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Abstract

While significant attention has been dedicated to sanctions episodes among major economies which usually rely on a diverse set of trade partners, little is known about the impact of sanctions imposed by senders on economies highly dependent on them. Using Ukrainian export data for 2009–2019 at product level, I study the effects of trade restrictions imposed by the Russian Federation against Ukraine since 2016 accounting for the impact of Russian occupation and destruction of productive capacities. I find no evidence for evasion of Russian trade policy measures via export to other members of the Eurasian Economic Union or product misclassification, instead trade flows were redirected to new destinations. Industries with higher exposure to Russian market experienced significant reductions in employment, number of enterprises and turnover when targeted by embargo.

JEL Classification Codes: F13, F14

Keywords: Ukraine, Russia, sanctions, trade war.

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1 Introduction

For a long time trade flows among the members of the Commonwealth of Independent States (CIS) and affiliated countries remained high due to the legacy of the Soviet Union (Djankov and Freund, 2002; Mazhikeyev and Edwards, 2021). Russian Federation attempts to retain its dominant position in the region through different means, for example, by using punitive trade measures (Cenusa, Emerson, Kovziridse, and Movchan, 2014; Svoboda, 2021). I study the effects of embargo and increased tariffs imposed on Ukrainian export by the Russian Federation, once a major trade partner of Ukraine, on January 1, 2016. Sanctions imposed on Ukraine together with the complete or partial occupation of three Ukrainian regions by Russia since 2014 (Crimea was occupied completely, Donetsk and Luhansk regions partially) constitute the 2014 Russia shock.

Russia's occupation of parts of Ukraine resulted in sizable losses of GDP and production capacities; this in turn had negative impact on Ukraine's export. According to the data on gross regional product from the State Statistics Service of Ukraine, Crimea, Donetsk and Luhansk regions in 2013 jointly accounted for 17% of Ukrainian GDP. Using synthetic control method, Bluszcz and Valente (2022) find that Ukraine's per capita GDP was on average 15.1% lower in 2013–2017, while for Donetsk and Luhansk regions losses were at 47% in 2013–2016.[1] Nevertheless, Ukrainian economy proved to be remarkably resilient and managed to return to growth in 2016[2] after the intensity of military actions temporarily decreased. In their seminal paper, Glick and Taylor (2010) provide evidence on negative long-term effect of wars on trade among belligerent nations, as well as their trade with third countries. Boyko, Nes, and Schaefer (2024) analyze the changes in patterns of Ukrainian trade since 2014 and find evidence of reorientation from Russia towards the EU. Korovkin and Makarin

[1] Centre for Economics and Business Research (Cebr) in a report prepared for the Ukrainian government evaluated Ukraine's losses caused by Russian invasion in 2014–2020 at 280 billion USD, link to the report: `https://cebr.com/reports/cost-to-ukraine-of-conflict-with-russia/?fbclid=IwAR3eITVGnauXBPrgYeEIm-a749mqkeACXrKdvRQvNvjVdIdKbxgtQlue_1c` (accessed on June 27, 2024). For comparison, the World Development Indicators database estimates Ukraine's GDP in 2021 at 199 billion USD.

[2] According to GDP data from World Development Indicators.

(2023) attribute this reorientation to erosion of intergroup trust. Yet, the coefficient for trust variable in Korovkin and Makarin (2023) is reduced by half when product-level effects are accounted for. Russian sanctions on Ukrainian trade are an example of such product-level policies likely to have caused redirection of targeted products away from Russia. Moreover, while Korovkin and Makarin (2023) account for average effects of Russian aggression against Ukraine by including a common indicator for all observed time periods since March 2014, sanctions were imposed only in 2016, thus the timelines of the Russian invasion and imposed restrictive trade measures differ. As a result, their empirical setup doesn't appropriately account for the presence of sanctions. This paper contributes to the literature by studying the effects of 2016 Russian sanctions on Ukrainian export.

Using yearly data on Ukrainian trade in 2009–2019 from BACI at 6-digit HS1 level, I run gravity-like regressions and find that Ukrainian export of products targeted by increased tariffs to Russia indeed decreased compared to unaffected products, while export of embargoed products stopped almost completely. I find no evidence for redirection of trade flows from Ukraine to Russia's partners in the Eurasian Economic Union (EEU, these are Armenia, Belarus, Kazakhstan and Kyrgyz Republic) after the imposition of sanctions, as export of targeted products to the EEU decreases as well. This finding is not unexpected since Russia restricted transit of Ukrainian goods targeted by embargo to the markets of Kazakhstan and Kyrgyz Republic in 2016–2019. Instead, products targeted by Russian restrictive measures (embargo or tariff) were redirected, among others, to China, India, Indonesia or Saudi Arabia and some of the member states of the European Union that joined since 2004, for example Poland and Romania. These findings extend the contribution in Boyko et al. (2024), who analyze the developments in Ukrainian trade over 2000–2019 for broad categories of agro-food, manufacturing and other products and show that the EU was not the only new destination for export.

I conduct additional estimations to check for possible evasion of sanctions. The evidence for misclassification of products is very limited: Export of similar goods (i.e. products in the

same 4-digit HS category with targeted) to Russia and its partners in the customs union did not change significantly in 2014–2015 and even decreased in 2016–2019. Another method commonly used to detect product misclassification is comparing trade flows reported by exporter and importer respectively: Product missclassification is present if importer reports lower trade flow than exporter (Javorcik and Narciso, 2008). Such evidence is present only in 2014–2015 for products that were targeted by increased tariffs since 2016: Russia reports lower value, weight and quantity of imports than Ukraine. Instead, import of embargoed and similar goods reported by Russia is higher than the corresponding data reported by Ukraine. The reason for this unexpected finding may be that since 2014, Russia recorded trade with occupied Ukrainian territories of Donetsk and Luhansk regions as trade with Ukraine, while Ukrainian official statistics do not account for these data. In the last step, I combine the information on restrictive measures imposed by the Russian Federation with the data on industrial production from the State Statistics Service of Ukraine to check whether Russian sanctions had any effects on Ukrainian economy beyond trade. I find that embargo had a significant negative effect on employment, number of enterprises and turnover in the industries with high exposure to Russian market.

There exists a broad literature on trade-related effects of sanctions quantifying their impact on both countries imposing sanctions (senders) and those targeted by them (targets) using product- or industry-level data. I contribute to this literature by studying the effect of sanctions on Ukraine, a target which was highly dependent on sender, Russia. A number of authors study the effects of sanctions imposed by the EU, the US and their partners on Russia since 2014 in connection to Russian invasion of Ukraine, as well sanctions imposed on them by Russia, both at the aggregate (Bělín and Hanousek, 2021; Cheptea and Gaigné, 2019; Flach, Heiland, Larch, Steininger, and Teti, 2024; Miromanova, 2023) and firm level (Ahn and Ludema, 2020; Crozet and Hinz, 2020; Gullstrand, 2020). Sanctions imposed by Russia on Ukraine belong to the same episode. In August 2014, Russian Federation imposed an embargo on import of a range of agricultural products from the EU, US and

their partners: Cheptea and Gaigné (2019, p. 685) note that in 2013, over 80% of Russian imports of embargoed products originated from the EU. As a result, exports of embargoed products from the EU to Russia decreased and were redirected to other destinations (Cheptea and Gaigné, 2019; Miromanova, 2023). Embargo was extended to Ukraine on January 1, 2016 and combined with increased tariffs on a range of products, as well as restrictions on transit to Central Asia.

The remainder of this paper is organized as follows: Section 2 presents the institutional background for Russia's use of punitive trade measures. In Section 3, I describe the data. Sections 4–6 discuss the empirical results, Section 7 concludes.

2 Institutional framework

It has long been suspected that the authorities of the Russian Federation use trade policy tools to achieve political goals not related to trade. Sanitary and phytosanitary measures, as well as technical barriers to trade are particularly likely to be employed for this purpose and the often stated objective of protection of human health may in fact be a cover for protectionism (Elvestad and Nilssen, 2010; Svoboda, 2021). Svoboda (2021) provides multiple examples of Russia using such measures against Belarus, Georgia, Moldova and Ukraine, similar evidence can be found in Cenusa et al. (2014). The suspicion of selective use of trade restrictions to achieve political goals is supported by the practice of their implementation: For example, Cheptea and Gaigné (2019, p. 689) state that in February 2014, the Russian Federation motivated its ban on import of pork from the EU by detection of African swine fever, but simultaneously continued importing pork from Belarus and Ukraine where this decease was observed as well. Additionally, Svoboda (2021) notes that due to high dependence of Belarus, Georgia, Moldova and Ukraine on the Russian market, measures introduced by Russia without prior warning could inflict significant economic damage on their producers. Due to the small size of their economies compared to Russian economy, these countries

cannot retaliate when targeted by Russian trade measures and rarely file complaints with the WTO (Svoboda, 2021, p. 2). Such punitive measures were often discontinued after the targeted country agreed to real or perceived concessions: Svoboda (2021, p. 6) reports that in 2016, after a few visits of the newly elected president of Moldova Igor Dodon to Moscow previously imposed restrictive measures were relaxed.

Since early 2000s, Russian Federation used multiple rounds of prohibitions on import of Ukrainian food products on the grounds of sanitary and phytosanitary concerns: For example, starting from January 20, 2006, Russia unexpectedly prohibited import of meat and milk products from Ukraine under this pretext.[3] Trade tensions between Ukraine and the Russian Federation intensified in 2012–2013, when Ukraine was preparing to sign the Deep and Comprehensive Free Trade Agreement (DCFTA) with the European Union. Russian officials objected to this treaty citing fears that cheap EU products will flow to Russia via Ukraine after DCFTA enters into force and disrupt its economy.[4] Cenusa et al. (2014, p. 2) provide a timeline of bans implemented by Russia in 2013–2014, among them are the prohibitions on import of confectionery, poultry, cheese, potatoes and alcohol, as well as railway cars. One of the most detrimental measures was implemented in August 2013, when Russia tightened the border controls for imports from Ukraine without any prior warning; this led to prolonged border procedures and waste of cargo (Svoboda, 2021).

Under the apparent pressure from the Russian Federation,[5] the President of Ukraine Viktor Yanukovych refused to sign the DCFTA; this decision triggered nationwide protests called the Revolution of Dignity. After their violent suppression failed in February 2014, Russian Federation started a military intervention in Ukraine occupying the Crimea and

[3]News report on prohibition of imports of meat and milk products from Ukraine (in Russian): `https://www.rbc.ru/politics/27/01/2006/5703bbaa9a7947afa08c9447` (accessed on April 29, 2024).

[4]See the news report from RBC (in Russian) `https://www.rbc.ru/economics/19/09/2014/5704225a9a794760d3d419b4` (accessed on June 1, 2024).

[5]For example, see the interview with the former U.S. Ambassador to Ukraine Steven Pifer from December 2, 2013 `https://www.brookings.edu/articles/why-did-ukraines-yanukovych-give-in-to-russian-pressure-on-eu-deal/` (accessed on October 16, 2024).

parts of Donetsk and Luhansk oblasts (regions) by the end of May 2014.[6] As a consequence of these actions, a number of countries, among them the US and members of the European Union imposed sanctions on the Russian Federation.[7] Measures adopted in March 2014 included asset freezes and travel bans for persons involved in occupation of parts of Ukraine. Additional sanctions were imposed after flight MH17 was downed by the forces controlled by the Russian Federation in July 2014. In August 2014, the Russian Federation announced a package of sanctions targeting agricultural products exported by the countries imposing sanctions on Russia; these are widely knows as 'countersanctions'.

Punitive measures imposed by Russia on Ukraine are part of the same sanctions episode. The newly elected Ukrainian president and government signed the DCFTA on June 27, 2014.[8] European Union simplified access of Ukrainian goods to its market with the autonomous trade preferences introduced by Regulation No 374/2014 adopted in April 2014,[9] but the provisional application of the DCFTA started only on January 1, 2016[10] to prolong Ukraine's access to Russian market at preferential rates, as Russian authorities were threatening to withdraw preferential treatment available to Ukraine via the Commonwealth of Independent States free trade area and apply higher MFN rates instead if the implementation of the agreement starts at an earlier date (Cenusa et al., 2014, p. 4). The MFN tariffs were applied by Russia since January 1, 2016. Starting from this date, Russia additionally extended to Ukraine the embargo already imposed on a number of food products imported from the EU,

[6]The authorities of the Russian Federation initially denied their involvement in eastern Ukraine. In the case "Ukraine and the Netherlands v. Russia" the European Court of Human Rights found that "areas in eastern Ukraine in separatist hands were, from 11 May 2014 and up to at least 26 January 2022, under the jurisdiction of the Russian Federation" with Russian military personnel present in eastern Ukraine since at least April 2014 and from August 2014 at the latest deployed there at large scale, see press release issued by the Registrar of the Court on January 25, 2023, available here `https://www.echr.coe.int/w/decision-concerning-an-inter-state-case` (accessed on April 2, 2024).

[7]For the timeline of sanctions imposed by the European Union see `https://www.consilium.europa.eu/en/policies/sanctions-against-russia/timeline-sanctions-against-russia/` (accessed on August 6, 2024).

[8]European Commission, see `https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/countries-and-regions/ukraine_en` (accessed on June 1, 2024).

[9]Regulation (EU) No 374/2014, link: `https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02014R0374-20141102` (accessed on August 6, 2024).

[10]European Commission, see `https://trade.ec.europa.eu/access-to-markets/en/content/eu-ukraine-deep-and-comprehensive-free-trade-area` (accessed on August 6, 2024).

US and their partners and imposed restrictions on transit to the Central Asia via its territory. Notably, restrictive measures applied since January 1, 2016, differ from those described in Cenusa et al. (2014) and Svoboda (2021), as they were announced in advance. The embargo on imports from Ukraine was introduced by the Decree No 842 of the Government of the Russian Federation from 13 August 2015, i.e. 4 months before it entered into force. Tariff increases were announced by a government decree No 959 on September 19, 2014 and also entered into force on January 1, 2016. Additionally, since the occupation of Crimea and Eastern Ukraine was underway and integration of Ukraine with the EU strengthened, Ukraine and Russia were on diverging paths and removal of the restrictive measures was unlikely.

Importantly, the imposition of embargo on imports of food products from the EU and later from Ukraine was not simply a punitive measure, but is in line with the general priorities of the Russian food policy. Götz, Heigermoser, and Jaghdani (2022) note that since 2000s, Russia has been prioritizing decreasing dependence on food imports and sees it as a component of national security. Moreover, its Food Security Doctrine adopted in 2020 sets a goal of transformation of Russia in a major exporter of food internationally. Since the embargo was introduced, Russian Federation did not withdraw from the international market, but rather reduced trade with the EU and the US and increased with China, the EEU and the Middle East (Götz et al., 2022, p. 118). The authors describe measures targeting food imports to Russia as deliberate choices aiming to "enhance national security and as an appeal to rising nationalism in Russia" (Götz et al., 2022, p. 119) and note that the embargo on imports of poultry, pork, beef and raw milk was combined with subsidies to increase domestic production in these sectors. These measures were only partially successful: Miromanova (2023) analyzes the data for selected products and shows that Russia was not able to achieve full self-sufficiency (i.e. consumption was not fully covered by domestic production) in meat and milk production, but import substitution was more successful for

grain. Also the quality of domestically produced goods appears to decrease (Miromanova, 2023, p. 934).

On top of the increases in tariffs and imposition of embargo, starting from January 2016 Russian Federation prohibited transit of Ukrainian products via its territory to Kazakhstan by a presidential decree No 1 from January 1, 2016. The restrictions for transit to the Kyrgyz Republic were added later, this ban deprived Ukraine of the shortest route to their markets. Still, Ukraine's complaint to the WTO was not satisfied and the Dispute Settlement Body (DSB) of the WTO found that imposed restrictions were covered by Article XXI(b)(iii) of the GATT 1994, the so called security exception.[11] Russian Federation argued that these restrictions were necessary to protect is national security and the DSB agreed with this motivation. This case is particularly important as it paved the way to the use of national security argument in trade wars (Voon, 2019). Ukrainian attempts to use an alternative transit route developed as a part of the New Silk Road project were unsuccessful: increased transport costs and transportation times put Ukrainian products at a disadvantage in Central Asia.[12] Russian transit ban was lifted on July 1, 2019.

3 Data

I use yearly trade data from BACI compiled by Gaulier and Zignago (2010) and available via the CEPII website.[13] The data set is restricted to Ukrainian exports as in Korovkin and Makarin (2023) and includes zero trade flows for country pair-product-year observations with no positive trade flow reported. Zero trade flows are included only for products that were ever traded by corresponding country pairs following French and Zylkin (2024).

[11]Summary of the dispute DS512 is available via the website of the WTO `https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds512_e.htm` (accessed on June 4, 2024).

[12]See the interview with the deputy minister of infrastructure of Ukraine Viktor Dovhan from July 18, 2019 (in Ukrainian)`https://interfax.com.ua/news/interview/601036.html` (accessed on June 24, 2024).

[13]I use version 202401b, link to BACI data: `http://www.cepii.fr/CEPII/en/bdd_modele/bdd_modele_item.asp?id=37` (accessed on August 5, 2024). Alternatively, monthly trade data are available via UN Comtrade,`https://comtradeplus.un.org/`, Crozet and Hinz (2020) and Miromanova (2023) use monthly data. I use yearly data since they provide a better coverage compared to monthly data, see Appendix A for details.

Since I am specifically interested in redirection of Ukrainian exports from Russia to other destinations, it is important to control for the existing impediments to trade. I add tariff data from TRAINS via WITS (World Bank, 2023). Following the procedure suggested by Teti (2020), missing observations are imputed with preceding and following values. In line with the results in Kinzius, Sandkamp, and Yalcin (2019), I also control for non-tariff barriers using the Global Trade Alert data maintained by Evenett and Fritz (2020). I follow the typology in Kinzius et al. (2019) and divide trade measures into non-tariff barriers and trade defence instruments (such as anti-dumping and anti-subsidy measures). The lists of products targeted by Russian embargo and increased tariffs are compiled from the decrees published on the official website of the government of the Russian Federation.

Table 1: Summary statistics

	Mean	St.dev.	Min	Max
Zero trade flows	0.7316	0.4431	0	1
Applied tariff	5.2311	19.0013	0	3000
Trade defence instruments	0.0002	0.0131	0	1
Non-tariff barriers	0.0022	0.0472	0	1
Embargo	0.0474	0.2125	0	1
Tariff	0.2143	0.4103	0	1
Observations	2865291			

Tariff data from World Bank (2023), TDI and NTB from GTA by Evenett and Fritz (2020), own presentation.

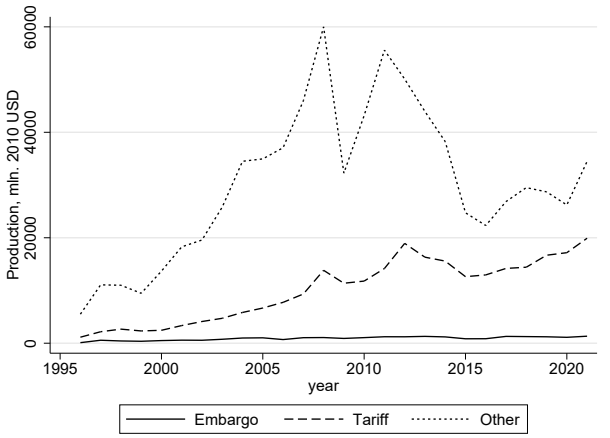
Table 1 reports basic descriptive statistics for the data.[14] Due to high level of disaggregation, zero trade flows account for 73% of the observations. Average tariffs are at 5.2%, while trade defence instruments and non-tariff barriers are rarely observed, in 0.02% and 0.2% of cases, respectively. Following Kinzius et al. (2019) all trade policy variables (applied tariff, trade defence instruments and non-tariff barriers) enter the estimations with 1 year lag. Finally, products targeted by Russian embargo account for 4.7% of the data and by tariffs for 21.4%.

Figure 1 illustrates the value in constant 2010 USD and weight of Ukrainian exports by

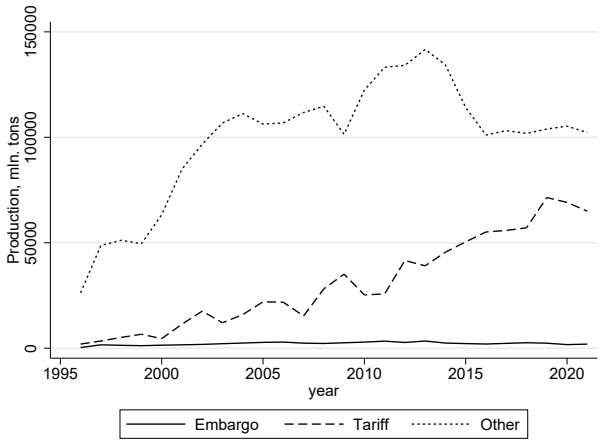
[14]Tables prepared using Jann (2007).

Figure 1: Total value and quantity exported

(a) Value, mln. 2010 constant USD



(b) Weight, mln. tons



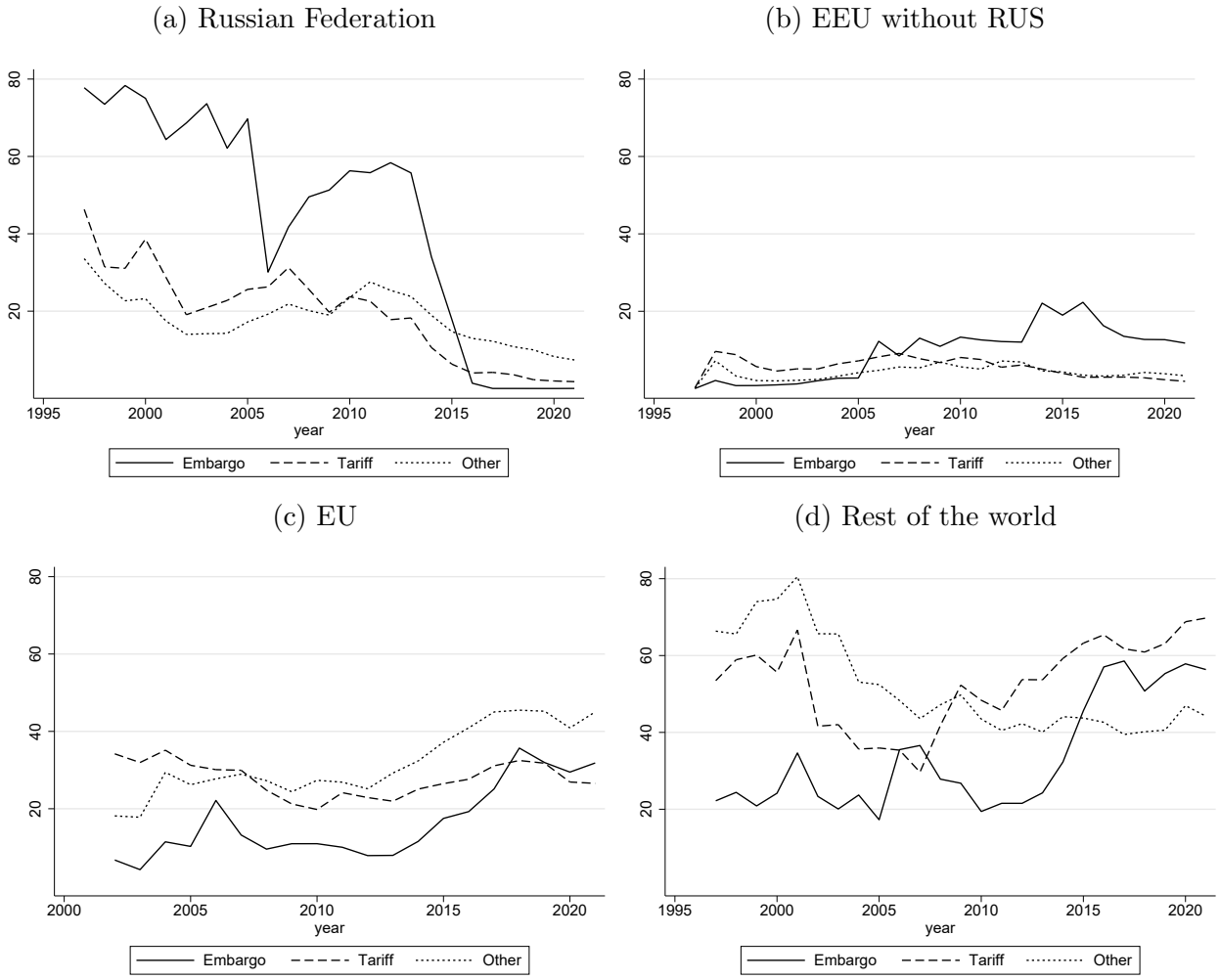
Data sources: Trade data from BACI, own presentation.

product group: Embargoed goods, products under tariffs and other.[15] I report the descriptive statistics and run separate regressions for weight to check whether the changes in value traded are connected to a decrease in quantity or only driven by changes in prices. The use of weight as a proxy for quantity has significant limitations: Weight is not an appropriate measure for many products and is difficult to use for a meaningful comparison across product groups. Still, I employ it since this is the only proxy for quantity available in BACI. There is a clear drop in exports in 2014–2016 connected to the effects of Russian complete or partial occupation of three Ukrainian regions. These descriptive statistics demonstrate that the products targeted by Russia's punitive measures constitute a substantial share of Ukrainian exports both in value and weight. Additionally, a drop in value and quantity of exports since 2014 appears to be more pronounced for goods that were not targeted by Russia.

Next, I present the statistics for destinations of Ukrainian exports. In 2013, the year before the start of the Russian invasion of Ukraine, the dependence of Ukrainian exporters on the Russian market was substantial. According to BACI data, in 2013 Russian Federation was the main export market (i.e. export to Russian Federation comprised more than 50% of

[15]In regressions, I use data only for 2009–2019, but provide descriptive statistics Figure 1 and Figure 2 for a longer time period to illustrate long-term trends.

Figure 2: Share of destinations in total value of Ukrainian exports by product group



Data sources: Trade data from BACI for value of exports, own presentation.

total export) for 35.6% of Ukrainian products identified by 6-digit HS codes. For 8.3% of products, share of export to Russian market in total export was even above 90%. Figure 2 illustrates the shares of four destinations in total export over 1997–2021: Russian Federation, other members of the Eurasian Economic Union (EEU: Armenia, Belarus, Kazakhstan and Kyrgyz Republic), the EU and the rest of the world. As Panel (a) of Figure 2 demonstrates, share of Russian Federation in total Ukrainian exports decreased strongly since 2014 in all product groups, but particularly so for embargoed goods. A downward trend in importance of the Russian Federation as an export destination is observed overall since 1997. A visible

drop in share of embargoed goods can be observed in 2006, it is connected to the ban on meat and dairy introduced on January 20, 2006. Panel (b) of Figure 2 depicts the share of the EEU in Ukrainian export. There is a visible increase in export of embargoed products to the EEU in 2014–2016 suggesting redirection of export to Russia's partners in the customs union. The share of the EEU in Ukrainian export of embargoed products decreases since 2016, when their transit via the Russian territory was banned. Finally, the share of the EU in exports increased only moderately, while there was a big increase in export shares of categories "Embargo" and "Tariff" for the rest of the world.

In the last step of the empirical analysis, I check whether Russian trade restrictions had an impact on industry-level employment, number of enterprises and turnover in Ukraine. The data on employment, number of enterprises and turnover by 4-digit ISIC industry used for this exercise are from the State Statistics Service of Ukraine,[16] The data are available since 2010, I include observations up to 2019 similarly to the data set for trade flows. I use the R-package *concordance* maintained by Liao, Kim, Miyano, and Zhang (2020) to merge production data reported in ISIC classification with trade data from BACI reported in HS classification.

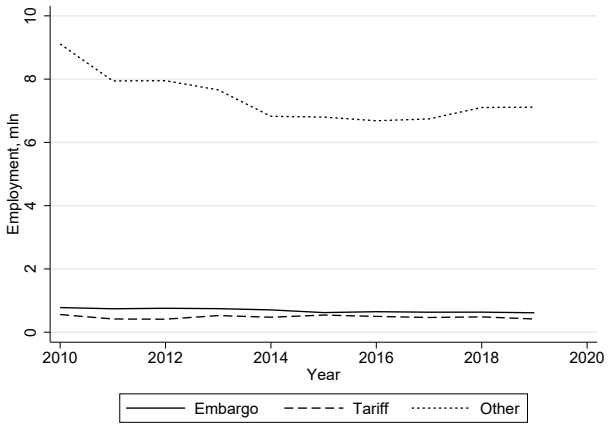
As Figure 3 demonstrates, industries targeted by Russian trade measures account for approximately 20% of Ukrainian employment in different years.[17] The share of industries targeted by Russian restrictive measures in the number of enterprises is relatively low. One explanation for the low share of enterprises from targeted industries in total number of enterprises could be the proliferation of self-employment in the form of individual entrepreneurship in Ukraine. According to the data from the State Statistics Service of Ukraine, in 2010–2022 the share of individual enterprises in total number of enterprises was at 77–85%. The number of enterprises remained relatively constant despite the occupation of Crimea and

[16]Link to the data (in Ukrainian): `https://www.ukrstat.gov.ua/operativ/oper_new.html`.

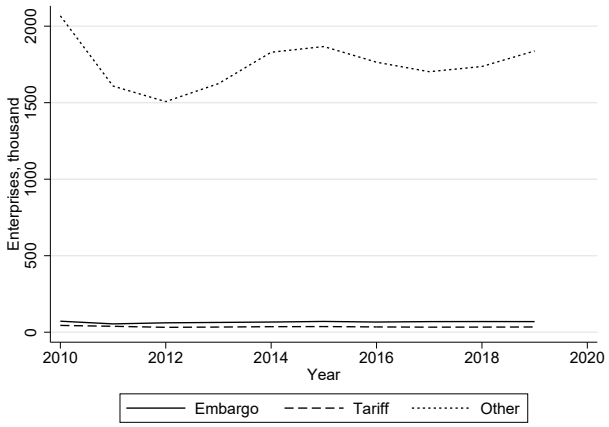
[17]In contrast to trade data, here the group "Other" includes non-traded goods as well. Kupets (2016) demonstrates that in 2004–2013 the share of employment in non-traded sector in Ukraine was increasing and thus contributing to job polarization. In particular, the share of employment in less knowledge-intensive sectors increased strongly.

Figure 3: Employment, number of enterprises and turnover at 4-digit HS industry

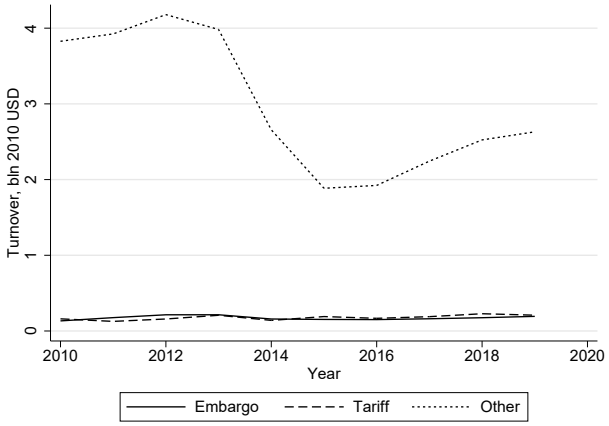
(a) Employment, mln.



(b) Number of enterprises, thousand



(c) Turnover, bln. 2010 USD



Data sources: Data from State Statistics Service of Ukraine, own presentation.

parts of Donetsk and Luhansk regions since Ukrainian law No 1207-VII "On ensuring the rights and freedoms of citizens and the legal regime in the temporarily occupied territory of Ukraine" adopted in April 2014 required that all firms from occupied territories change their registration to regions controlled by the Ukrainian government. Nevertheless, continuation of production was not always possible: An illustrative example is Luhanskteplovoz, a locomotive producer founded in late XIX century in Luhansk. The enterprise changed its official address to Severodonetsk, but had to stop production in 2015 and thus continued to exist

only formally.[18] At the same time, the contribution of targeted industries to total turnover is relatively low. In 2014–2016 the turnover of non-targeted industries decreased by ca. 50%, but the decrease was stronger than for targeted industries. On the other hand, the rebound observed for non-targeted industries since 2016 was stronger too.

4 Export to Russia and the EEU

4.1 Aggregate evidence

In Table 2, I report the results from the estimation of Equation 1 with the data on Ukrainian exports to all destinations. I restrict the sample to 2009–2019 and exclude the years 2020 and 2021 due to the COVID-19 pandemic and observations from 2022 due to the full-scale Russian invasion of Ukraine. The period after 2014 contains the data for 5 years and the length of the prior period is the same, so that the time window is symmetric.

$$\begin{aligned} X_{ipt} = \ln(\text{Applied tariff})_{ip(t-1)} + \text{Non-tariff barriers}_{ip(t-1)} + \text{Trade defence instruments}_{ip(t-1)} \\ + \text{Embargo}_{pt} \times \text{RUS}_i + \text{Tariff}_{pt} \times \text{RUS}_i + \text{Embargo}_{pt} \times \text{EEU}_i + \text{Tariff}_{pt} \times \text{EEU}_i \\ + \text{Similar}_{pt} \times \text{RUS}_i + \text{Similar}_{pt} \times \text{EEU}_i + \beta_{it} + \gamma_{pt} + \mu_{ip}, \end{aligned} \tag{1}$$

where X_{ipt} denotes export to country i of product p in year t, with lags of the natural logarithm of applied tariff and indicators for non-tariff barriers and trade defence instruments as additional controls. The main interest here is on interaction terms, where 'Embargo' and 'Tariff' indicate products targeted by corresponding trade measures and 'Similar' products in the same 4-digit HS industry with them. 'RUS' denotes trade flows to Russia and 'EEU' to the EEU.

[18] According to news reports, equipment from Luhanskteplovoz was dismantled and moved from Luhansk to the Russian Federation in late 2015 (in Ukrainian): `https://lb.ua/society/2015/12/03/322523_luganske_sdayut_metallolom.html` (accessed on June 28, 2024).

Table 2: Export of products under RUS restrictions to RUS and EEU

	RUS		EEU		Similar	
	(1) Value	(2) Weight	(3) Value	(4) Weight	(5) Value	(6) Weight
Log applied tariff	-0.0451	-0.157	-0.0440	-0.154	-0.0439	-0.154
	(0.0745)	(0.0906)	(0.0745)	(0.0907)	(0.0744)	(0.0907)
Non-tariff barriers	0.0160	0.0641	0.0150	0.0414	0.0147	0.0399
	(0.231)	(0.203)	(0.231)	(0.206)	(0.231)	(0.206)
Trade defence instruments	-4.196**	-3.798***	-4.202**	-3.791***	-4.201**	-3.789***
	(1.315)	(0.676)	(1.314)	(0.674)	(1.314)	(0.674)
Embargo × 2014–15 × RUS	-0.700***	0.107	-0.658***	0.144	-0.671***	0.143
	(0.165)	(0.158)	(0.165)	(0.161)	(0.159)	(0.161)
Embargo × 2016–19 × RUS	-6.139***	-2.018***	-6.254***	-2.134***	-6.268***	-2.134***
	(0.425)	(0.448)	(0.542)	(0.390)	(0.543)	(0.394)
Tariff × 2014–15 × RUS	-0.345***	-0.403***	-0.336***	-0.473***	-0.334***	-0.471***
	(0.0631)	(0.114)	(0.0712)	(0.118)	(0.0713)	(0.120)
Tariff × 2016–19 × RUS	-0.926***	-0.435	-0.978***	-0.692*	-0.985***	-0.697*
	(0.0980)	(0.482)	(0.110)	(0.342)	(0.109)	(0.345)
Embargo × 2014–15 × EEU			0.116	0.495*	0.122	0.494
			(0.328)	(0.251)	(0.319)	(0.255)
Embargo × 2016–19 × EEU			-0.225	-0.453	-0.227	-0.447
			(0.287)	(0.238)	(0.278)	(0.239)
Tariff × 2014–15 × EEU			0.0515	-0.372*	0.0511	-0.370*
			(0.0933)	(0.177)	(0.0935)	(0.178)
Tariff × 2016–19 × EEU			-0.259*	-1.688***	-0.259*	-1.693***
			(0.107)	(0.345)	(0.107)	(0.348)
Similar × 2014–15 × RUS					0.134	0.143
					(0.0920)	(0.361)
Similar × 2016–19 × RUS					-0.747***	-1.699***
					(0.136)	(0.268)
Similar × 2014–15 × EEU					-0.0826	0.112
					(0.142)	(0.430)
Similar × 2016–19 × EEU					0.0329	-0.847***
					(0.286)	(0.208)
Pseudo R-sq.	0.950	0.971	0.950	0.971	0.950	0.971
Obs.	1405560	1380495	1405560	1380495	1405560	1380495

The table presents *ppmlhdfe* estimates of effects of Russian trade restrictions on Ukrainian exports. All regressions controlling for importer-time, product-time and importer-product fixed effects. Errors clustered at importer level. Standard errors in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

I analyze the effects of Russian embargo and tariffs separately for value and weight of shipped goods. All regressions in Table 2 employ *ppmlhdfe* by Correia, Guimarães, and Zylkin (2020) and include importer-time, product-time and importer-product fixed effects. Export of a number of products may have decreased due to the Russian occupation, product-time fixed effects capture this development. Importer-time fixed effects account for average

effect of redirection of trade flows from and to specific partners across all products and importer-product indicators capture closeness of trade connections by partner country and product. Additionally, since the imposition of higher tariffs was announced already in 2014 and embargo was imposed on the EU member states and their partners in 2014 and extension for Ukraine was announced in 2015, I separately analyze the effects of embargo and tariffs in two sub-periods: 2014–2015 and 2016–2019.

Columns (1) and (2) in Table 2 demonstrate that the imposition of Russian embargo in 2016 had a negative effect on trade in both value (trade was almost 100% lower, the coefficient is interpreted as follows: (exp(-6,139)-1)*100 = 99,8% reduction) and weight (ca. 87% lower).[19] Similarly, the increase in tariffs caused a reduction of trade compared to unaffected products (baseline), but the magnitude of the effect was lower. Export to Russia decreased already in 2014–2015 compared to unaffected products, before the restrictions were actually imposed. Results in columns (3) and (4) suggest that export of products subject to embargo to the Eurasian Economic Union (EEU) increased in terms of weight in 2014–2015, before the restrictions entered into force, while the coefficient for value is not significant. This effect vanished in 2016, when transit restrictions were imposed and is not robust to controlling for similar products. In terms of weight, export of goods targeted by increased tariffs to the EEU decreased in 2014-2015 and further in 2016–2019. Therefore, I find no evidence for evasion via the EEU after the imposed restrictions entered into force in 2016.

An alternative to direct rerouting of trade flows is misclassification of goods: Products under embargo or tariff can be wrongly declared as similar goods, for example, as other 6-digit products from the same 4-digit HS category (Javorcik and Narciso, 2008). I report the result for the corresponding check in the columns (5) and (6) of Table 2: Export of goods under embargo or tariff and similar to them to Russian Federation did not increase in 2014–2015 and decreased in 2016–2019 for both value and weight, while for the EEU the corresponding export was lower in weight in 2016–2019. The coefficients for effects

[19]Trade in embargoed goods didn't decrease by 100%, as restrictions were sometimes assigned at a more granular level than the 6-digit HS product considered here.

of embargo and tariff on exports to Russia and the EEU remain stable when controls for similar goods are included. In Appendix B, I provide the results for an alternative method of identification of product misclassification by comparing the values of trade flows reported, by exporter and importer respectively, see Table 8. This method also does not deliver clear evidence in favor of product misclassification: Only in 2014–2015 Russia reported importing less of goods targeted by increased tariffs since 2016 than Ukraine reported exporting, an indicator of misclassification.

Finally, the coefficients for tariffs and non-tariff barriers are insignificant in all specifications, possibly due to the inclusion of importer-product fixed effects. The coefficients for trade defence instruments are highly statistically significant and enter with a negative sign, as expected.

4.2 Product heterogeneity

Next, I check whether the effects of Russian tariffs and embargo imposed on Ukraine were different by product group. First, I include an interaction term for differentiated goods, following the conservative definition of product classification in Rauch (1999).[20] 'Embargo' and 'Tariff' take value of 1 from the year 2014 when Russian occupation started, since the results from Table 2 demonstrate that export patterns started changing already in 2014–15. The results are again reported separately for value and weight, all coefficients should be interpreted individually. For interpretation of the results, it is important to keep in mind that differentiated products were targeted by embargo in very rare cases (only 26 products among 243 products targeted by embargo were differentiated), while the majority of products subject to tariff were differentiated (465 out of 669). Consumer goods constitute the majority of both embargoed goods (225 out of 243) and products targeted by tariffs (385 out of 669).

The results in Table 3 suggest that export of differentiated embargoed goods to Russia

[20]Rauch (1999) divides products into non-differentiated with prices set internationally and differentiated. He suggests two classifications: liberal assigns more products to the group of non-differentiated than conservative. J. Rauch made Stata-code available via his website `https://econweb.ucsd.edu/~jrauch/rauch_classification.html` (accessed on October 14, 2024).

Table 3: Export of products under RUS restrictions to RUS and EEU by group

	Change since 2014		Differentiated		Intermediate/Capital	
	Value	Weight	Value	Weight	Value	Weight
Log applied tariff	-0.0457	-0.162	-0.0451	-0.162	-0.0424	-0.159
	(0.0747)	(0.0922)	(0.0741)	(0.0921)	(0.0736)	(0.0916)
Non-tariff barriers	0.0175	0.0412	-0.00671	0.0486	0.0249	0.0792
	(0.231)	(0.205)	(0.233)	(0.205)	(0.231)	(0.204)
Trade defence instruments	-4.119**	-3.661***	-4.121**	-3.662***	-4.147**	-3.798***
	(1.288)	(0.680)	(1.285)	(0.680)	(1.293)	(0.670)
Embargo × RUS	-2.036***	-0.944**	-2.267***	-0.950**	-2.468***	-3.352***
	(0.215)	(0.289)	(0.226)	(0.289)	(0.324)	(0.235)
Embargo × RUS × Diff.prod.			3.265***	0.973**		
			(0.334)	(0.344)		
Embargo × RUS × Intermediate					1.528***	2.652***
					(0.457)	(0.400)
Tariff × RUS	-0.683***	-0.612**	-1.345***	-0.527**	-1.095***	-2.304***
	(0.0873)	(0.196)	(0.108)	(0.204)	(0.105)	(0.303)
Tariff × RUS × Diff.prod.			1.022***	-0.439**		
			(0.133)	(0.140)		
Tariff × RUS × Intermediate					0.688***	2.049***
					(0.112)	(0.211)
Tariff × RUS × Capital					1.141***	2.401***
					(0.204)	(0.343)
Embargo × EEU	-0.0526	-0.0931	-0.205	-0.148	-0.362	-0.780**
	(0.286)	(0.141)	(0.288)	(0.146)	(0.411)	(0.243)
Embargo × EEU × Diff.prod.			2.197***	1.500**		
			(0.453)	(0.462)		
Embargo × EEU × Intermediate					1.415*	0.572
					(0.642)	(0.399)
Tariff × EEU	-0.140	-1.292***	-0.312*	-1.400***	0.0416	-0.755*
	(0.0871)	(0.269)	(0.131)	(0.272)	(0.114)	(0.334)
Tariff × EEU × Diff.prod.			0.378**	0.555		
			(0.135)	(0.315)		
Tariff × EEU × Intermediate					-0.605***	-0.920*
					(0.148)	(0.398)
Tariff × EEU × Capital					0.145	0.709*
					(0.151)	(0.311)
Pseudo R-sq.	0.950	0.971	0.950	0.971	0.950	0.971
Obs.	1405560	1380495	1405560	1380495	1405560	1380495

The table presents *ppmlhdfe* estimates of effects of Russian trade restrictions on Ukrainian exports. Differentiated vs non-differentiated goods according to Rauch (1999), assignment to consumption, intermediate and capital goods follows BEC classification from the UN. All regressions controlling for importer-time, product-time and importer-product fixed effects. Errors clustered at importer level. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

and the EEU was higher than the baseline since 2014, although their number is very low. At the same time, export of differentiated goods targeted by tariffs was higher that the baseline in value both to Russia and the EEU, but didn't increase in weight.

Additionally, I use the Broad Economic Categories (BEC) classification from the United Nations, which divides products into three categories: consumption, intermediate and capital goods.[21] The group of consumption goods is the baseline; there were no capital goods among products under embargo. The results in the last two columns of Table 3 suggest that export of intermediate and capital goods targeted by embargo and tariffs to the Russian Federation was higher than the baseline. Simultaneously, export of embargoed intermediate goods to the EEU was above the baseline, while export of intermediate goods targeted by tariffs was lower. Thus, the impact of trade restrictions on Ukrainian export to Russia was particularly detrimental for non-differentiated and consumption goods supporting the connection between trade policy measures and Russian objective to attain agricultural self-sufficiency as mentioned in Götz et al. (2022).

5 New export destinations

To identify the new destinations of Ukrainian exports, I start by exploring the role of distance, a basic building block of the gravity equation of trade. Following the logic of the gravity model, distance is expected to have a negative impact on trade. I check whether distance played a role in redirection of Ukrainian exports due to Russian restrictive measures, the regression results are reported in Table 4. The results in the first column show that after the imposition of punitive measures goods subjected to increased Russian tariffs were redirected to countries located further away from Ukraine, not in line with the expected impact of gravity forces. This finding is driven by non-differentiated goods following Rauch (1999) or consumption goods according to the BEC classification, these are the two categories of products that suffered from Russian restrictive measures as Table 3 demonstrates. For embargoed goods, the effects of distance are not significant.

Next I identify some of the new destinations. An obvious choice for Ukraine after the

[21] Concordance table is from WITS, link: `https://wits.worldbank.org/product_concordance.html` (accessed on August 6, 2024).

Table 4: Export of products under RUS restrictions and distance

	Distance		Differentiated		Intermediate/Capital	
	Value	Weight	Value	Weight	Value	Weight
Log applied tariff	-0.0857	-0.191*	-0.0879	-0.191*	-0.0878	-0.190*
	(0.0719)	(0.0899)	(0.0684)	(0.0898)	(0.0687)	(0.0890)
Non-tariff barriers	-0.0557	0.0261	-0.0627	0.0243	-0.0623	0.0196
	(0.200)	(0.165)	(0.199)	(0.164)	(0.198)	(0.165)
Trade defence instruments	-3.914**	-3.642***	-3.917**	-3.646***	-3.931**	-3.605***
	(1.272)	(0.621)	(1.266)	(0.618)	(1.273)	(0.684)
Embargo × Distance	0.247	-0.261	0.225	-0.289	0.219	0.219
	(0.154)	(0.263)	(0.138)	(0.266)	(0.190)	(0.215)
Embargo × Diff.prod. × Distance			0.129	1.033		
			(0.505)	(0.624)		
Embargo × Intermediate × Distance					0.0271	-0.888
					(0.260)	(0.508)
Tariff × Distance	0.557***	0.555*	0.681***	0.569*	0.293*	0.405*
	(0.143)	(0.262)	(0.163)	(0.269)	(0.139)	(0.163)
Tariff × Diff.prod. × Distance			-0.547***	-0.357		
			(0.138)	(0.258)		
Tariff × Intermediate × Distance					0.387	0.177
					(0.224)	(0.280)
Tariff × Capital × Distance					-0.196	0.0588
					(0.166)	(0.370)
Pseudo R-sq.	0.950	0.971	0.950	0.971	0.950	0.971
Obs.	1405560	1380495	1405560	1380495	1405560	1380495

The table presents *ppmlhdfe* estimates of effects of Russian trade restrictions on Ukrainian exports. All regressions controlling for importer-time, product-time and importer-product fixed effects. Errors clustered at importer level. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

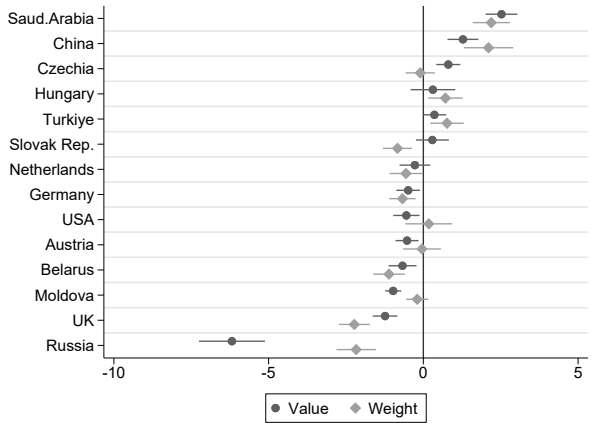
imposition of punitive measures by Russia would be to redirect export to the Western neighbors, such as Poland, Slovakia, Hungary, Romania and Moldova. The latter is too small economically to absorb the export to Russia, while the rest have been members of the EU since 2004/2007. The entry into the EU markets is well know to be difficult, particularly for the agricultural goods. This situation is exacerbated by the fact that agricultural goods were additionally targeted by Russian embargo imposed on the EU member states.

I add to the regressions interaction terms for the restricted goods and top 25 importers of Ukrainian products in 2021, each of them individually accounted for at least 1% of total Ukrainian export.[22] Significant coefficients for interaction terms are reported in Figure 4

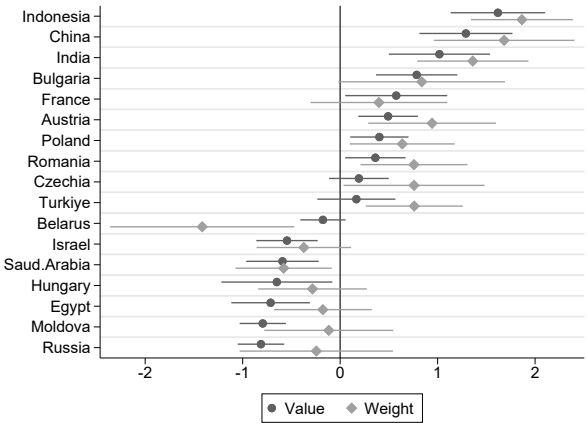
[22]These are China, Poland, Turkiye, Russia, Italy, Germany, India, Netherlands, Egypt, Spain, Hungary, USA, Romania, Belarus, Czech Republic, UK, Slovak Republic, Austria, France, Moldova, Bulgaria, Saudi Arabia, Indonesia, Israel and Iraq.

Figure 4: Total value and quantity exported

(a) Embargo



(b) Tariff



Regression results, ppmlhdfe estimates of effects of Russian trade restrictions on Ukrainian exports, own presentation using Jann (2014).

and denote cases when pattern of imports of Ukrainian products targeted by embargo or increased tariffs deviates from the average captured by country-time fixed effects. For example, coefficients for China are positive for both embargo and tariff, meaning that controlling for country-time, product-time and country-pair fixed effects Chinese imports of Ukrainian products targeted by Russian restrictive measures increased since 2014. Thus, embargoed products appear to be redirected to China, Turkiye and Saudi Arabia (Panel a of Figure 4), while products targeted by increased tariffs were redirected to multiple destinations, with particularly large coefficients for China and Indonesia (Panel b of Figure 4).

6 Industry-level effects

Finally, I check whether Russian restrictive trade measures had a significant influence on Ukrainian economy beyond the trade effects. In this section, I study their impact on industry-level employment, number of enterprises and turnover; industries are defined at 4-digit NACE rev. 2 classification.

The question of the impact of trade on employment received broad attention in economic

literature with the rapid economic development of China in the 1990s–early 2000s and its accession to the WTO. The paper by Acemoglu, Autor, Dorn, Hanson, and Price (2016) is particularly relevant in this respect, the authors study impact of increasing import from China on U.S. employment using stacked first differences regressions. For the case of Russian restrictive measures imposed on Ukraine this empirical strategy doesn't appear to be optimal, since trade restrictions were imposed on a fixed date unlike the gradual increase of imports from China. Still, my definition of the measure for exposure and general empirical setup are similar to those in Acemoglu et al. (2016).

I define exposure to Russian trade policy as the share of export to Russian market in total export of industry k in 2012:

$$\text{Exposure}_k = \frac{(\text{Export of products under embargo/tariff to RUS in 2012})_k}{\text{Total export}_k} \tag{2}$$

In 2013, Russian Federation imposed on Ukraine a number of punitive trade measures that most probably distorted trade patterns (see Section 2 for an overview) and since 2014, it occupied a number of Ukrainian regions, thus I choose the year 2012 to define exposure to the Russian market (in value and in weight) before the introduction of restrictive measures in 2016.

Table 5: Summary statistics

	Mean	St.dev.	Min	Max
Exposure: Embargo, value	0.68	6.52	0	94.77
Exposure: Tariff, value	2.23	8.88	0	76.86
Exposure: Embargo, weight	0.66	6.87	0	98.28
Exposure: Tariff, weight	2.36	9.47	0	81.55
Observations	596			

Trade data from BACI by Gaulier and Zignago (2010), own presentation.

Table 5 provides the descriptive statistics for the measure of exposure of 596 4-digit NACE industries to the Russian market in 2012. For the majority of observations exposure is equal to zero, i.e. there are no exports to the Russian market or the good is non-tradable.

On average, industry-level exposure to embargo is at ca. 0.7% and exposure to tariff at ca. 2.3%, this is the share of export to Russia in total export of the corresponding industry in 2012.

I estimate the following equation:

$$\ln Y_{kt} = \text{Post 2014} \times \text{Exposure: Embargo} + \text{Post 2016} \times \text{Exposure: Embargo} + \text{Post 2014} \times \text{Exposure: Tariff} + \text{Post 2016} \times \text{Exposure: Tariff} + \alpha_k + \beta_t, \quad (3)$$

where Y_{kt} is employment, number of enterprises or turnover in different specifications. In all estimations, I control for industry and time fixed effects, the latter capture average effect of Russian occupation since 2014. Following Acemoglu et al. (2016), I cluster standard errors by 2-digit industry to capture broad industry dynamics. The results for the connection between exposure to the Russian market and employment, number of enterprises and turnover are reported in Table 6.

Table 6: Domestic production effects of Russian trade policy

	Exposure: Value			Exposure: Weight		
	Employment	Enterprises	Turnover	Employment	Enterprises	Turnover
Post 2014 × Exp:Emb	-0.00365**	0.000172	-0.00341**	-0.00422***	-0.000664	-0.00385***
	(0.00113)	(0.00145)	(0.00117)	(0.000467)	(0.000558)	(0.000534)
Post 2016 × Exp:Emb	-0.00353**	-0.000936	0.000289	-0.00388***	-0.00185$^+$	-0.0000937
	(0.00110)	(0.00196)	(0.00107)	(0.000533)	(0.000931)	(0.000694)
Post 2014 × Exp:Tar	0.00205	-0.0000485	0.00517	0.00199	-0.000285	0.00472
	(0.00303)	(0.00177)	(0.00404)	(0.00269)	(0.00165)	(0.00357)
Post 2016 × Exp:Tar	-0.000139	0.0000191	0.00174	0.000600	0.000479	0.00232
	(0.00309)	(0.00214)	(0.00430)	(0.00276)	(0.00209)	(0.00383)
Adjusted R-sq.	0.957	0.981	0.945	0.957	0.981	0.945
Adj. within R-sq.	0.000463	-0.000615	0.000420	0.000751	-0.000208	0.000463
Obs.	5421	5934	5416	5421	5934	5416

The table presents *reghdfe* estimates of effects of Russian trade restrictions on Ukrainian domestic production. All regressions controlling for ISIC-industry and year fixed effects. Errors clustered at 2-digit industry. Standard errors in parentheses. $+$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

I find that exposure to embargo in value or weight had negative effects on employment in all time periods and on turnover in 2014–2015. Th effects for exposure to tariffs are insignificant for all industry-level variables. Additionally, I cannot confirm that trade policy

had a significant impact on the number of enterprises. The findings should be interpreted as follows: a 1% increase in exposure to Russian market translates into 0.37% lower industry-level employment in 2014–2015 and 0.35% lower employment in 2016–2019.

Table 7: Domestic production effects of Russian trade policy, high vs low exposure

	Exposure: Value			Exposure: Weight		
	Employment	Enterprises	Turnover	Employment	Enterprises	Turnover
Post 2014 × Embargo:LE	0.0962	0.219*	0.157	0.0692	0.209*	0.128
	(0.0957)	(0.0839)	(0.102)	(0.0997)	(0.0862)	(0.101)
Post 2014 × Embargo:HE	-0.383***	-0.0834**	-0.365***	-0.383***	-0.0834**	-0.365***
	(0.0281)	(0.0277)	(0.0394)	(0.0281)	(0.0277)	(0.0394)
Post 2016 × Embargo:LE	0.152	0.252**	0.121	0.129	0.240**	0.110
	(0.0950)	(0.0836)	(0.0970)	(0.0981)	(0.0879)	(0.0895)
Post 2016 × Embargo:HE	-0.358***	-0.281***	0.107*	-0.358***	-0.281***	0.107*
	(0.0330)	(0.0290)	(0.0472)	(0.0330)	(0.0290)	(0.0472)
Post 2014 × Tariff:LE	-0.0896	-0.0519	-0.00527	-0.0711	-0.0449	0.0160
	(0.0586)	(0.0439)	(0.0731)	(0.0580)	(0.0440)	(0.0696)
Post 2014 × Tariff:HE	0.226	0.0689	0.321	0.119	0.0319	0.193
	(0.279)	(0.123)	(0.383)	(0.283)	(0.129)	(0.373)
Post 2016 × Tariff:LE	-0.132*	-0.0803	-0.0182	-0.123+	-0.0735	-0.0148
	(0.0652)	(0.0540)	(0.0789)	(0.0633)	(0.0533)	(0.0751)
Post 2016 × Tariff:HE	0.190	0.114	0.145	0.149	0.0870	0.131
	(0.301)	(0.158)	(0.407)	(0.304)	(0.172)	(0.391)
Adjusted R-sq.	0.957	0.981	0.945	0.957	0.981	0.945
Adj. within R-sq.	0.00269	0.00576	-0.0000208	0.00198	0.00536	-0.000399
Obs.	5421	5934	5416	5421	5934	5416

The table presents *reghdfe* estimates of effects of Russian trade restrictions on Ukrainian domestic production. All regressions controlling for ISIC-industry and year fixed effects. Standard errors in parentheses. + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In the last step, I introduce separate indicators for high (90^{th} percentile and above) exposure to Russian market versus low, the results are reported in Table 7. Here exposure is not a continuous measure as in Table 6, but an indicator, so the interpretation is similar to the one in gravity estimations: Industries with high exposure on average lost $(e^{-0.383} - 1) * 100 = 46.7\%$ of employment in 2014–2015. The negative effect of embargo on industry-level variables appears to be driven by industries with high exposure. Interestingly, employment decreased in industries with low exposure targeted by tariffs. For enterprises, two different trends can be observed depending on exposure to Russian market: industries with low exposure experienced increases in number of enterprises, while for industries with high exposure it decreased.

7 Conclusion

In this paper, I analyze the effects of Russian punitive measures (embargo and increased tariffs) imposed on January 1, 2016 on Ukrainian exports. This sanction episode merits particular attention, since prior to the 2014 invasion Ukraine was dependent on the Russian market in a number of exported products.

First, I show that the trade measures imposed by Russia were successful in restricting Ukraine's access to its market. I find no evidence for evasion via redirection of trade flows to Russia's partners in the Eurasian Economic Union or misclassification of products. Instead, I show that exports were redirected to other countries. Particularly non-differentiated and consumption goods targeted by increased tariffs were likely to be redirected far away from Ukraine, while export of differentiated goods and intermediate/capital goods to Russia even increased.

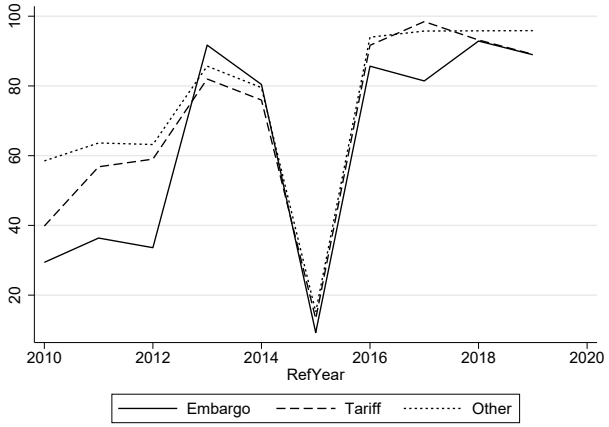
Finally, I find evidence for statistically significant decreases in employment, number of enterprises or turnover in industries particularly dependent on Russian market and targeted by Russian embargo. The industry-level impact of tariffs appears to be limited.

A Data

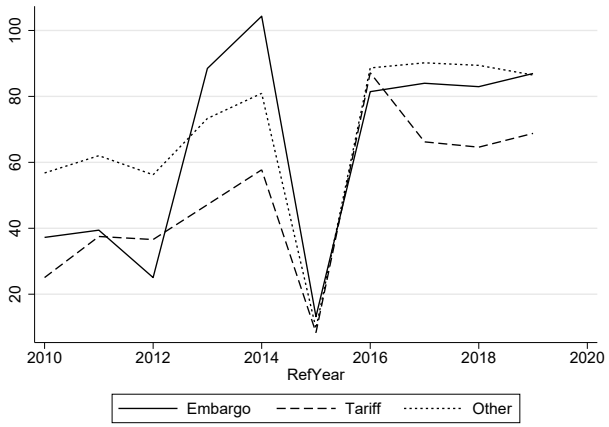
This paper employs yearly trade data, in contrast to Crozet and Hinz (2020) and Miromanova (2023), who use monthly trade data available via UN Comtrade. I decided against using monthly trade data due to their worse coverage compared to yearly data. First, as Figure 5 demonstrates, observations are missing for March-December 2015. Additionally, monthly data in 2010–2012 cover a lower share of reported yearly trade flows: ca. 40-60% of observations for all product groups compared to 80% in 2016–2019. Finally, a larger share of trade value flows is reported at monthly level compared to weight.

Figure 5: Share of yearly trade flows covered by monthly data

(a) Value, mln. 2010 constant USD



(b) Weight, mln. tons



Data sources: Monthly trade data from UN Comtrade (as reported by importers), yearly trade from BACI, own presentation.

B Regressions

Table 8 summarizes the results of an additional check for product misclassification. The dependent variable is trade gap, defined as $\ln(import) - \ln(export)$. If the coefficient is negative, reported import is higher than export, this is interpreted as evidence of evasion.

As Table 8 demonstrates, Russian Federation reported importing more embargoed and

similar goods from Ukraine in 2014–2019 than Ukraine reported exporting to them. One explanation for this discrepancy is that export from occupied territories of Donetsk and Luhansk regions was not included in Ukrainian trade statistics and reported as Ukrainian export in Russian statistics. Russia was the main trade partner for these territories, therefore similar effect is not observed for trade with the EEU. Overall, limited evidence for misclassification is detected only in 2014–2015 for goods targeted by increased tariffs since 2016.

Table 8: Export to Russia and EEU, mirror trade data

	Value	Weight	Quantity
Log applied tariff	-0.000224	-0.00230	0.00531
	(0.0167)	(0.0182)	(0.0215)
Non-tariff barriers	0.125*	0.118*	0.178**
	(0.0550)	(0.0462)	(0.0546)
Embargo × 2014–15 × RUS	0.112*	0.139	0.117
	(0.0546)	(0.0781)	(0.0801)
Embargo × 2016–19 × RUS	1.553***	2.001***	1.974***
	(0.213)	(0.229)	(0.240)
Tariff × 2014–15 × RUS	-0.0978**	-0.138***	-0.161***
	(0.0312)	(0.0299)	(0.0376)
Tariff × 2016–19 × RUS	-0.0206	-0.0246	-0.0104
	(0.0338)	(0.0336)	(0.0365)
Similar × 2014–15 × RUS	0.132*	0.245***	0.177**
	(0.0654)	(0.0620)	(0.0661)
Similar × 2016–19 × RUS	0.390***	0.333***	0.466***
	(0.0956)	(0.0844)	(0.0912)
Embargo × 2014–15 × EEU	-0.0827	-0.280*	-0.299*
	(0.0832)	(0.124)	(0.129)
Embargo × 2016–19 × EEU	-0.0539	-0.148	-0.152
	(0.0780)	(0.0955)	(0.107)
Tariff × 2014–15 × EEU	-0.0238	-0.0287	-0.0302
	(0.0408)	(0.0407)	(0.0503)
Tariff × 2016–19 × EEU	0.0327	0.0216	0.0346
	(0.0638)	(0.0451)	(0.0533)
Similar × 2014–15 × EEU	0.0201	-0.0687	-0.0184
	(0.126)	(0.116)	(0.138)
Similar × 2016–19 × EEU	0.00884	-0.131	-0.0829
	(0.129)	(0.105)	(0.109)
Adjusted R-sq.	0.362	0.352	0.374
Adj. within R-sq.	0.000101	0.000189	0.000246
Obs.	240966	232225	211891

The table presents *reghdfe* estimates of effects of Russian trade restrictions on Ukrainian export. All regressions controlling for importer-time, product-time and importer-product fixed effects. Errors clustered at product level. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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