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## **EU's Export Embargoes on Russia: Have they been effective?**

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## EU's Export Embargoes on Russia: Have They Been Effective? <sup>†</sup>

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### Abstract

This paper evaluates the effectiveness of the EU's post-2022 export embargoes on goods with potential military applications against Russia. Using HS6-level UN Comtrade data for 2019–2024, I first estimate gravity-style specifications and event-study designs that confirm a sharp and immediate contraction in direct EU exports of embargoed goods to Russia. I then propose a product-level identification strategy that links potential transit country's imports of an HS6 product from the EU to its exports of the same product to Russia in the post-2022 period. The results indicate that (i) EU export controls substantially reduced direct shipments, (ii) some Caspian littoral countries and major non-sanctioning suppliers—China, India, and Turkey—expanded exports of comparable goods to Russia, and (iii) there is nuanced but limited evidence of roundabout trade, whereby sanctioned goods were exported from the EU to these Russia-friendly countries and then re-exported to Russia. These findings imply that the effectiveness of export embargoes hinges not only on the scope of the listed items but also on enforcement that targets high-risk transit routes and substitute suppliers.

**Key words:** EU embargo, roundabout trade, trade diversion

**JEL Classification:** F13, F14

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# 1. INTRODUCTION

“Putin must pay ‘a high price for his brutal aggression.’”

– Ursula von der Leyen, President of the European Commission, May 2022

“This hard-hitting package will further deny Russia access to key technologies. It will strip Russia of further energy revenues. And tackle Putin’s shadow fleet and shadow banking network abroad.”

– Ursula von der Leyen, President of the European Commission, June 2024

Russia launched its full-scale invasion of Ukraine on February 24, 2022. Immediately after the invasion, Western countries announced major sanctions packages, including export bans of military and dual-use items, the freezing of Russian central bank assets held in Western countries, the exclusion of Russian banks from SWIFT access, import bans of Russian crude oil, and travel bans. Western countries believed that the economic sanctions on an unprecedented scale against Russia would stifle Russia’s war efforts. However, there is no sign that Russia's war efforts are waning. Royal United Services Institute, a think-tank based in the UK, examined Russian weapons recovered in Ukraine and documented large numbers of foreign-made components, especially electronics (RUSI (2022)). International Institute for Strategic Studies, another think-tank based in the UK, reported a continued reliance on foreign commercial components in Russian (and Iranian / North Korean) missiles and drones. It says that these three countries take advantage of the complexity of global and distributor-centric supply chains by making extensive use of third-party intermediaries to access necessary components and evade relevant sanctions.

This paper complements the aforementioned forensic studies with comprehensive statistical evidence based on trade data on Western components imported into Russia via third countries.

The main findings of this study are as follows:

1. Exports from the EU countries to Russia of sanctioned goods precipitously dropped after the sanctions, whereas its exports to some Russia-friendly countries, such as Caspian Sea countries and Turkey, increased.
2. Exports of the EU-sanctioned goods from Russia-friendly countries to Russia substantially increased after the EU sanctions.
3. The analyses provide nuanced but limited evidence of roundabout trade, whereby sanctioned goods were exported to Russia-friendly countries and then re-exported to Russia.

4. The effects of the EU sanctions against Russia were partly undermined by trade diversion and, to a lesser extent, by roundabout trade.

## **2. WESTERN COUNTRIES' SANCTIONS ON RUSSIA**

### ***2.1. Overview of sanctions by the West***

The EU enacted the first package of sanctions against Russia on 22-23 February 2022, shortly before Russia's invasion of Ukraine. The package includes sanctions on State Duma members; restrictions linked to Russia's recognition of non-government-controlled areas of Donetsk/Luhansk. Shortly after the invasion, the EU announced the second package, which includes economic sanctions targeting the finance, energy, transport, and technology sectors, as well as restrictions on exports of goods and technology that could enhance Russia's defence sector. The third package announced on 2 March 2022, most notably, includes a ban on transactions with the Russian Central Bank and a SWIFT ban imposed on seven Russian banks. On 3 June 2022, the EU adopted the sixth package of sanctions against Russia, most notably a ban on imports of Russian crude oil and refined petroleum products. The subsequent packages reinforced the sanctions to achieve effective enforcement, including export embargoes intended to undermine Russia's weapons production, the subject of this study.

### ***2.2. Export embargoes of goods potentially used for weapons***

The EU's sectoral sanctions aim to curtail Russia's capability to continue the war, depriving it of critical technologies and markets and significantly weakening its industrial base. To that end, the EU banned exports of high-priority items, economically critical goods, and dual-use goods, with exceptions for humanitarian, medical, or disaster-relief purposes. High-priority items are those used for weapons, such as microelectronics, navigation equipment, and digital cameras, classified under the Harmonised System (HS) six-digit code. 50 HS six-digit code products are designated as high-priority items. Economically critical goods are those that are supposedly used for Russia's war against Ukraine. 30 HS six-digit code products are named as economically critical goods. Dual-use goods are those which can be used both for civilian purposes and military ends. Approximately one-fifth of HS 8-digit codes are designated for this category.<sup>1</sup>

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<sup>1</sup> For announcement and detailed list of sanctioned goods. See the reference below of the EU announcement.

### 3. LITERATURE

Economic sanctions have become a central instrument of foreign policy and have expanded markedly since World War II (Morgan et al., 2023). A large empirical literature evaluates their average trade and macroeconomic effects, typically finding sizable reductions in targeted trade but also substantial heterogeneity depending on enforcement capacity and the availability of alternative suppliers. A second, fast-growing strand focuses on sanctions evasion and intermediated trade, documenting how embargoed flows are rerouted via third countries, trading companies, or informal channels. Using firm-level evidence, Haidar (2017) shows that a substantial share of Iranian exports affected by sanctions was deflected to non-sanctioning destinations. For Russia-related restrictions, Tyazhelnikov and Romalis (2024) quantify evasion of Russia’s 2014 agri-food import ban via third-country transshipment, while Crozet and Hinz (2020) emphasize that heightened country risk can depress exports broadly beyond explicitly targeted product lines; Crozet et al. (2021) further highlight firm-level adjustments in response to sanctions.

The post-2022 export embargoes imposed by the EU and its partners differ from many earlier episodes in that they target dual-use and high-priority goods that are embedded in complex global supply chains and often traded through distributor-centric networks. This raises a measurement challenge: even when direct exports from sanctioning economies collapse, embargoed goods may still reach the target through roundabout trade, while non-sanctioning suppliers may expand exports of close substitutes. Establishing systematic evidence on the scale and dynamics of such indirect channels—especially after enforcement has evolved over time—remains an open empirical question.

The paper most closely related to this study is Chupilkin et al. (2025), which documents a sharp decline in direct exports from sanctioning economies to Russia after March 2022 and a concomitant rise in intermediated trade that offsets a non-trivial fraction of the direct reduction. This paper advances the literature in three ways. First, it extends the sample window to 2024, a period in which enforcement and adaptation likely changed the composition and routes of trade. Second, rather than inferring re-routing from two separate legs of trade alone, it proposes and implements a product-level identification strategy that links a potential transit country’s imports from the EU and its exports of the same HS6 product to Russia in the post-2022 period, thereby providing more direct statistical evidence of roundabout trade.

Third, it decomposes the overall undermining of EU export embargoes into (i) indirect re-routing via specific transit regions (notably Caspian littoral states) and (ii) export expansion by major non-sanctioning suppliers (China, India, and Turkey), clarifying the relative importance of “evasion” versus “supplier substitution.”

## 4. HYPOTHESIS

The central hypothesis is that EU-sanctioned goods are exported to third countries, especially Russia-friendly ones, and then rerouted to Russia. The Russian government announced a list of 32 “friendly and neutral countries” on September 21, 2023.<sup>2</sup> From this list, I focus on the countries that ranked among Russia’s top 20 import partners<sup>3</sup> in 2021, namely China, India, and Turkey, and the Caspian Sea littoral countries, because of the suspected smuggling route through the Caspian Sea. I investigate the hypothesis by examining structural shifts in the international trade patterns of sanctioned goods. Two testable predictions arise from the hypothesis. First, following Russia’s invasion of Ukraine, the exports of the sanctioned goods from the EU to Russia should substantially decrease, while its exports to Russia-friendly countries increase. Second, exports of sanctioned goods from Russia-friendly countries to Russia should markedly increase.

## 5. DATA AND EMPIRICAL FRAMEWORK

### 5.1. *Data*

The trade data used for this study are drawn from the UN Comtrade database. The annual trade data for the top 100 exporters (including Russia) and the Caspian Sea littoral states (Azerbaijan, Iran, Kazakhstan) were collected for the period 2019-2024 at the 6-digit level of the Harmonized System.

### 5.2. *Descriptive analyses*

Figure 1 shows changes in the EU’s export values of the sanctioned goods, namely, high priority items, economically critical goods, and dual-use goods, with the values in 2019 being normalized to one. In all three categories of sanctioned goods, the EU’s exports to Russia declined substantially from 2022, whereas its exports to the Caspian littoral countries increased notably from 2022. The EU’s exports to Russia-friendly countries show no marked difference before and after 2022. Figure 2 shows the change in export values of EU-sanctioned goods from

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<sup>2</sup> 32 countries are: Azerbaijan; Algeria; Armenia; Bangladesh; Bahrain; Belarus; Brazil; Venezuela; Viet Nam; Egypt; India; Indonesia; Iran; Kazakhstan; Qatar; Kyrgyzstan; China; Cuba; Malaysia; Morocco; Mongolia; United Arab Emirates; Oman; Pakistan; Saudi Arabia; Serbia; Tajikistan; Thailand; Turkmenistan; Türkiye; Uzbekistan; South Africa

<sup>3</sup> China, Germany, USA, Belarus, Korea, Rep., France, Italy, Japan, Kazakhstan, Turkey, Poland, Vietnam, United Kingdom, India, Netherlands, Ukraine, Czech Republic, Finland, Spain, Switzerland

China, India, Turkey, and Caspian Sea littoral countries, with 2019 values normalized to 1. A spike in exports from Caspian Sea littoral countries is observed, while exports from China and Turkey also increased. The notable increase in exports from the EU to Caspian Sea littoral countries, and the synchronized increase in exports from Caspian Sea littoral countries to Russia, suggest rerouting or roundabout trade in sanctioned goods.

===== Figure 1, Figure 2 =====

Whereas Figure 1 and Figure 2 demonstrate the growth of exports to Russia from the countries in question, Figure 3 shows the year-on-year change in exports to Russia by the selected countries. While the EU reduced its export value of sanctioned goods to Russia by 20.2 billion US dollars in 2022, it increased exports notably to Turkey and to the Caspian Sea countries. Figure 4 shows the year-on-year change in exports of the sanctioned goods to Russia by the EU and Russia-friendly countries. Whereas the EU's exports to Russia declined by approximately \$20 billion, the Caspian countries' exports to Russia increased substantially in 2022. China increased its exports to Russia in 2023. We observe that the EU's decline was partially offset by exports from Russia-friendly countries in 2022, but only by half. In 2023, the EU's reduction was almost completely offset by Russia-friendly countries.

===== Figure 3, Figure 4 =====

## 6. ESTIMATION ANALYSES

### 6.1. Baseline Results

#### 6.1.1. EU's exports

Following the convention in the literature, I estimate the following equation on an unbalanced panel dataset of the EU's exports of approximately 5,200 HS 6-digit goods to about 230 partners from 2019 to 2024.

$$\ln \text{Exp\_EU}_{jyp} = \beta_0 + \beta_1 \text{Russia}_j \cdot \text{SanctionedGoods}_p \cdot \text{SanctionPeriods}_y + \alpha_{jy} + \alpha_{jp} + \alpha_{yp} + \varepsilon_{jyp}, \quad (1)$$

where  $\ln \text{Exp\_EU}_{igt}$  is the EU's export to country  $j$  of product  $p$  in year  $y$ .  $\text{Russia}_j$  is a dummy variable which takes a value of 1 if the importer country  $j$  is Russia. It takes 0 otherwise.  $\text{SanctionedGoods}_p$  is a dummy variable which takes on unity for sanctioned good  $p$ . It takes 0 otherwise.  $\text{SanctionPeriods}_y$  is a dummy variable which takes on unity for the years on and after 2022. It takes 0 otherwise.  $\alpha_{jy}$ ,  $\alpha_{jp}$ , and  $\alpha_{yp}$  are country-year fixed effects, country-product fixed effects, and year-product fixed effects, respectively.  $\varepsilon_{jyp}$  is the error term that captures unobservable shocks for a given  $jyp$ . Table 1 presents the estimation results. The first column presents the estimation results for all sanctioned goods, i.e., all three categories.

Columns (2) to (4) show estimation results for each sanctioned goods category. *SanctionDummy* shows statistically significant coefficient estimates for all three categories of sanctioned goods (high priority items, economically critical goods, and dual-use goods). For example, the coefficient estimate for Sanction dummy (All) in Column (1), -1.307, indicates that the EU's export embargoes reduced the export to Russia by 73 percent.<sup>4</sup> In the case of High-priority goods in Column (4), the impact is stronger at 93 percent decrease.

===== Table 1 =====

Next, the following equation is estimated to assess whether the EU's exports of sanctioned goods to Caspian Sea countries increased markedly after the sanctions.

$$\ln Exp\_EU_{jyp} = \beta_0 + \beta_1 Caspian_j \cdot SanctionedGoods_p \cdot SanctionPeriods_y + \alpha_{jy} + \alpha_{jp} + \alpha_{yp} + \varepsilon_{jyp}, \quad (2)$$

*SanctionDummy* takes a value of 1 if an export product *p* is a sanctioned good, country *j* is Caspian Sea countries, and year *y* is on or after 2022. The estimation results are in Table 2. The estimated coefficient for the Sanction dummy (All) is statistically significant at a 10 percent significance level with a p-value of 0.07, and that for the Sanction dummy (Economically (critical) goods) is also statistically significant at a 10 percent significance level with a p-value of 0.051, suggesting some evidence of a trade diversion. The same type of equation is estimated for the EU's exports of the sanctioned goods to China. Namely, the estimation equation is:

$$\ln Exp\_EU_{jyp} = \beta_0 + \beta_1 China_j \cdot SanctionedGoods_p \cdot SanctionPeriods_y + \alpha_{jy} + \alpha_{jp} + \alpha_{yp} + \varepsilon_{jyp}, \quad (3)$$

Analogously, for India:

$$\ln Exp\_EU_{jyp} = \beta_0 + \beta_1 India_j \cdot SanctionedGoods_p \cdot SanctionPeriods_y + \alpha_{jy} + \alpha_{jp} + \alpha_{yp} + \varepsilon_{jyp}, \quad (4)$$

And for Turkey:

$$\ln Exp\_EU_{jyp} = \beta_0 + \beta_1 Turkey_j \cdot SanctionedGoods_p \cdot SanctionPeriods_y + \alpha_{jy} + \alpha_{jp} + \alpha_{yp} + \varepsilon_{jyp}, \quad (5)$$

Estimation results are in Table 3 for China, Table 4 for India, and Table 5 for Turkey. The coefficient estimates for the sanction dummies are statistically insignificant except for the High-priority goods to China. These results indicate that there is little evidence of trade diversion to these countries.<sup>5</sup>

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<sup>4</sup> The marginal effects are computed as  $(\exp(\beta_1)-1)*100$ .

<sup>5</sup> It should be noted that the coefficients  $\beta_1$  are estimated by comparing a change in the sanctioned goods exports from the EU to Russia-friendly countries with a change in its exports to other trading partners. This comparison

===== Table 2, Table 3, Table 4, Table 5 =====

### 6.1.2. Russia-friendly countries' exports to Russia

The same type of equation is estimated for Russia-friendly countries' exports to Russia. First, Caspian Sea countries' exports.

$$\ln Exp\_Caspian_{jyp} = \beta_0 + \beta_1 Russia_j \cdot SanctionedGoods_p \cdot SanctionPeriods_y + \alpha_{jy} + \alpha_{jp} + \alpha_{yp} + \varepsilon_{jyp}, \quad (6)$$

Table 6 reports the estimation results of Caspian Sea countries. All the sanction dummy variables show coefficient estimates around 0.5, with high statistical significance. The coefficient estimate of 0.487 in Column (1) indicates that the EU sanctions increased the Caspian countries' exports to Russia by 63 percent. Table 7, Table 8, and Table 9 are for exports by China, India, and Turkey, respectively. Almost all coefficient estimates for the sanction dummies are highly statistically significant and positive, with a few insignificant results, indicating that the EU's sanctions increased exports from these Russia-friendly countries to Russia.

===== Table 6, Table 7, Table 8, Table 9 =====

The above findings imply the presence of roundabout trade through Caspian Sea countries and trade diversion of Russia's import partners from the EU to China, India, and Turkey.

## 6.2. Event study analyses

I estimate an event study for the same trade flow as the last sub-section. The estimation equation is:

$$E_{jyp} = \exp\left(\beta_0 + \sum_{k \neq -1} \beta_k RU_j \cdot SantionGoods_p \cdot \mathbf{1}(y = 2022 + k) + \alpha_{jy} + \alpha_{jp} + \alpha_{yp}\right) \cdot \varepsilon_{jyp}, \quad (7)$$

$RU_i$  is a dummy variable that takes the value 1 for Russia and 0 otherwise.  $SantionGoods_p$  is a dummy variable that takes 1 for the sanctioned good  $p$ , and zero otherwise. To define the pre- and post-invasion periods, I use a time dummy variable for  $k$  periods relative to 2022.

First, the equation is estimated for the EU's exports. Figure 5 presents the event study plot of the estimated coefficients  $\beta_k$  for each sanctioned good. The period 0 corresponds to the year 2022. The impact of the sanctions appears from 2022, as the EU sanctions came into effect

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group includes the EU's exports to Russia following the Russian invasion. As a result, the inclusion of Russia in the sample may lead to overestimating a structural increase in the sanctioned goods exports from the EU to Russia-friendly countries. To address this issue, I estimate the equations excluding exports to Russia. Estimation results are omitted due to page constraints and are available upon request.

shortly after the invasion in February 2022. Prior to 2022, there is no statistically significant deviation in export values from zero. In contrast, from 2022 onward, the coefficient estimates are statistically significant and negative. This finding is not itself surprising. The focus of this study is whether this reduction is offset by increases in trade with Russia-friendly countries, including some rerouting or roundabout trade. Figures 6, 7, and 8 present event study plots of the EU's exports of the sanctioned goods to Kazakhstan, Iran, and Azerbaijan, respectively. In the case of Kazakhstan, the coefficient estimates prior to 2021 are statistically insignificant across all categories of sanctioned goods. The coefficient estimate for the dual-use goods becomes positive in 2022, and that for the high-priority goods becomes statistically significant and positive after 2021. In the case of Iran, the coefficient estimate for the economically critical goods in 2022 becomes significant and positive, whereas all the others remain insignificant. In the case of Azerbaijan, all the coefficient estimates remain insignificant throughout the period. The case for the EU's exports of the sanctioned goods to China is in Figure 9. The coefficient estimate for the dual-use goods becomes statistically significant and positive after 2021, and that for the high-priority goods becomes positive in 2022 and 2024. Figures 10 and 11 show the event study plot for the EU's exports of the sanctioned goods to India and Turkey, respectively. Throughout the whole period, there is no statistically significant deviation in export values from zero.

===== Figure 6, Figure 7, Figure 8, Figure 9 =====

Second, the equation is estimated for the exports of sanctioned goods from Russia-friendly countries to Russia. Figure 12 shows the event study plot for Azerbaijan's exports of the sanctioned goods to Russia. The coefficient estimates for dual-use goods become statistically significant in 2022 and 2023, while those for economically critical goods and high-priority goods become positive and statistically significant in 2022. Figure 13 presents the event study plots for Kazakhstan's exports of the sanctioned goods to Russia. The coefficient estimates become significantly positive in 2022 and 2023 for dual-use goods, and in 2022 for economically critical goods. Figures 14, 15, and 16 present the event study plots for China's, India's, and Turkey's exports of the sanctioned goods to Russia, respectively. For China, the coefficients become positive and statistically significant from 2022 onward for some categories, indicating an increased supply of sanctioned goods to Russia after the invasion. For India and Turkey, the post-2022 coefficients are also generally positive, although the magnitude and statistical significance vary by product category. These results are consistent with the view that non-sanctioning suppliers partly replaced EU exporters in the Russian market.

=== Figure 10, Figure 11, Figure 12, Figure 13, Figure 14, Figure 15, Figure 16 ===

The above results suggest some, though nuanced, evidence of roundabout trade via Kazakhstan and China. The clear positive trend in exports from these countries to Russia indicates that the effects of EU sanctions were partly mitigated by increased exports from them.

### 6.3. *Alternative specification*

The conventional approach used in Sections 6.1 and 6.2, a variant of which is also used by Chupilkin et al. (2025), investigates trade flows from the sanctioning countries (the EU in this study) to potential transit countries (Russia-friendly countries in this study) and from those countries to the sanctioned country (Russia in this study), separately. In this case, we cannot follow the same HS 6-digit product from the EU to Russia-friendly countries and then to Russia. Thus, to precisely track the trade flow of each HS 6-digit product within this triangular trade structure, I propose the following estimation equation.

$$\ln Exp_{jyp} = \beta_0 + \beta_1 \ln Imp_{iyp} + \beta_2 \ln Imp_{iyp} * RoundaboutDummy + \alpha_{ijy} + \alpha_{ijp} + \alpha_{yp} + \varepsilon_{ijyp} \quad (8)$$

where  $y$ ,  $i$ ,  $j$ , and  $p$  represent the year, import partner, export partner, and product, respectively. Note that we estimate the equation by each reporter country, i.e., Caspian Sea countries, China, India, and Turkey, to see if the reporter country in question seems to have engaged in roundabout trade of the EU sanctioned goods. The covariate,  $\ln Imp_{iyp}$ , captures the association between the import values of the reporter country (e.g. China) of good  $p$  from country  $i$  to its export values of the same good  $p$ . *RoundaboutDummy* takes a value of 1 if imports are from the EU ( $i=EU$ ), exports are to Russia ( $j=Russia$ ),  $y$  is 2022 onwards, and  $p$  is a sanctioned good. Thus, the cross-term  $\ln Imp_{iyp} * RoundaboutDummy$  picks up the roundabout trade.  $\alpha$  is the fixed effects. Full fixed effects are included to correctly identify the roundabout trade. To ease the understanding of the identification strategy of the above estimation equation, a sketch of this identification strategy is shown in Figure A1, and a sketch of the data structure is shown in Figure A2 in the appendix. I estimate the equation for each Caspian Sea country, i.e., Azerbaijan, Kazakhstan, and China, India, and Turkey.<sup>6</sup> The estimation results in Table 10 (Azerbaijan) and Table 11 (Kazakhstan) show statistically significant positive coefficient estimates. Table 12, Table 13, and Table 14 presents the estimation results for China, India, and Turkey, respectively. The coefficient estimates for the roundabout dummies are mostly positive and statistically significant, indicating some signs of roundabout trade. However, the magnitudes are small. The coefficient estimates are mostly 0.02 to 0.03, which indicates that a one percent increase from the EU to the country in question

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<sup>6</sup> Turkmenistan is not included because it has not reported its trade statistics to the UN since 2000. Iran is not included in this alternative specification because, contrary to the analyses in Section 6.1. and 6.2. This analysis requires export data from Iran, which has not reported its trade statistics to the UN for 2023 and 2024.

increases its exports to Russia by 0.02 percent. The impact is also small or even smaller in terms of levels, because import values of each of these countries from the EU are mostly larger than the export values to Russia.

===== Table 10, Table 11, Table 12, Table 13, Table 14 =====

## **7. CONCLUSION**

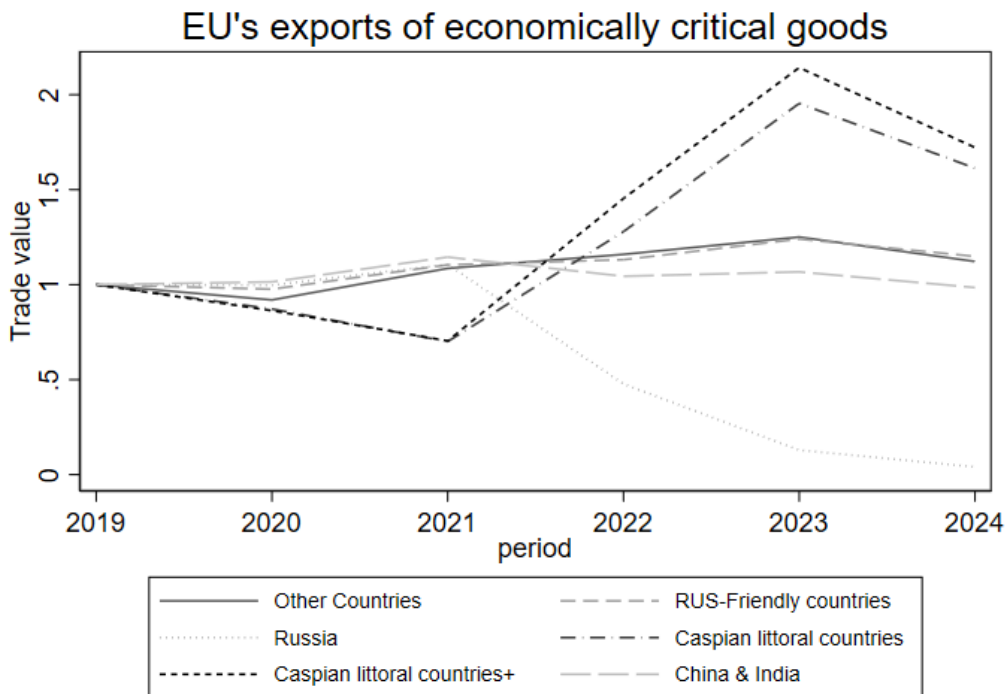
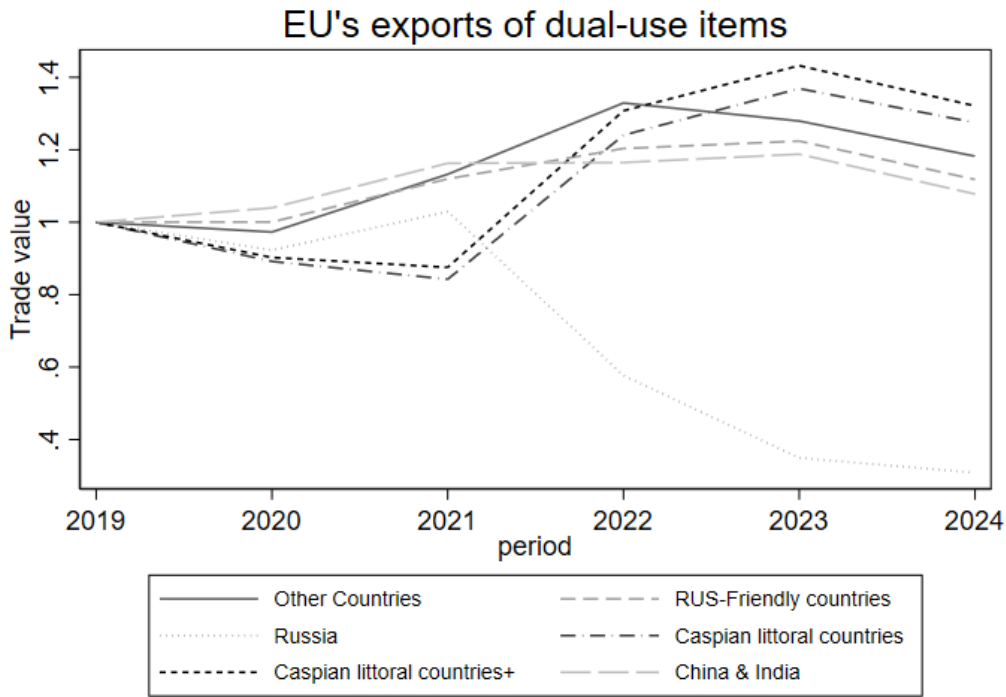
This study examined whether the EU's post-invasion export embargoes curtailed Russia's access to goods with potential military applications. Gravity-style estimations and event studies show that direct EU exports of embargoed goods to Russia fell sharply from 2022 onward, whereas exports of these goods from Caspian littoral countries, China, India and Turkey increased. The analyses suggest that these changes largely reflect trade diversion. These analyses suggest that these changes largely reflect trade diversion, as Russia-friendly countries increasingly served as alternative suppliers of embargoed goods to Russia. The study also shows nuanced but limited evidence of roundabout trade, in which the sanctioned goods are exported to these Russia-friendly countries from the EU and then re-exported to Russia. These findings suggest that the effectiveness of export embargoes depends critically on enforcement capacity and the monitoring of high-risk transit routes and substitute suppliers, rather than on listing decisions alone. Several limitations are important. HS6 trade statistics cannot fully distinguish re-exports from domestically produced goods, and measurement error may arise from reporting differences across partners. Future work could combine trade statistics with firm-level transaction data, customs microdata, or component-level forensic evidence to better trace origin, intermediaries, and the pricing/quantity margins of sanction circumvention.

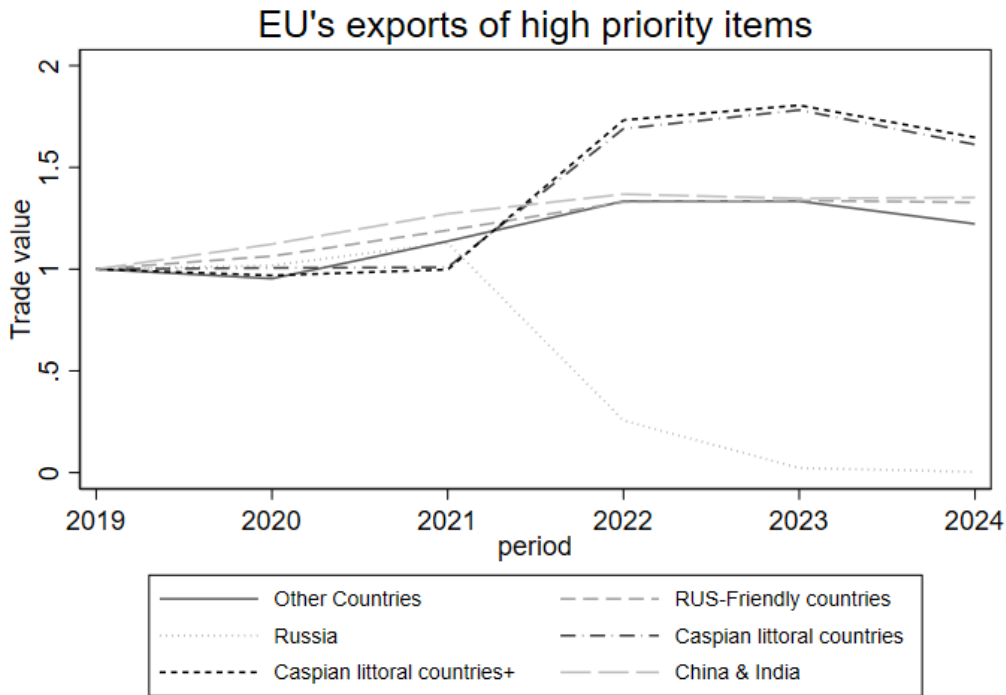
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## Figures and Tables

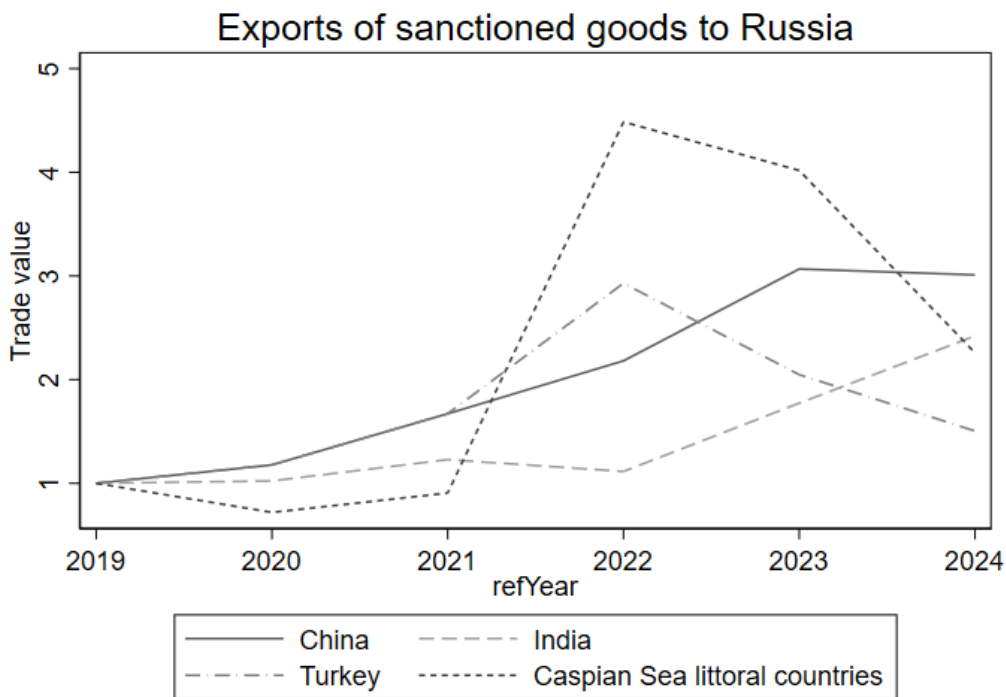
Figure 1: EU's exports of the sanctioned goods to Russia and Russia-friendly countries

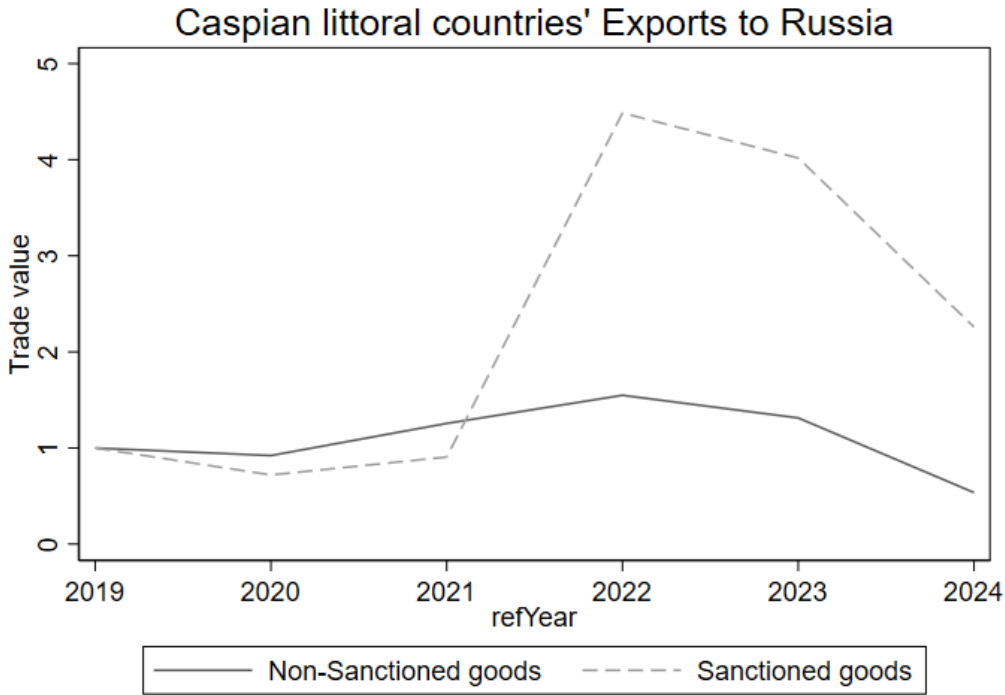




Source: Author's computation from the trade data

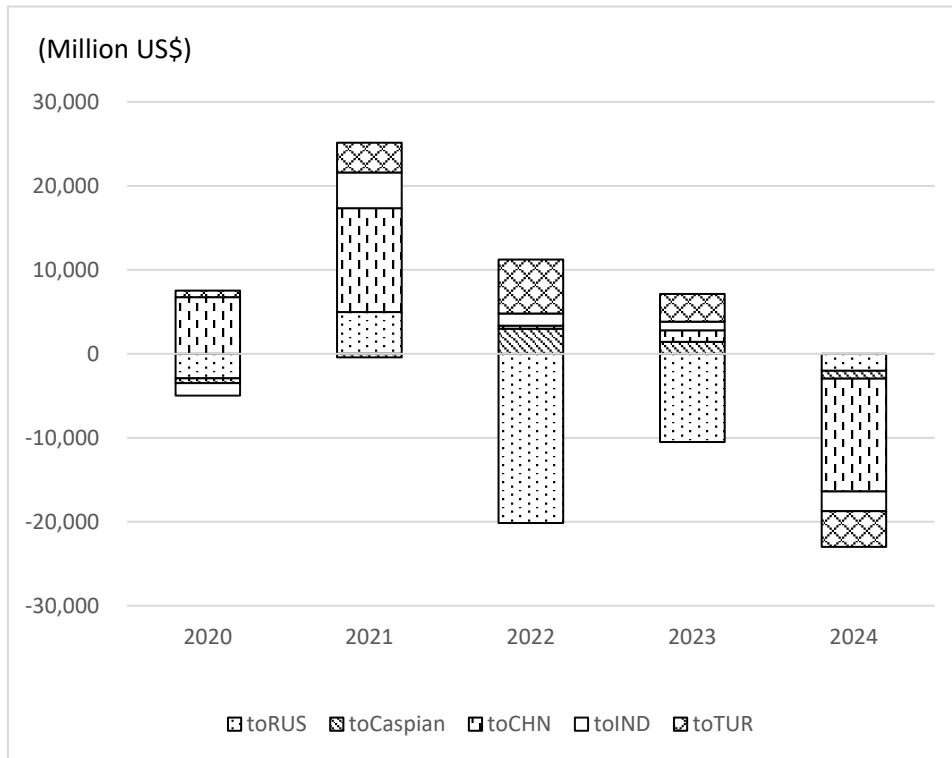
**Figure 2: Russia-friendly countries' exports of the sanctioned goods to Russia**





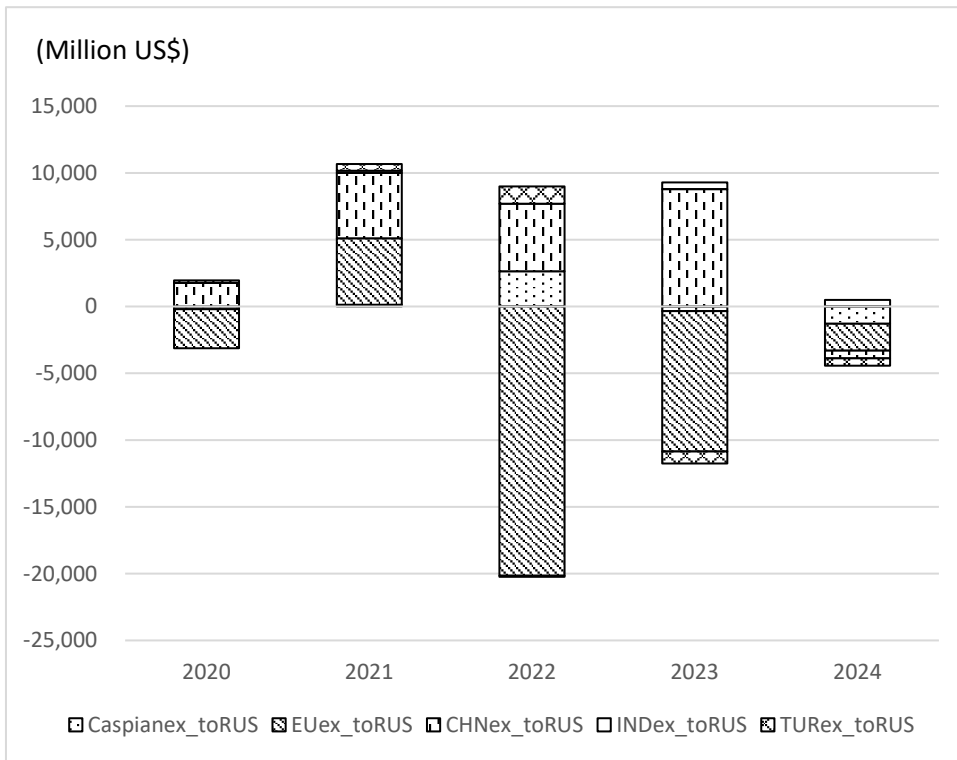
Source: Author's computation from the trade data

**Figure 3 : Year-on-year change in the EU's exports to Russia and Russia-friendly countries**



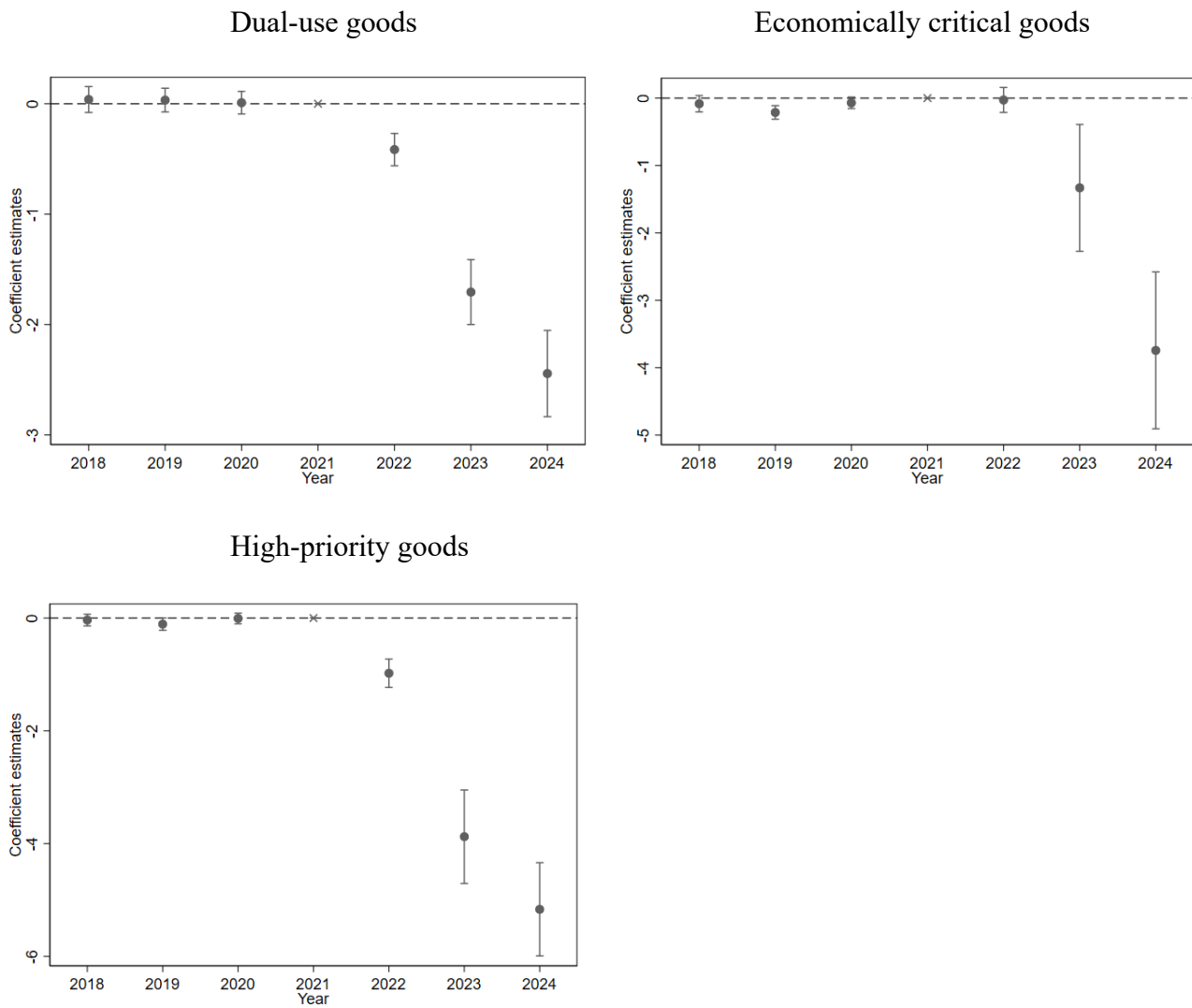
Source: Author's computation from the trade data

**Figure 4: Year-on-year change in exports of the sanctioned goods to Russia by the EU and Russia-friendly countries**



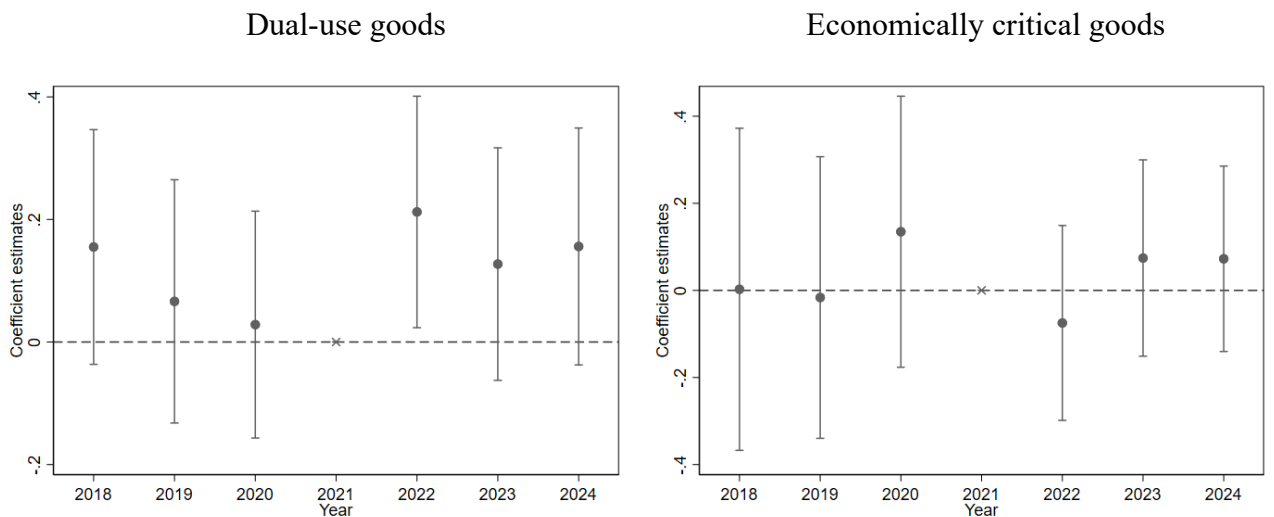
Source: Author's computation from the trade data

**Figure 5: Event study plot for the EU's exports of the sanctioned goods to Russia**

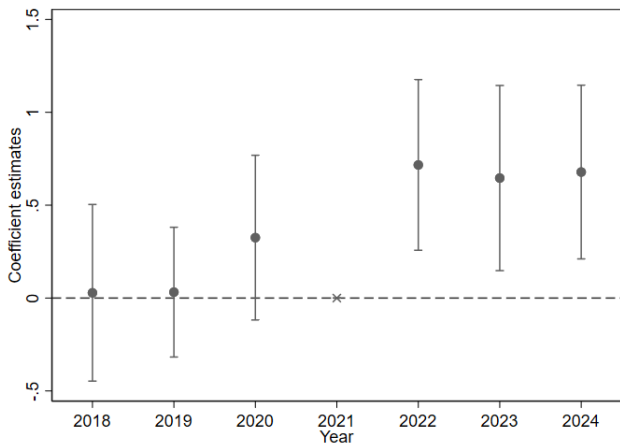


Source: Author's computation from the trade data

**Figure 6: Event study plot for EU's exports of the sanctioned goods to Kazakhstan**



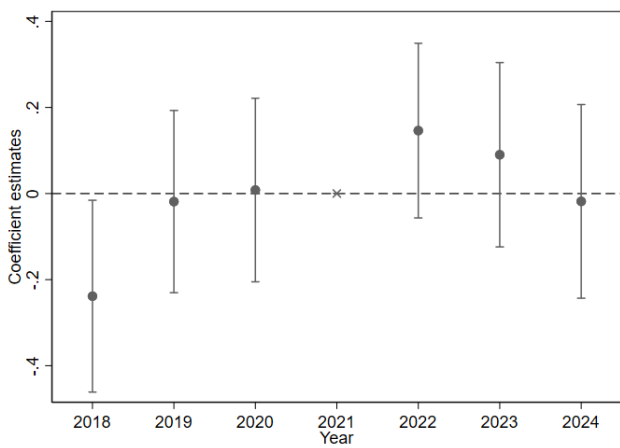
High-priority goods



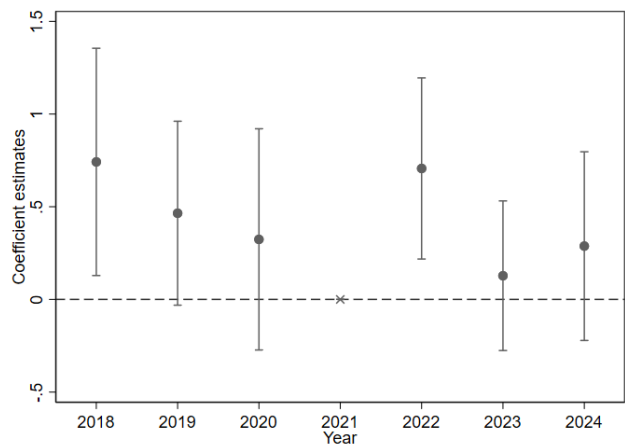
Source: Author's computation from the trade data

**Figure 7: Event study plot for the EU's exports of the sanctioned goods to Iran**

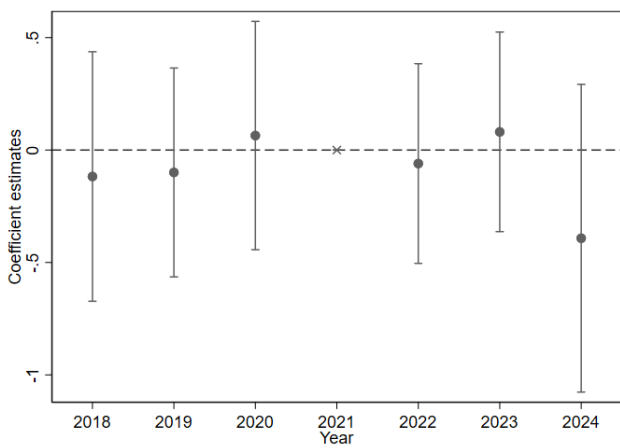
Dual-use goods



Economically critical goods

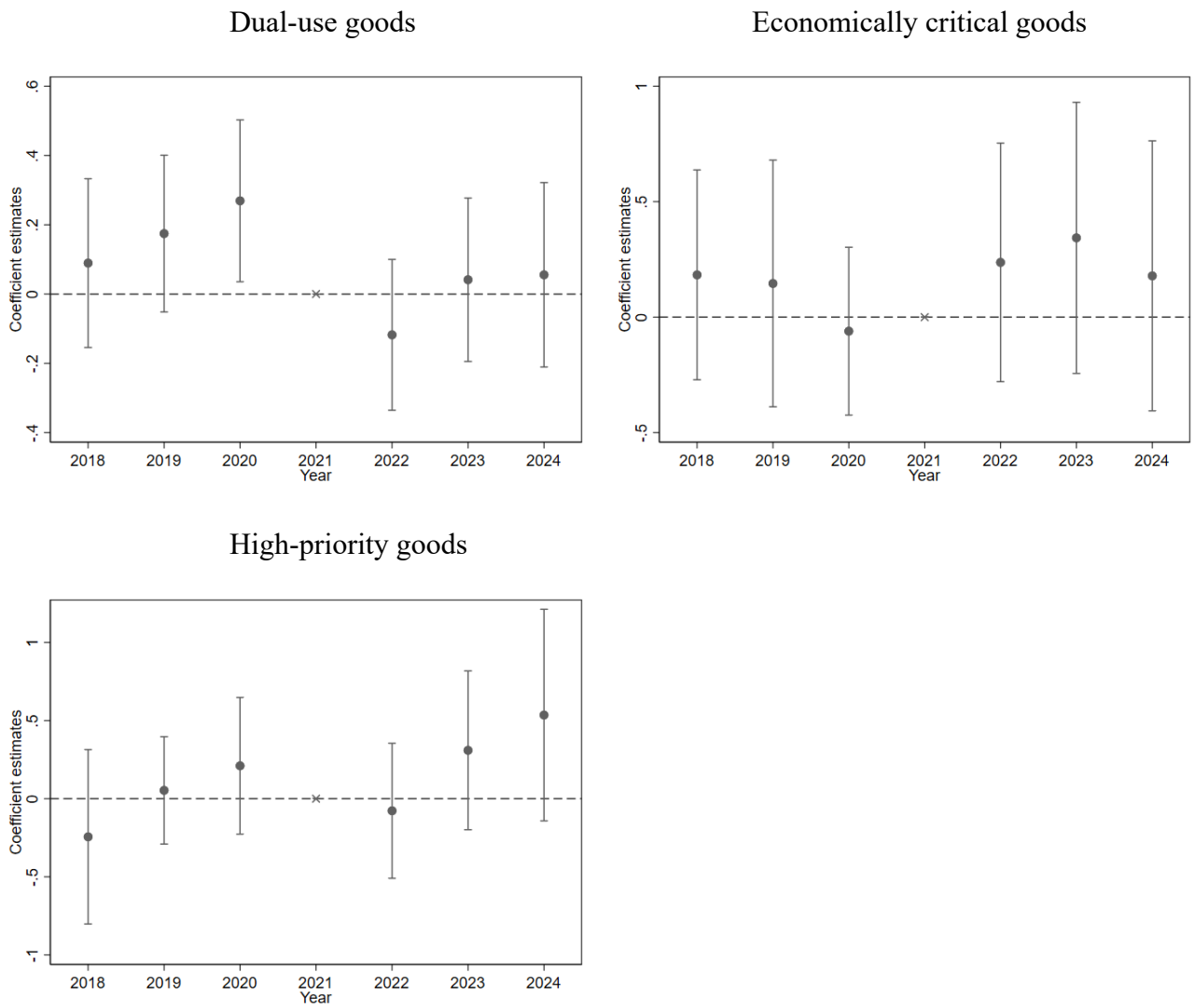


High-priority goods



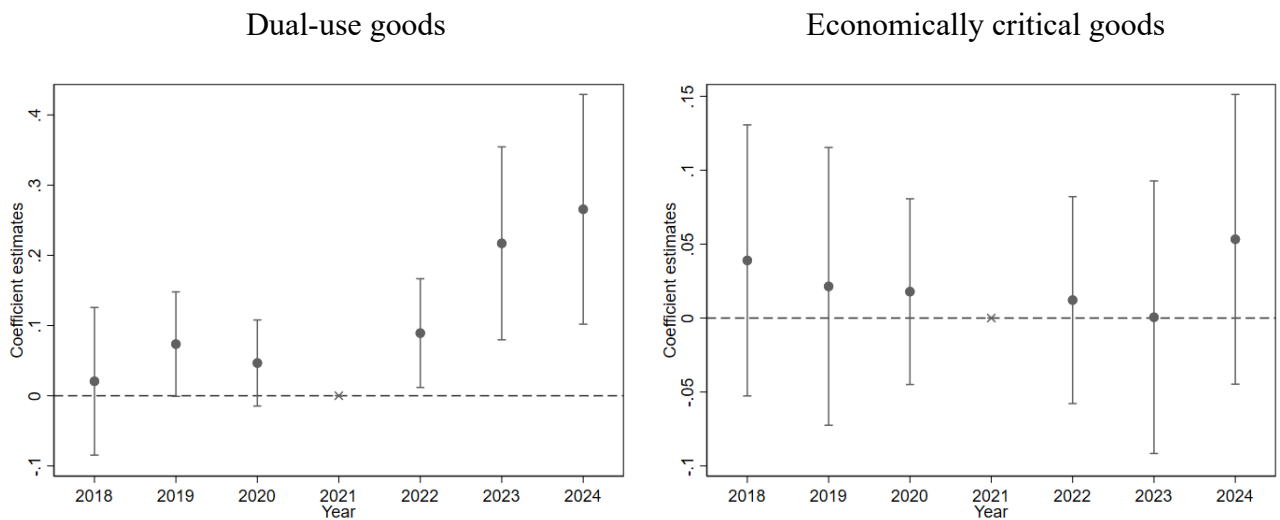
Source: Author's computation from the trade data

**Figure 8: Event study plot for the EU's exports of the sanctioned goods to Azerbaijan**

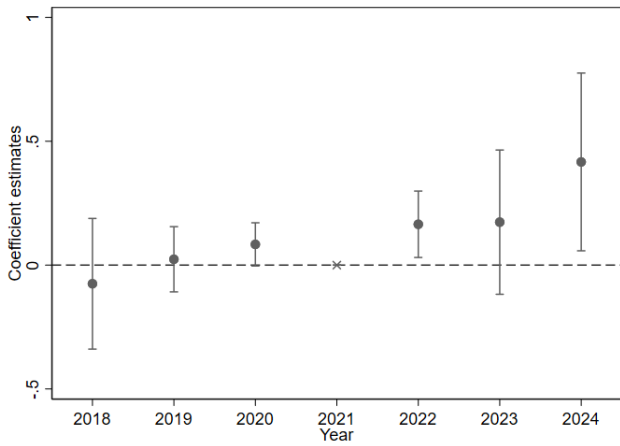


Source: Author's computation from the trade data

**Figure 9: Event study plot for the EU's exports of the sanctioned goods to China**



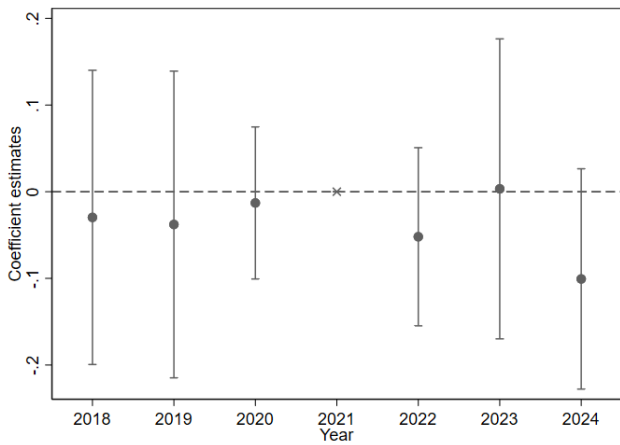
### High-priority goods



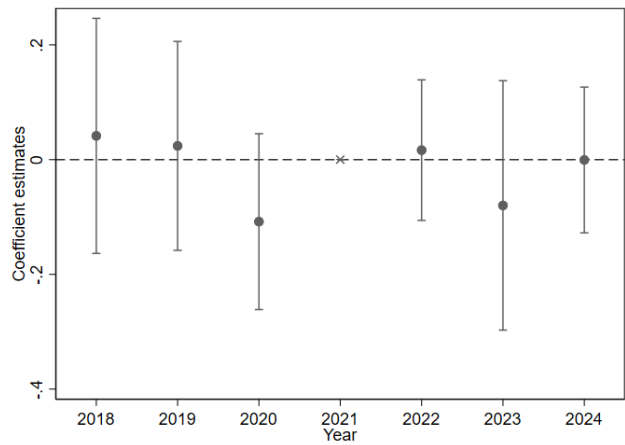
Source: Author's computation from the trade data

**Figure 10: Event study plot for the EU's exports of the sanctioned goods to India**

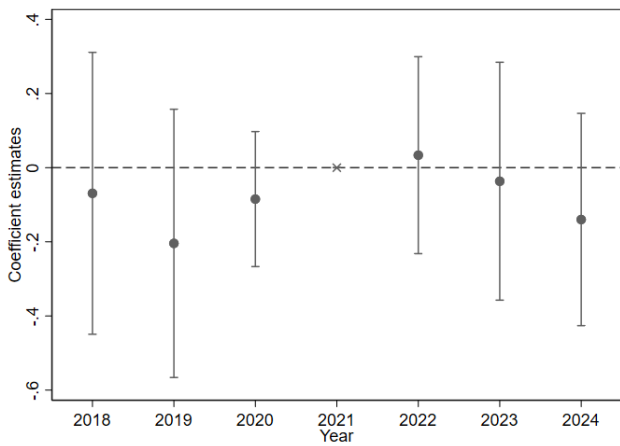
### Dual-use goods



### Economically critical goods

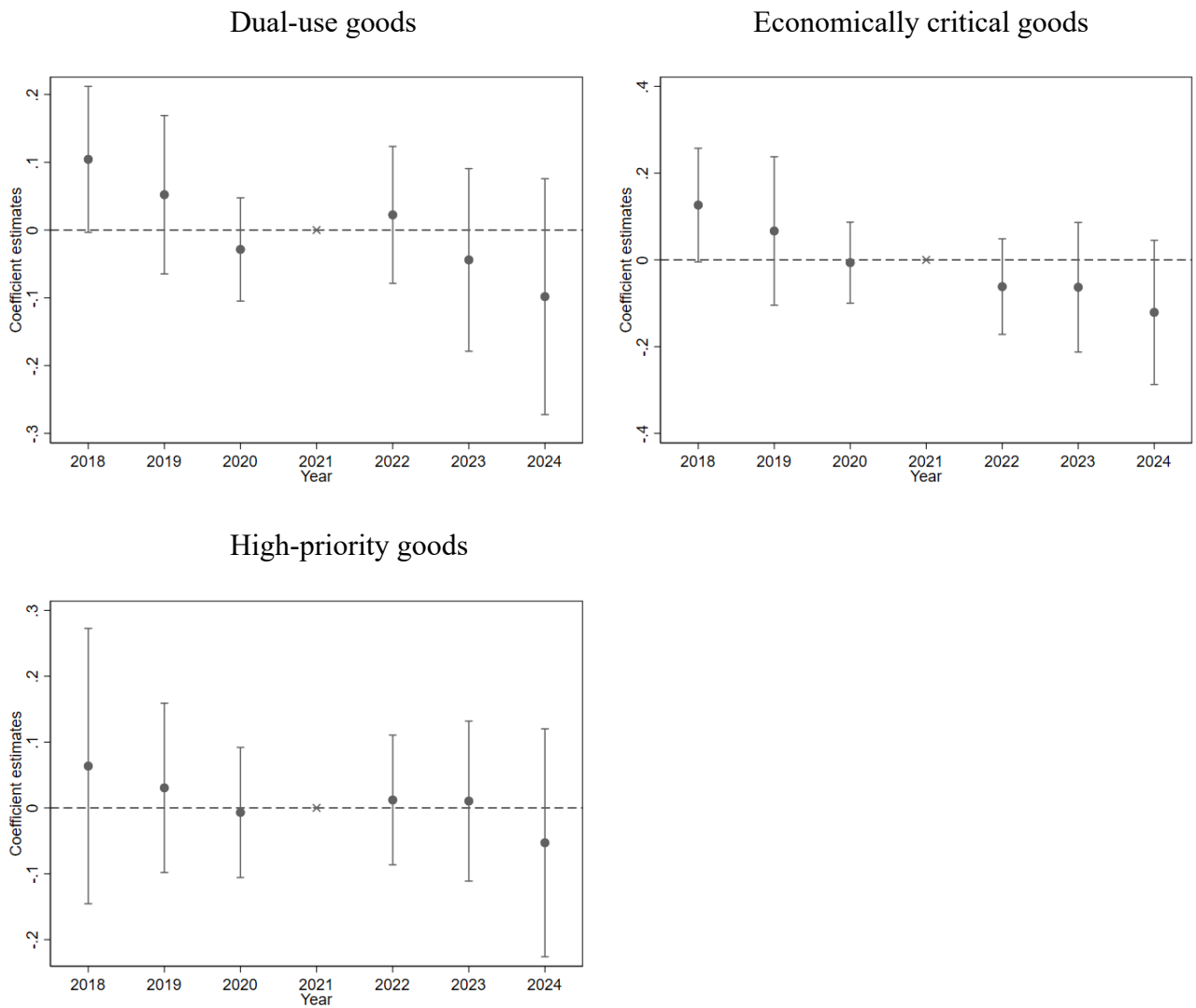


### High-priority goods



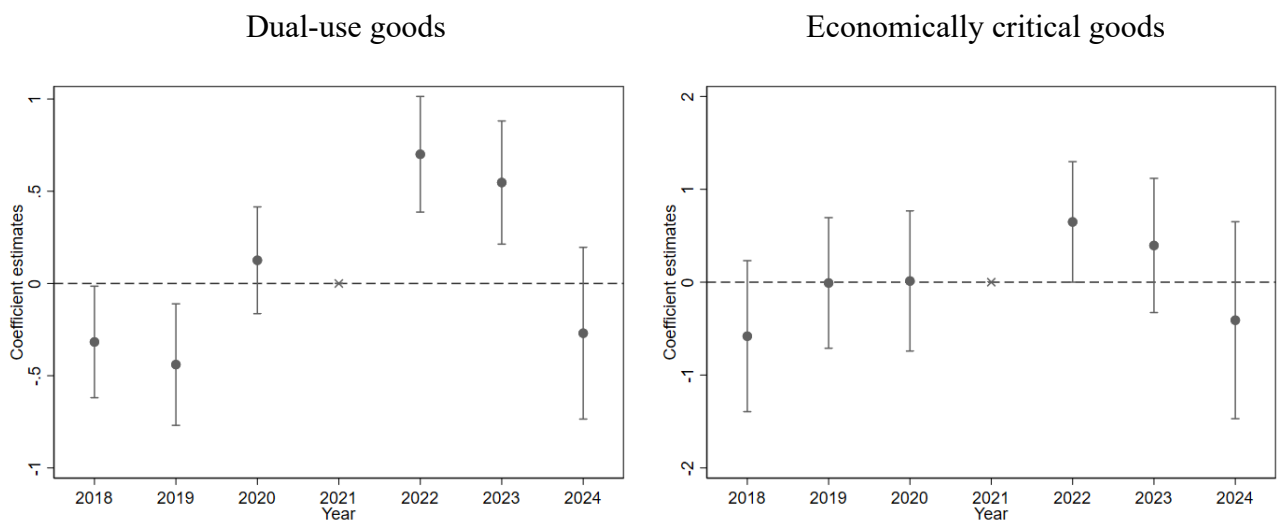
Source: Author's computation from the trade data

**Figure 11: Event study plot for the EU's exports of the sanctioned goods to Turkey**

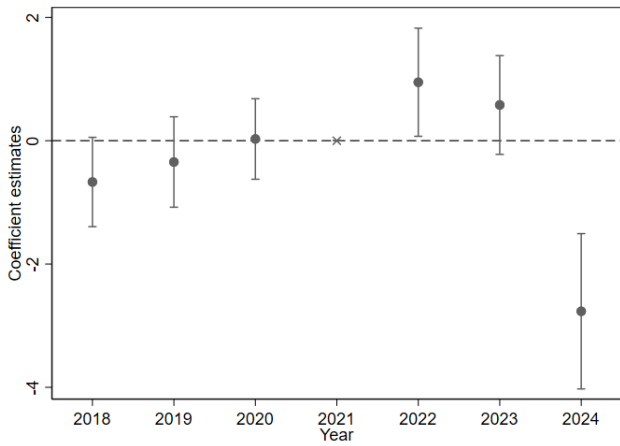


Source: Author's computation from the trade data

**Figure 12: Event study plot for Azerbaijan's exports of the sanctioned goods to Russia**



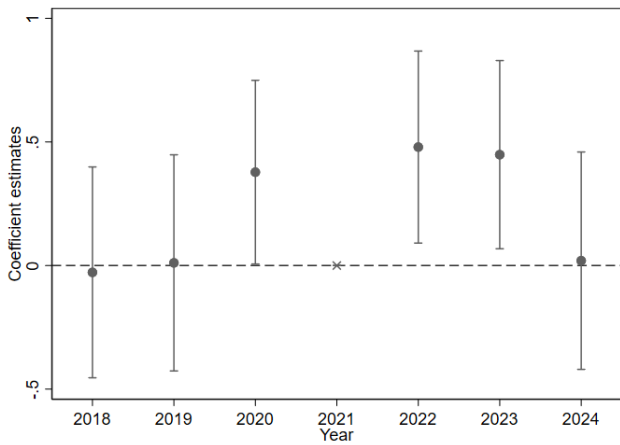
High-priority goods



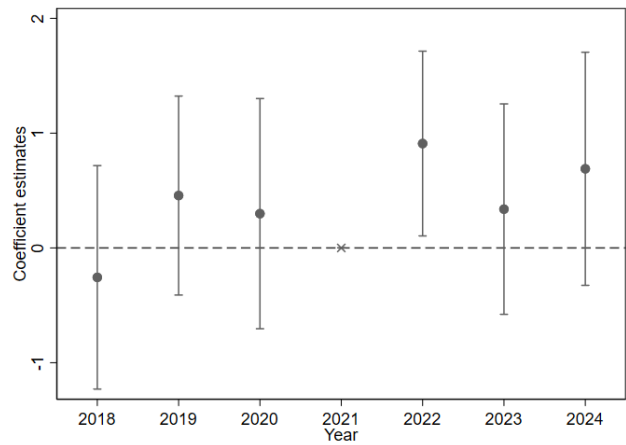
Source: Author's computation from the trade data

**Figure 13: Event study plot for Kazakhstan's exports of the sanctioned goods to Russia**

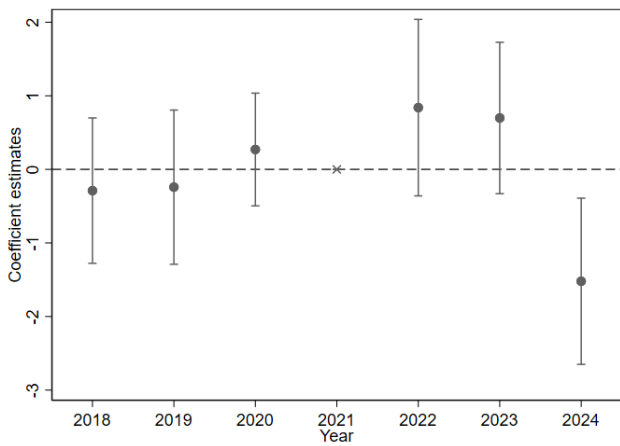
Dual-use goods



Economically critical goods

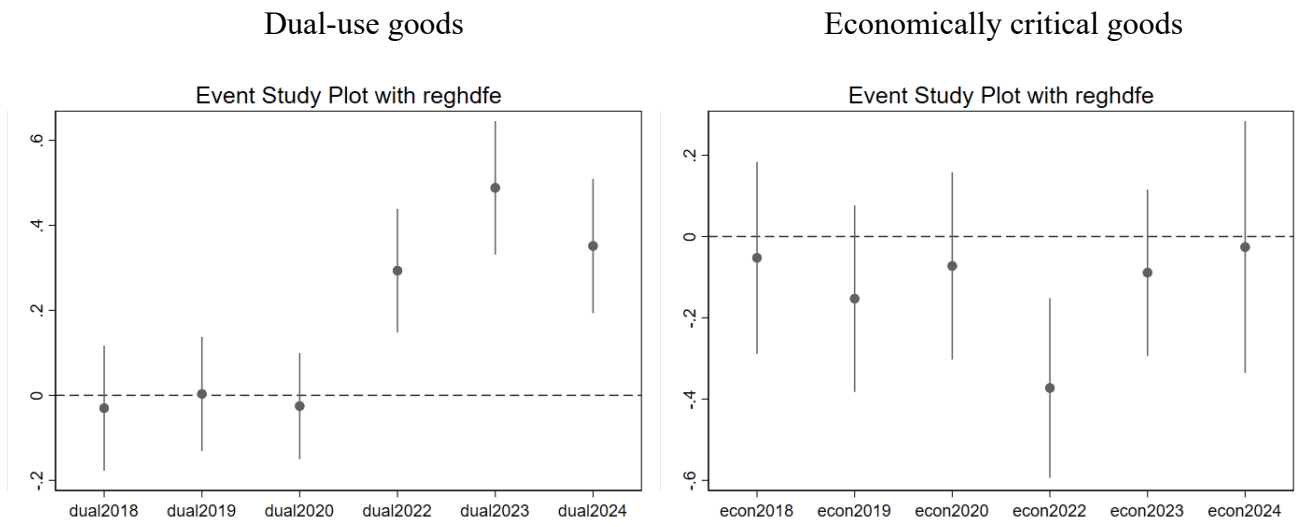


High-priority goods



Source: Author's computation from the trade data

**Figure 14: Event study plot for China's exports of the sanctioned goods to Russia**

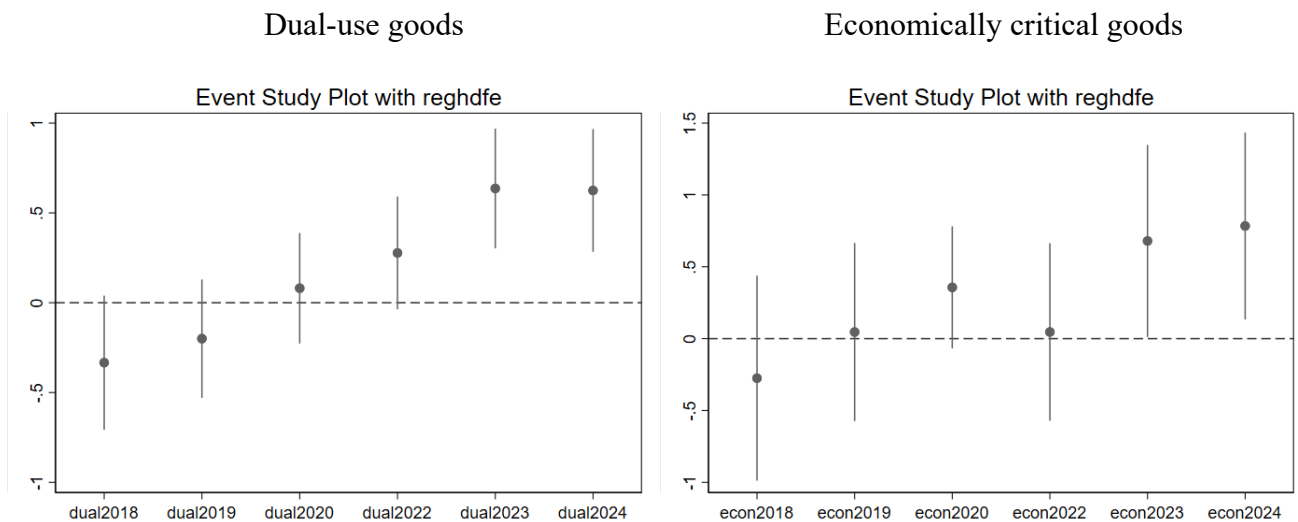


**High-priority goods**



Source: Author's computation from the trade data

**Figure 15: Event study plot for India's exports of the sanctioned goods to Russia**



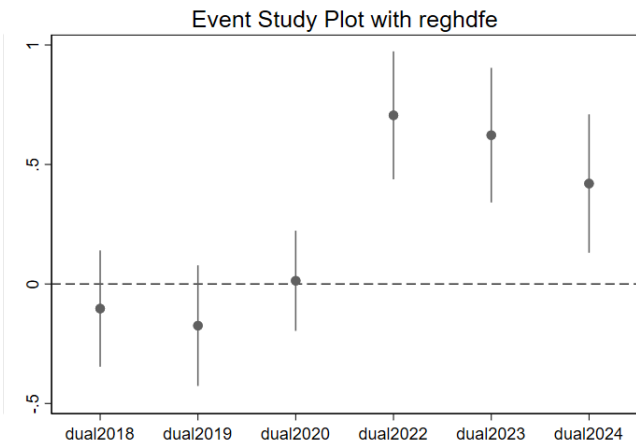
### High-priority goods



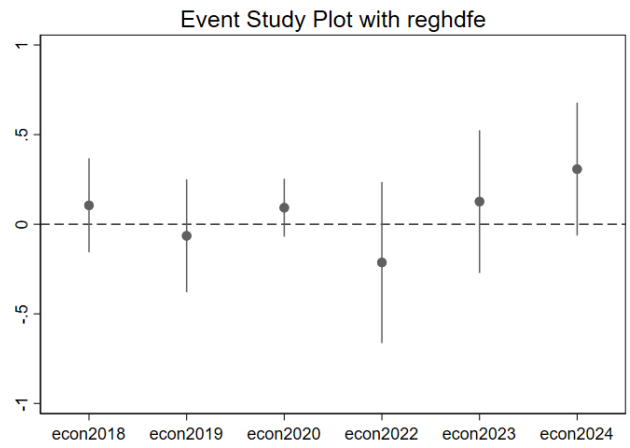
Source: Author's computation from the trade data

**Figure 16: Event study plot for Turkey's exports of the sanctioned goods to Russia**

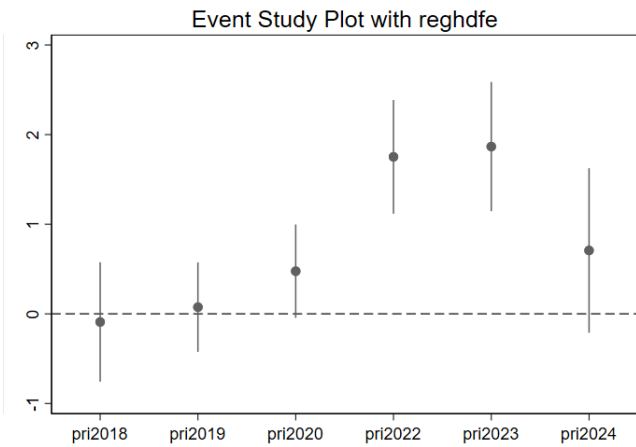
### Dual-use goods



### Economically critical goods



### High-priority goods



Source: Author's computation from the trade data

**Table 1: Estimation results: EU's exports of the sanctioned goods to Russia**

Dependent variable: Export value	(1)	(2)	(3)	(4)
Sanction dummy(All)	-1.307*** (0.0765)			
Sanction dummy(Dual-use goods)		-1.285*** (0.0778)		
Sanction dummy(Economically goods)			-1.303*** (0.286)	
Sanction dummy(Priority goods)				-2.765*** (0.273)
Trade partner * HS code fixed effect	✓	✓	✓	✓
Year * HS code fixed effect	✓	✓	✓	✓
Year * Trade partner fixed effect	✓	✓	✓	✓
Observations	3,541,219	3,541,219	3,541,219	3,541,219
R-squared	0.908	0.908	0.908	0.908

Robust standard errors in parentheses

\*\*\* p&lt;0.001, \*\* p&lt;0.01, \* p&lt;0.05

**Table 2: Estimation results: EU's exports of the sanctioned goods to Caspian Sea countries**

Dependent variable: Export value	(1)	(2)	(3)	(4)
Sanction dummy(All)	0.0627+ (0.0346)			
Sanction dummy(Dual-use goods)		0.0472 (0.0360)		
Sanction dummy(Economically goods)			0.146+ (0.0748)	
Sanction dummy(Priority goods)				0.158+ (0.0860)
Trade partner * HS code fixed effect	✓	✓	✓	✓
Year * HS code fixed effect	✓	✓	✓	✓
Year * Trade partner fixed effect	✓	✓	✓	✓
Observations	3,541,219	3,541,219	3,541,219	3,541,219
R-squared	0.908	0.908	0.908	0.908

Robust standard errors in parentheses

\*\*\* p&lt;0.001, \*\* p&lt;0.01, \* p&lt;0.05, + p&lt;0.1

**Table 3: Estimation results: EU's exports of the sanctioned goods to China**

Dependent variable: Export value	(1)	(2)	(3)	(4)
Sanction dummy(All)	0.0482 (0.0381)			
Sanction dummy(Dual-use goods)		0.0505 (0.0394)		
Sanction dummy(Economically goods)			0.00493 (0.0463)	
Sanction dummy(Priority goods)				0.231*** (0.0448)
Trade partner * HS code fixed effect	✓	✓	✓	✓
Year * HS code fixed effect	✓	✓	✓	✓
Year * Trade partner fixed effect	✓	✓	✓	✓
Observations	3,541,219	3,541,219	3,541,219	3,541,219
R-squared	0.908	0.908	0.908	0.908

Robust standard errors in parentheses  
\*\*\* p<0.001, \*\* p<0.01, \* p<0.05

**Table 4: Estimation results: EU's exports of the sanctioned goods to India**

Dependent variable: Export value	(1)	(2)	(3)	(4)
Sanction dummy(All)	-0.00752 (0.0401)			
Sanction dummy(Dual-use goods)		-0.0185 (0.0414)		
Sanction dummy(Economically goods)			0.161** (0.0625)	
Sanction dummy(Priority goods)				0.115 (0.0895)
Trade partner * HS code fixed effect	✓	✓	✓	✓
Year * HS code fixed effect	✓	✓	✓	✓
Year * Trade partner fixed effect	✓	✓	✓	✓
Observations	3,541,219	3,541,219	3,541,219	3,541,219
R-squared	0.908	0.908	0.908	0.908

Robust standard errors in parentheses  
\*\*\* p<0.001, \*\* p<0.01, \* p<0.05

**Table 5: Estimation results: EU's exports of the sanctioned goods to Turkey**

Dependent variable: Export value	(1)	(2)	(3)	(4)
Sanction dummy(All)	0.0334 (0.0365)			
Sanction dummy(Dual-use goods)		0.0296 (0.0378)		
Sanction dummy(Economically goods)			0.132 (0.0825)	
Sanction dummy(Priority goods)				-0.0935 (0.0699)
Trade partner * HS code fixed effect	✓	✓	✓	✓
Year * HS code fixed effect	✓	✓	✓	✓
Year * Trade partner fixed effect	✓	✓	✓	✓
Observations	3,541,219	3,541,219	3,541,219	3,541,219
R-squared	0.908	0.908	0.908	0.908

Robust standard errors in parentheses  
\*\*\* p<0.001, \*\* p<0.01, \* p<0.05

**Table 6: Estimation results: Caspian Sea countries' exports of the sanctioned goods to Russia**

Dependent variable: Export value	(1)	(2)	(3)	(4)
Sanction dummy(All)	0.487*** (-0.0612)			
Sanction dummy(Dual-use goods)		0.505*** (-0.0637)		
Sanction dummy(Economically goods)			0.478** (-0.147)	
Sanction dummy(Priority goods)				0.573*** (-0.167)
Trade partner * HS code fixed effect	✓	✓	✓	✓
Year * HS code fixed effect	✓	✓	✓	✓
Year * Trade partner fixed effect	✓	✓	✓	✓
Observations	1,130,548	1,130,548	1,130,548	1,130,548
R-squared	0.608	0.608	0.608	0.608

Robust standard errors in parentheses  
\*\*\* p<0.001, \*\* p<0.01, \* p<0.05

**Table 7: Estimation results: China's exports of the sanctioned goods to Russia**

Dependent variable: Export value	(1)	(2)	(3)	(4)
Sanction dummy(All)	0.370*** (0.0432)			
Sanction dummy(Dual-use goods)		0.385*** (0.0447)		
Sanction dummy(Economically goods)			-0.0815 (0.0696)	
Sanction dummy(Priority goods)				0.554*** (0.100)
Trade partner * HS code fixed effect	✓	✓	✓	✓
Year * HS code fixed effect	✓	✓	✓	✓
Year * Trade partner fixed effect	✓	✓	✓	✓
Observations	2,655,167	2,655,167	2,655,167	2,655,167
R-squared	0.888	0.888	0.888	0.888

Robust standard errors in parentheses

\*\*\* p&lt;0.001, \*\* p&lt;0.01, \* p&lt;0.05

**Table 8: Estimation results: India's exports of the sanctioned goods to Russia**

Dependent variable: Export value	(1)	(2)	(3)	(4)
Sanction dummy(All)	0.610*** (0.0928)			
Sanction dummy(Dual-use goods)		0.585*** (0.0960)		
Sanction dummy(Economically goods)			0.430* (0.209)	
Sanction dummy(Priority goods)				1.585*** (0.292)
Trade partner * HS code fixed effect	✓	✓	✓	✓
Year * HS code fixed effect	✓	✓	✓	✓
Year * Trade partner fixed effect	✓	✓	✓	✓
Observations	1,756,304	1,756,304	1,756,304	1,756,304
R-squared	0.851	0.851	0.851	0.851

Robust standard errors in parentheses

\*\*\* p&lt;0.001, \*\* p&lt;0.01, \* p&lt;0.05

**Table 9: Estimation results: Turkey's exports of the sanctioned goods to Russia**

Dependent variable: Export value	(1)	(2)	(3)	(4)
Sanction dummy(All)	0.629*** (0.0517)			
Sanction dummy(Dual-use goods)		0.657*** (0.0543)		
Sanction dummy(Economically goods)			-0.00220 (0.0870)	
Sanction dummy(Priority goods)				1.387*** (0.125)
Trade partner * HS code fixed effect	✓	✓	✓	✓
Year * HS code fixed effect	✓	✓	✓	✓
Year * Trade partner fixed effect	✓	✓	✓	✓
Observations	4,357,282	4,357,282	4,357,282	4,357,282
R-squared	0.679	0.679	0.679	0.679

Robust standard errors in parentheses

\*\*\* p&lt;0.001, \*\* p&lt;0.01, \* p&lt;0.05

**Table 10: Estimation results of roundabout trade for Azerbaijan**

Dependent variable: Export value	(1)	(2)	(3)	(4)
Log of import value	-0.000149 (0.000710)	-0.000142 (0.000710)	-0.000145 (0.000710)	-0.000130 (0.000710)
Log of import value * Roundabout dummy				
All sactions	0.0214*** (0.00358)			
Dual-use Items		0.0158*** (0.00373)		
Economically critical goods			0.0635*** (0.00580)	
High Priority Items				-0.00141 (0.00770)
Trade partner pair fixed effects * HS code fixed effect	✓	✓	✓	✓
Year * HS code fixed effect	✓	✓	✓	✓
Year * Trade partner group fixed effect	✓	✓	✓	✓
Observations	1,804,791	1,804,791	1,804,791	1,804,791
R-squared	0.797	0.797	0.797	0.797

Robust standard errors in parentheses

\*\*\* p&lt;0.001, \*\* p&lt;0.01, \* p&lt;0.05, + p&lt;0.1

**Table 11: Estimation results of roundabout trade for Kazakhstan**

Dependent variable: Export value	(1)	(2)	(3)	(4)
Log of import value	-0.000125 (0.000456)	-0.000124 (0.000456)	-6.95e-05 (0.000456)	-6.63e-05 (0.000456)
Log of import value * Roundabout dummy				
All sactions	0.0364*** (0.00300)			
Dual-use Items		0.0366*** (0.00312)		
Economically critical goods			0.0395*** (0.00534)	
High Priority Items				0.0234*** (0.00670)
Trade partner pair fixed effects * HS code fixed effect	✓	✓	✓	✓
Year * HS code fixed effect	✓	✓	✓	✓
Year * Trade partner group fixed effect	✓	✓	✓	✓
Observations	3,796,791	3,796,791	3,796,791	3,796,791
R-squared	0.789	0.789	0.789	0.789

Robust standard errors in parentheses

\*\*\* p&lt;0.001, \*\* p&lt;0.01, \* p&lt;0.05, + p&lt;0.1

**Table 12: Estimation results of roundabout trade for China**

Dependent variable: Export value	(1)	(2)	(3)	(4)
Log of import value	-0.000997*** (0.000124)	-0.000997*** (0.000124)	-0.000994*** (0.000124)	-0.000995*** (0.000124)
Log of import value * Roundabout dummy				
All sactions	0.0160*** (0.000742)			
Dual-use Items		0.0177*** (0.000772)		
Economically critical goods			-0.00730*** (0.00117)	
High Priority Items				0.0321*** (0.00156)
Trade partner pair fixed effects * HS code fixed effect	✓	✓	✓	✓
Year * HS code fixed effect	✓	✓	✓	✓
Year * Trade partner group fixed effect	✓	✓	✓	✓
Observations	72,249,493	72,249,493	72,249,493	72,249,493
R-squared	0.869	0.869	0.869	0.869

Robust standard errors in parentheses

\*\*\* p&lt;0.001, \*\* p&lt;0.01, \* p&lt;0.05, + p&lt;0.1

Full fixed effects included

**Table 13: Estimation results of roundabout trade for India**

Dependent variable: Export value	(1)	(2)	(3)	(4)
Log of import value	-0.000510*** (7.65e-05)	-0.000509*** (7.65e-05)	-0.000490*** (7.65e-05)	-0.000502*** (7.65e-05)
Log of import value * Roundabout dummy				
All sactions	0.0291*** (0.00128)			
Dual-use Items		0.0315*** (0.00137)		
Economically critical goods			-0.00860*** (0.00189)	
High Priority Items				0.0922*** (0.00291)
Trade partner pair fixed effects * HS code fixed effect	✓	✓	✓	✓
Year * HS code fixed effect	✓	✓	✓	✓
Year * Trade partner group fixed effect	✓	✓	✓	✓
Observations	53,144,607	53,144,607	53,144,607	53,144,607
R-squared	0.842	0.842	0.842	0.842

Robust standard errors in parentheses

\*\*\* p&lt;0.001, \*\* p&lt;0.01, \* p&lt;0.05, + p&lt;0.1

**Table 14: Estimation results of roundabout trade for Turkey**

Dependent variable: Export value	(1)	(2)	(3)	(4)
Log of import value	-0.000167*** (3.27e-05)	-0.000166*** (3.27e-05)	-0.000155*** (3.27e-05)	-0.000160*** (3.27e-05)
Log of import value * Roundabout dummy				
All sactions	0.0302*** (0.000450)			
Dual-use Items		0.0317*** (0.000481)		
Economically critical goods			-0.00935*** (0.000550)	
High Priority Items				0.0773*** (0.000923)
Trade partner pair fixed effects * HS code fixed effect	✓	✓	✓	✓
Year * HS code fixed effect	✓	✓	✓	✓
Year * Trade partner group fixed effect	✓	✓	✓	✓
Observations	190,484,659	190,484,659	190,484,659	190,484,659
R-squared	0.861	0.861	0.861	0.861

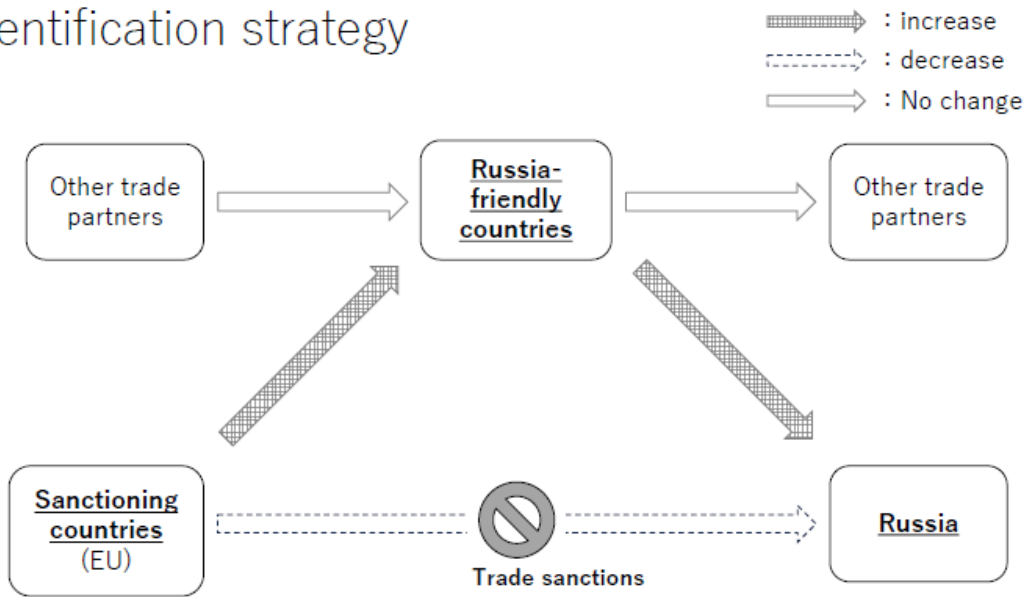
Robust standard errors in parentheses

\*\*\* p&lt;0.001, \*\* p&lt;0.01, \* p&lt;0.05, + p&lt;0.1

## Appendix

Figure A1: Illustration of identification strategy for roundabout trade

Identification strategy



**Figure A2: A sketch of the data structure**

year	reporter	HS	Sanction listed	Sanction effected	import_partner	imp_val	export_partner	exp_val	ExpRUS_ImpSanctioningCountries_dummy	Roundabout dummy
2020	KAZ	111111	0	0	DEU	10	RUS	10	1	0
2020	KAZ	111111	0	0	TUR	20	RUS	10	0	0
2020	KAZ	111111	0	0	EGY	10	GRC	30	0	0
2020	KAZ	111111	0	0	CHN	10	TUR	20	0	0
2021	KAZ	111112	1	0	DEU	30	RUS	15	1	0
2021	KAZ	111112	1	0	TUR	25	RUS	15	0	0
2021	KAZ	111112	1	0	EGY	15	GRC	25	0	0
2021	KAZ	111112	1	0	CHN	20	TUR	30	0	0
2022	KAZ	111112	1	1	DEU	20	RUS	10	1	1
2022	KAZ	111112	1	1	TUR	30	RUS	20	0	0
2022	KAZ	111112	1	1	EGY	20	GRC	15	0	0
2022	KAZ	111112	1	1	CHN	20	TUR	10	0	0

Using trade statistics, I constructed all combinations of export and import partners with positive trade values for each HS code. The first line shows that the reporter country (KAZ (Kazakhstan)) imported US\$10 million of HS 111111 goods from a EU country, DEU (Germany) and exported US\$10 million of the same HS 111111 goods to Russia. When the good is in sanction list (Sanction listed=1), the year is on or after 2022 (Sanction effected=1), and import/export partner is a EU country/Russia (ExtRUS\_ImpSanctioningCountries\_dummy=1), the roundabout dummy takes 1. Otherwise, 0. With this data structure and the above estimation equation,  $\beta_2 \ln Imp_{iyp} * RoundaboutDummy$  picks up the roundabout trade.