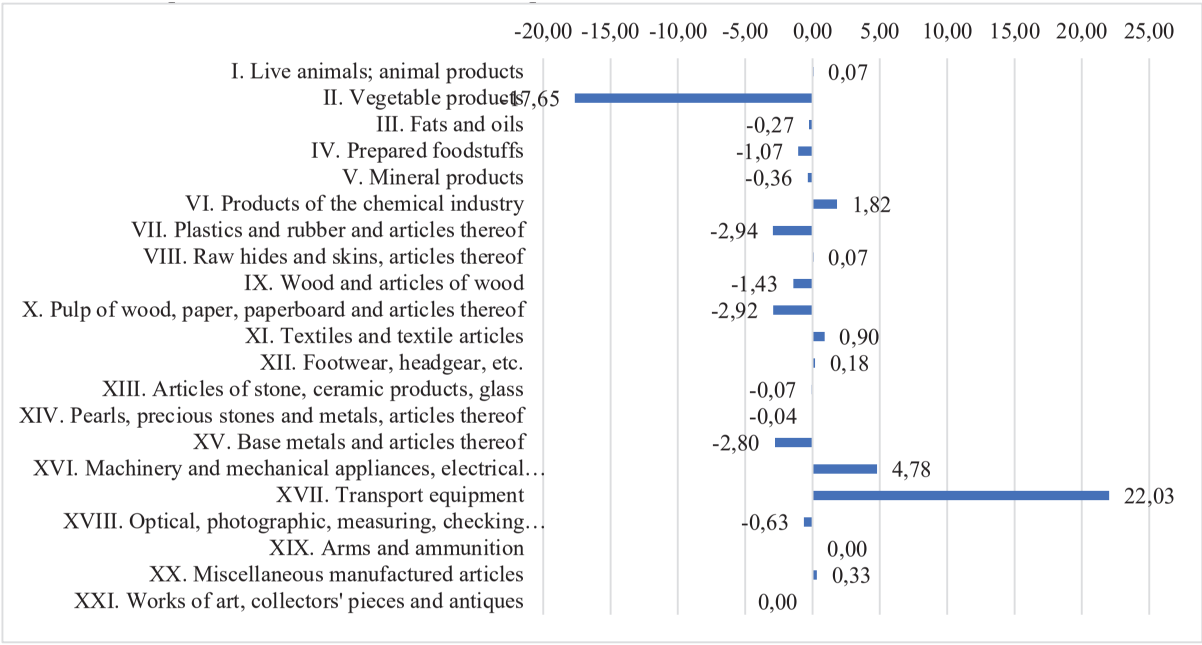
Section	2015	2016	2017	2018	2019	2020	2021	2022	2023
XX. Miscellaneous manufactured articles	0.41	0.37	0.35	0.74	0.56	1.52	0.60	0.82	0.74
XXI. Works of art, collectors' pieces and antiques	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note. Own elaboration, based on data from the National Revenue Administration (KAS, 2024).

Fourthly, comparing the merchandise composition of LOM exports to Ukraine in 2023 with that of 2015 revealed a few sections with the most notable changes in their share of total exports. The most significant changes were: a 22.0 p.p. increase in Section XVII. *Transport equipment* and a 17.65 p.p. decrease in Section II. *Vegetable products*. Additionally, there were smaller changes in other sections, set out below:

– an increase of 4.78 percentage points in Section XVI. *Machinery and mechanical appliances; electrical and electrotechnical equipment*;
– an increase of 1.82 percentage points in Section VI. *Products of the chemical industry*;
– a decrease of 2.94 percentage points in Section VII. *Plastics and rubber and articles thereof*;
– a decrease of 2.92 percentage points in Section X. *Pulp of wood, paper, paperboard and articles thereof*;
– a decrease of 2.92 percentage points in Section XV. *Base metals and articles of base metal*;
– a decrease of 1.43 percentage points in Section IX. *Wood and articles of wood*;
– a decrease of 1.07 percentage points in Section IV. *Prepared foodstuffs; beverages, spirits and vinegar; tobacco and manufactured tobacco substitutes*.

Figure 5. Changes in the share of individual sections in LOM exports to Ukraine in 2015–2023 (per cent).



Note. Own elaboration, based on data from the National Revenue Administration (KAS, 2024).

The analysis of changes occurring in the merchandise structure of LOM exports to Ukraine, at the level of HS sections, is further enhanced by identifying the main groups of exported products. In 2015, five of the 15 commodity groups with the highest value of exports to Ukraine were classified under Section II. *Vegetable products*, three under Section VI. *Products of the chemical industry*, and three under Section XV. *Base metals and articles thereof*. Products belonging to the groups *Citrus fruit, fresh or dried* (9.31%) and *Apricots, cherries, peaches (including nectarines), plums and sloes, fresh* had the highest shares (6.17%).

In the subsequent years, there was a noteworthy improvement in the technological sophistication of exports. The importance of primary products – recognised for their low levels of processing and low capital intensity – declined. In both 2020 and 2023, products classified under Section II. *Vegetable products* remained among the top 15 exported goods, but their contribution to total exports did not exceed 3%. Taking the lead were products from Section XVII, specifically those in the group *Motor cars and other motor vehicles*, principally designed for the transport of persons (other than those of heading 8702), including station wagons and racing cars. Their share in 2020 was 10.06%, increasing to 17.05% in 2023. Following these, the other prominent export products from the Lublin Metropolitan Area to Ukraine included: flat-rolled products of iron or non-alloy steel, of a width of 600 mm or more, clad, plated or coated (6.41%), synthetic staple fibres, not carded, combed or otherwise processed for spinning (3.36%), organic surface-active agents (other than soap); surface-active preparations, washing preparations (including auxiliary washing preparations) and cleaning preparations, whether or not containing soap, other than those of heading 3401 (3.05%). The group *Citrus fruit, fresh or dried*, which held the top position in 2015, fell to fifth place by 2023, with a share of 2.04%.

Table 4. Top 15 commodity groups in exports from LOM to Ukraine in 2015, 2020 and 2023 in PLN million and percentage of total LOM exports to Ukraine.

Section	HS Code	Description	Value in PLN million	Share in %
2015				
II	0805	Citrus fruit, fresh or dried	16.87	9.31
II	0809	Apricots, cherries, peaches (including nectarines), plums and sloes, fresh	11.18	6.17
XI	6309	Worn clothing and other worn articles	6.61	3.65
X	4802	Uncoated paper and paperboard, of a kind used for writing, printing or other graphic purposes, and non perforated punchcards and punch tape paper, in rolls or rectangular (including square) sheets, of any size, other than paper of heading 4801 or 4803; hand-made paper and paperboard	5.44	3.00
II	0702	Tomatoes, fresh or chilled	5.44	3.00
II	0810	Other fruit, fresh	5.44	3.00
II	0808	Apples, pears and quinces, fresh	4.85	2.68
VI	2905	Acyclic alcohols and their halogenated, sulphonated, nitrated or nitrosated derivatives	4.40	2.43
XV	7506	Nickel plates, sheets, strip and foil	4.37	2.41
XV	7502	Unwrought nickel	4.11	2.27
VII	3925	Builders' ware of plastics, not elsewhere specified or included	3.51	1.93
V	2701	Coal; briquettes, ovoids and similar solid fuels manufactured from coal	3.32	1.83
VI	2810	Oxides of boron; boric acids	3.24	1.79
VI	2833	Sulphates; alums; peroxosulphates (persulphates)	3.00	1.65
XV	7210	Flat-rolled products of iron or non-alloy steel, of a width of 600 mm or more, clad, plated or coated	2.68	1.48
		Total	84.44	46.59

Section	HS Code	Description	Value in PLN million	Share in %
2020				
XVII	8703	Motor cars and other motor vehicles principally designed for the transport of persons (other than those of heading 8702), including station wagons and racing cars	43.80	10.06
XV	7506	Nickel plates, sheets, strip and foil	23.64	5.43
XV	7210	Flat-rolled products of iron or non-alloy steel, of a width of 600 mm or more, clad, plated or coated	17.46	4.01
XI	6309	Worn clothing and other worn articles	15.30	3.51
XV	7202	Ferro-alloys	13.27	3.05
II	0805	Citrus fruit, fresh or dried	12.33	2.83
VI	3004	Medicaments (excluding goods of heading 3002, 3005 or 3006) consisting of mixed or unmixed products for therapeutic or prophylactic uses, put up in measured doses (including those in the form of transdermal administration systems) or in forms or packings for retail sale	10.94	2.51
XVI	8433	Harvesting or threshing machinery, including straw or fodder balers; grass or hay mowers; machines for cleaning, sorting or grading eggs, fruit or other agricultural produce, other than machinery of heading 8437	10.76	2.47
XVII	8708	Parts and accessories of the motor vehicles of headings 8701 to 8705	10.66	2.45
XVI	8429	Self-propelled bulldozers, angledozers, graders, levellers, scrapers, mechanical shovels, excavators, shovel loaders, tamping machines and road rollers	10.66	2.45
II	0809	Apricots, cherries, peaches (including nectarines), plums and sloes, fresh	9.86	2.26
VI	2905	Acyclic alcohols and their halogenated, sulphonated, nitrated or nitrosated derivatives	8.57	1.97

Section	HS Code	Description	Value in PLN million	Share in %
VI	3402	Organic surface-active agents (other than soap); surface-active preparations, washing preparations (including auxiliary washing preparations) and cleaning preparations, whether or not containing soap, other than those of heading 3401	8.25	1.89
XVI	8528	Monitors and projectors, not incorporating television reception apparatus; reception apparatus for television, whether or not incorporating radio-broadcast receivers or sound or video recording or reproducing apparatus	7.90	1.81
XVII	8704	Motor vehicles for the transport of goods	7.70	1.77
		Total	211.11	48.48
2023				
XVII	8703	Motor cars and other motor vehicles principally designed for the transport of persons (other than those of heading 8702), including station wagons and racing cars	132.56	17.05
XV	7210	Flat-rolled products of iron or non-alloy steel, of a width of 600 mm or more, clad, plated or coated	49.80	6.41
XI	5503	Synthetic staple fibres, not carded, combed or otherwise processed for spinning	26.14	3.36
VI	3402	Organic surface-active agents (other than soap); surface-active preparations, washing preparations (including auxiliary washing preparations) and cleaning preparations, whether or not containing soap, other than those of heading 3401	21.04	2.71
II	0805	Citrus fruit, fresh or dried	15.87	2.04
II	0804	Dates, figs, pineapples, avocados, guavas, mangoes and mangosteens, fresh or dried	15.87	2.04
XVII	8701	Tractors (other than tractors of heading 8709)	15.38	1.98

Section	HS Code	Description	Value in PLN million	Share in %
VI	2905	Acyclic alcohols and their halogenated, sulphonated, nitrated or nitrosated derivatives	15.20	1.96
XVII	8708	Parts and accessories of the motor vehicles of headings 8701 to 8705	14.56	1.87
VI	2833	Sulphates; alums; peroxosulphates (persulphates)	13.74	1.77
XVII	8704	Motor vehicles for the transport of goods	13.19	1.70
XVII	8806	Unmanned aircraft	12.63	1.63
XVI	8502	Electric generating sets and rotary converters	12.07	1.55
XVI	8433	Harvesting or threshing machinery, including straw or fodder balers; grass or hay mowers; machines for cleaning, sorting or grading eggs, fruit or other agricultural produce, other than machinery of heading 8437	11.70	1.51
VI	2922	Oxygen-function amino-compounds	11.32	1.46
		Total	381.05	49.03

Note. Own elaboration, based on data from the National Revenue Administration (KAS, 2024).

CONCLUSIONS

The outbreak of a full-scale war in Ukraine in February 2022 has brought about fundamental changes to the economy of the country under attack. Foreign trade is one of the most frequently examined areas of impact, apart from economic growth and investment. While analyses of the trade effects of an armed conflict typically focus on the countries directly involved, exploring their trade relations with third countries is also worthwhile.

This paper examines the impact of the ongoing war in Ukraine on the exports of enterprises from the border region – the Lublin Metropolitan Area. Our analysis of changes in the exports of LOM

enterprises to Ukraine in 2015–2023 makes it possible to draw several conclusions.

Firstly, data on the value of exports from LOM to Ukraine during the entire research period (since 2015) does not support the prevalent view in the literature that war decreases trade with neighbouring areas. In fact, LOM exports to Ukraine experienced an over fourfold increase in transaction value. Furthermore, this growth trend continued even during wartime, with record export values to Ukraine observed in 2022 and 2023. In 2022, there was a high growth rate, and a decrease in exports did not occur until 2023. The drop in LOM exports to Ukraine in 2023 was noticeably lower (1.79%) than the overall decline of LOM exports (9%). This rate was similar to the national level decline of 1.69%. The high dynamics of export growth resulted in a considerable increase of Ukraine's share in total exports of LOM, reaching 5.8% in 2023.

Secondly, there was no clear impact of war on the merchandise composition of LOM exports to Ukraine. The changes observed in 2022–2023 continued the trends established prior to the war. Exports remained highly concentrated in a limited number of HS sections, with the top five sections accounting for approximately 80% of total exports throughout the entire analysed period. The dynamics of exports in specific sections were volatile, with fluctuations of several hundred percent, particularly in merchandise groups with relatively low trade value (below 1% of total LOM exports to Ukraine). However, the main sections by export share include: VI. *Products of the chemical industry*, XVI. *Machinery and mechanical appliances, electrical and electrotechnical equipment*, and XVII. *Transport equipment*, and their situation remained relatively stable. The most notable change occurred in Section VI. *Products of the chemical industry*, where a declining share in LOM exports to Ukraine during the 2015–2021 period was replaced by a considerable increase during the war.

Thirdly, the changes in the merchandise structure of exports highlighted a significant 22.03 percentage point increase in Section

XVII. *Transport equipment*, alongside a 17.65 percentage point decrease for Section II. *Vegetable products*. As a result, the first place in 2023 was taken by the group *Motor cars and other motor vehicles principally designed for the transport of persons (other than those of heading 8702), including station wagons and racing cars*, with the contribution of 17.05% to the total LOM export.

Taking into account the merchandise structure of LOM exports, we reckon that it is characterised by a high degree of similarity to the main areas of specialisation of Lublin (see Table 1). In the case of LOM exports to Ukraine, it is necessary to emphasise the high export potential of companies operating in three specialisations: 1) automotive and machinery industry, 2) chemical processes and products of speciality chemicals, and 3) automated food processing and functional food. The other areas of specialisation did not appear in our analysis, as it focused on merchandise and these specialisations are mostly service-based.

In conclusion, it is challenging to identify unquestionable changes in the Lublin Metropolitan Area's exports to Ukraine. The observed trends result from a complex interplay of various factors, including economic, cost-related and political influences. The fluctuations in the value and dynamics of exports from the Lublin Metropolitan Area were generally consistent with broader trends seen in Polish exports. The main limitation in drawing definitive conclusions is the relatively short timeframe of the analysis**.** At the time of submitting this paper, the data available since the outbreak of the full-scale war covered only 22 months. Nevertheless, the analysis presented here has revealed several patterns that emerged even over this brief period. Furthermore, a substantial body of literature indicates that such changes are likely. Acknowledging the preliminary nature of the shifts identified, we emphasise the need for continued research, as a longer analysis period in the future should enable a more accurate assessment of the war's impact on trade with border-region enterprises.

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