Trade Sanctions*

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Abstract

How effective are trade sanctions? We examine the economic impact of the unprecedented sanctions imposed on Russia following February 2022, when Western countries banned exports of nearly 40% of all country-product varieties Russia had been importing prior to the war. By combining novel, manually-collected records of these sanctions with the universe of Russian international trade transactions, firm balance sheets, and government procurement data, we provide the most comprehensive analysis of the economic impact of trade sanctions on a target country to date. Using a difference-in-differences approach, we find that the sanctioned country-product imports into Russia experienced a sharp 60% decline compared to non-sanctioned import flows following the war's onset. Total imports of sanctioned products fell by 31%, suggesting that while roundabout trade and substitution were substantial, they did not fully offset the decline in sanctioned imports. Firms that relied on to-be-sanctioned imports experienced a 14% reduction in output. This pattern is also observed in the manufacturing and science and technology sectors, consistent with the stated aims of disrupting technologically advanced production within Russia. Overall, our findings suggest that, despite anecdotal evidence highlighting sanctions' ineffectiveness, the sanctions on the imports of Russia had an adverse impact on the Russian economy.

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1 Introduction

After decades of globalization, the world is now experiencing a trend toward fragmentation of trade linkages (Gopinath, Gourinchas, Presbitero, and Topalova, 2025). This trend is accompanied by a growing reliance on *trade sanctions*, i.e., trade restrictions imposed for geopolitical purposes (Morgan, Syropoulos, and Yotov, 2023).

Governments typically resort to trade sanctions for at least two sets of key reasons. One set of aims seeks to punish a target country and induce a change in the political behavior of that or other countries immediately or over time. Yet, in many cases, political concessions are not forthcoming right away, making it difficult to assess sanctions' effectiveness in achieving these goals. Another critical rationale for trade sanctions is to impede production in the target economy—particularly via export controls in high-tech sectors—and, by extension, weaken its supply chains.[1]

How effective are trade sanctions at achieving this second objective? And, in particular, can sanctions on the target country's imports (hereafter, *import sanctions*) disrupt its production capacity? On the one hand, economic theory would predict that unless firms can readily secure alternative suppliers, import sanctions should reduce the target country's productive capacity. Given that import sanctions are often imposed on technology-intensive products that are difficult to substitute, this logic appears plausible. On the other hand, considerable journalistic, anecdotal, and scholarly evidence suggests that import sanctions may be counterproductive, as they lead to a relatively quick reorganization of supply chains, are challenging to enforce, and ultimately do not hurt the target economy as significantly as to justify the costs for the sanctioning countries.

Despite significant scholarly interest, causal estimates for the pass-through of import sanctions have been lacking. They require detailed micro-level data linking firms within targeted countries to their import behavior and balance sheets, coupled with a significant variation in sanction timing and coverage. Such settings are typically unavailable, either due to poor data quality in sanctioned countries or because sanctions are imposed at a single point in time, simultaneously with other restrictions, on a limited number of sectors, or only by a few sanctioning countries.

[1] E.g., the EU officially justifies the sanctions it imposed on Russia after February 2022 with "the aim of weakening Russia's economic base, depriving it of critical technologies and markets, and significantly curtailing its ability to wage war" (European Commission, 2022).

We resolve these issues by studying the effectiveness of import sanctions in the context of Russia following the 2022 Russian invasion of Ukraine. This context is uniquely suitable for our research for several reasons. First, it represents one of the most extensive sanctions campaigns against one of the world's biggest economies.[2] This case tests the limits of sanctions' effectiveness, as it involves a large economy with economically prosperous neighboring countries that remained neutral or even friendly after the start of the war. A major debate is ongoing on the effectiveness of import sanctions against Russia and whether they were compromised by re-routing and substitution facilitated by these third countries.[3] Second, multiple nations imposed sanctions at different points in time and on different product codes, down to the ten-digit level, creating ample variation for empirical analysis. Third, this case offers a data-rich environment, with available information on customs transactions, firm balance sheets, firm-to-firm railway shipments, and government procurement contracts. This wealth of data allows us to analyze the economic pass-through of import sanctions with a previously unattainable level of detail.

A major obstacle we tackle in our analysis is that the data specifying which countries imposed trade sanctions against Russia, on which specific products, and at what times are not readily available, however. We address this by manually assembling the largest dataset on sanctions imposed on imports to Russia, drawing on official sources. The dataset covers 35 countries from February 2022 through June 2024 and ultimately relates to around 6,000 ten-digit product codes imported.

Combining these data with the universe of Russian import transactions, we start by documenting several stylized facts.[4] First, trade sanctions banned close to 40% of all country-product varieties Russia imported before the war, constituting one of the largest trade shocks in recent history.[5] Second, while most of the sanctioned import was concentrated in a few high-tech product categories and a few countries, a nontrivial share of imports within these categories and coun-

[2] As of 2021, Russia ranked as the fourth-largest economy globally in terms of PPP-based GDP and tenth-largest in terms of nominal GDP, according to World Bank (2023).

[3] See, for example, Conway (2023) and Mackinnon (2024), as well as academic work by Chupilkin, Javorcik, and Plekhanov (2023), Babina et al. (2023), and Tyazhelnikov and Romalis (2024).

[4] Egorov, Korovkin, Makarin, and Nigmatulina (2025) offer an extended discussion of these stylized facts. However, the numbers in Egorov et al. (2025) may differ from the ones in this manuscript because the former are based on a combination of our trade sanctions data and the UN Comtrade rather than Russian customs data.

[5] For comparison, during the 2018–2021 US-China trade war, the US increased tariffs up to 25.8% on 18% of its imports (Fajgelbaum and Khandelwal, 2022)

tries remained unsanctioned. Third, there was substantial variation in the specific products banned across different sanctioning countries despite coordination within the Western coalition. Collectively, these facts confirm that our setting offers rich variation for a granular empirical analysis.

Our analysis proceeds in several steps. We begin by assessing whether sanctions have effectively restricted imports to the target country—Russia. Next, we examine the extent to which these import sanctions have disrupted production and supply chains within the Russian economy.

First, we explore whether sanctions effectively reduced imports of the sanctioned country-product varieties. To this end, we pursue two complementary empirical strategies. The first is a simple pre-post difference-in-differences (DiD) approach that compares import flows of sanctioned and non-sanctioned country-product varieties before and after the war's onset. The second is a staggered DiD strategy that compares newly sanctioned imports with those not (or not yet) subject to sanctions. While the former approach leverages all available variation and is well-suited to our context—given that most sanctions were imposed in the early months of the war—the latter allows us to focus on the period just around the imposition of sanctions, helping us to further disentangle the effects of trade sanctions from broader wartime disruptions.

In both specifications, a rich set of fixed effects helps us rule out a number of competing explanations. Granular ten-digit-product-by-time fixed effects account for product-specific shocks, such as surges in demand for military-related or dual-use goods. Country-time fixed effects control for country-specific shocks, such as whether a country simultaneously imposed other types of restrictions on doing business with Russia. Under the assumption that absent sanctions, sanctioned and non-sanctioned (or not-yet-sanctioned) import flows would have followed parallel trends, both strategies provide a causal estimate of the impact of sanctions on trade flows.[6]

Using these strategies, we find a massive reduction in the sanctioned country-product imports. The pre-post DiD strategy suggests that sanctioned imports went down dramatically after the war's onset, decreasing by 60% relative to non-sanctioned imports. Dynamic estimates reveal that the decline was sharp and growing over time, reaching nearly 80% by the end of 2023. The staggered DiD strategy shows similar estimates. Importantly, we observe no pretrends for either strategy,

[6]Recent research highlights potential biases in staggered DiD designs when treatment effects vary substantially across units and over time (see Arkhangelsky and Imbens, 2023 for a review). We address these issues by employing the ETWFE estimator from Wooldridge (2021), following the advice from Rios-Avila, Nagengast, and Yotov (2024).

lending support to the parallel trends assumption underlying our identification argument.

Such large negative estimates are perhaps not surprising—after all, a full and immediate ban would be expected to result in a complete halt in sanctioned imports. The fact that the estimated decline is not as extreme likely reflects a combination of imperfect enforcement, the presence of sanction exemptions, or limitations in our measurement, as some sanctions may apply only to specific product descriptions even within a given ten-digit HS code. Nevertheless, the sharp reduction in sanctioned imports, observed without pretrends despite many simultaneous shocks, indicates a strong first stage and validates our empirical strategy.

Second, we document substantial substitution and rerouting of sanctioned products through third countries. Specifically, we show that import sanctions caused a sharp and substantial differential spike in the imports of sanctioned products from countries that remained relatively friendly to the Russian regime following the war's onset, such as China and Turkey.[7] According to the pre-post DiD estimates, such imports have sharply increased by close to 150% following the war's onset. These estimates again exhibit no pretrends, are growing over time, and are confirmed in the staggered DiD design. They also remain similar when we only compare the imports of sanctioned and non-sanctioned products from these ten friendly countries. Moreover, by explicitly accounting for the country of origin, we show that the increase in sanctioned product imports from friendly countries was predominantly driven by rerouting; in contrast, substitution toward products made in those countries has been much more muted.

Third, we show that significant rerouting and, to a lesser extent, substitution did not fully offset the decline in sanctioned imports. Specifically, when we estimate our DiD specifications at the product level, we find that the total imports of sanctioned products declined substantially compared to the total imports of non-sanctioned products across all importing countries. For instance, in a pre-post DiD specification with two-digit-product-time fixed effects—to account for time-varying changes in demand within broader product categories—the decline in overall imports of sanctioned products is estimated at around 30%. The effect again comes with no pretrends, remains persistent over time, and is similar in magnitude under the staggered DiD design. These results suggest

[7]The full list of friendly countries consists of Armenia, Belarus, China, Georgia, Hong Kong, Kazakhstan, Kyrgyzstan, Serbia, Turkey, and the UAE.

that rerouting and substitution, on average, only partially mitigated the impact of trade sanctions, offsetting only about half of the total decline in sanctioned imports.

It is important to note that this average effect masks some important heterogeneity across product categories. While sanctions were largely effective, they did not reduce import flows for critical components directly used in weapons production. The results thus suggest that sanctions were less effective in curtailing imports of the essential components for the war effort but still effective for products used in industrial production more generally.

Having estimated the effect of sanctions on country-product and product-level imports, we re-estimate the same effect at the product-firm level. This specification allows us not only to account for firm-level correlated shocks but also to explore firm heterogeneity. We confirm an average decline in imports of sanctioned products controlling for firm-by-year fixed effects. In addition, we see a decrease in imports of sanctioned products also for firms that are a part of the military supply chain and provide goods to the government under defense procurement. This suggests that while the Russian government may have successfully restored access to critical components, the military sector may have still faced indirect disruptions due to import sanctions.

Although the sanctions appear to have been moderately successful in reducing the imports of sanctioned products into Russia despite substantial rerouting and substitution on average, sanctions could still be ineffective in disrupting domestic production due to domestic substitution and compensatory effects of government demand. We now merge in the comprehensive data on the balance sheets of more than 2.5 million Russian firms to explore the impact of import sanctions on production and supply chains in the target country.

We investigate whether trade sanctions had a negative impact on Russian firms that were more exposed to import restrictions. We estimate a set of DiD specifications at the firm-year level, comparing firms that imported the sanctioned country-product varieties prior to the war with those that did not, before and after the war's onset. Our specifications include firm fixed effects to account for time-invariant firm characteristics, as well as a range of firm-level controls interacted with year fixed effects. In particular, we include industry-year fixed effects to control for time-varying shocks that may have differentially affected industries—such as labor supply disruptions, which could have had a greater impact on more labor-intensive sectors.

We find that firms that imported sanctioned country-product varieties prewar experienced a sharp 14% decline in revenues following the war's onset. This negative effect persisted with a similar magnitude throughout both 2022 and 2023, indicating that any adaptation strategies that firms may have employed did not result in a successful recovery. At the same time, the stability of the effect also suggests that the impact was not substantially delayed due to firms depleting existing inventories gradually. These findings provide further support for the evidence of an overall decline in sanctioned product imports, alleviating concerns that Russian customs data might be missing significant volumes of black-market transactions.

The downstream impact on firm revenue is present even when focusing exclusively on manufacturing and science and technology firms. This aligns with one of the goals of these trade sanctions and the fact that high-tech and manufacturing inputs are among the most heavily sanctioned products in our dataset.

Further, consistent with the revenue decline reflecting an actual contraction in output, we find similar negative effects on other firm-level outcomes, including labor and material expenditures. We also see a 4.6 percentage point higher probability that firm sales become missing in the data, which can be interpreted as increased firm exit.

We also do not see a relative increase in firms' government procurement sales, which could indicate the government's efforts to compensate the firms negatively affected by import sanctions. On the contrary, among firms that are frequent suppliers to the government, we find that exposed firms experienced a 33% drop in the yearly contract volume after the full-scale invasion.

Finally, we leverage firm-to-firm railway shipment data to examine the broader impact of import sanctions on domestic supply chains. We find that firms directly exposed to import sanctions experienced a decline in both their in- and out-shipments, indicating disruptions in their trading activity. Moreover, firms with suppliers that were exposed to import sanctions also saw a decline in their own sales, even after accounting for their own direct exposure. These findings suggest that the effects of import sanctions propagated through supply chains, amplifying their overall impact.

Taken together, our results suggest that, contrary to claims that import sanctions against Russia were ineffective due to roundabout trade, these measures resulted in significant disruptions to Russia's production capacity, especially in technologically advanced sectors, and supply chains.

We contribute to the burgeoning literature on the economics of geopolitical threats and international trade—or geoeconomics (see Mohr and Trebesch, 2025 for a recent overview). Theoretically, researchers have explored the rationale behind imposing sanctions on other nations. Most existing frameworks consider trade policy and the threat of trade sanctions as a tool of coercion (Eaton and Engers, 1992; Thoenig, 2023; Alekseev and Lin, 2024; Becko, 2024; Bianchi and Sosa-Padilla, 2024; Broner, Martin, Meyer, and Trebesch, 2024; Clayton, Maggiori, and Schreger, 2024; Kooi, 2024; Mayer, Mejean, and Thoenig, 2024; Liu and Yang, 2024). In Becko and O'Connor (2024), sanctions may also be used to preserve the countries' commitment power and make future threats more credible. Our paper contributes to this ongoing discussion by demonstrating empirically that trade sanctions fulfill a geopolitical purpose beyond mere coercion. Specifically, they can disrupt production within the target economy and, ultimately, serve to weaken its technological and military capabilities (so far, this possibility is only theoretically explored in Kooi (2024) and is an underlying premise for Alekseev and Lin (2024)). Furthermore, this paper provides an empirical evaluation of the true extent of geoeconomic power—how credible is the threat of the US and the Western coalition on a targeted country—and highlights what share of that power is diluted by trade rerouting and substitution via third countries. The empirical moments found in this paper, such as the degree of substitution between the US and Chinese goods or the pass-through of the import sanctions onto the Russian firms, could guide the calibration exercises, such as in Clayton et al. (2024), and the future theoretical literature on geoeconomics.

On the empirical side, the literature primarily investigates two types of sanctions: trade sanctions, which impose restrictions on export or import transactions for an entire country (Haidar, 2017; Juhász, 2018; Hinz and Monastyrenko, 2022; Aytun, Hinz, and Özgüzel, 2025), and targeted sanctions, which restrict economic transactions for select firms (Ahn and Ludema, 2020; Nigmatulina, 2021; Draca, Garred, Stickland, and Warrinnier, 2023).[8] In both cases, the evidence for sanctions' effectiveness is mixed. Targeted sanctions, when applied alone, have generally shown limited impact. For example, the sanctions imposed on Russia following the 2014 Annexation of Crimea targeted specific firms rather than products and, paradoxically, had a *positive* average

[8] See also Morgan, Syropoulos, and Yotov (2023) and Itskhoki and Ribakova (2024) for the excellent reviews on the current literature on sanctions.

impact on the targeted Russian firms due to compensatory subsidies from the Russian government (Nigmatulina, 2021). Trade sanctions have also shown to be of mixed effectiveness. While Haidar (2017) find a small decline of total trade flows with sanctioning countries, he also observes a significant diversion of total exports from sanctioning to non-sanctioning countries, especially for firms that already had exported to both friends and enemies. Most relevant to our study is contemporaneous work by Chupilkin et al. (2023) and Chupilkin, Javorcik, Peeva, and Plekhanov (2024) who use UN COMTRADE and the Russian customs data, respectively, to document the importance of roundabout trade in circumventing the post-2022 trade sanctions against Russia.[9]

We contribute to the empirical literature on sanctions in four ways. Most importantly, this paper is the first to combine the transaction-level customs data and firms' balance sheets to trace out the full causal chain from the impact of import sanctions on import flows and then all the way down to firm output and supply chains. Second, we are able to assess whether trade rerouting and substitution documented by journalists and academics were sufficient to offset the negative downstream effects on firms. While we find substantial rerouting and substitution, on average, they were not enough to fully mitigate the adverse effects. Third, by compiling a novel dataset of import sanctions against Russia at the 10-digit product by country by time level, we are the first paper to separate the causal impact of trade sanctions from correlated shocks at the economy-wide level, such as trade uncertainty, macroeconomic conditions, or other country- or product-specific demand and supply shocks. Much of the earlier work focused on aggregate trade flows between a sender and a target. We are also able to analyze the impact of trade sanctions by all major countries—not just the EU—and utilize a staggered roll-out design that flexibly accounts for war-related shocks. Finally, we analyze an unprecedented set of sanctions imposed on one of the world's largest economies. Earlier research typically focused on smaller economies like Iran or Venezuela or on the much more limited pre-2022 sanctions against Russia. Altogether, our paper

[9] Also see the research on the implications of trade sanctions on the exchange rate (Itskhoki and Mukhin, 2022) and the use of the US dollar in trade invoicing (Berthou, 2022; Chupilkin, Javorcik, Peeva, and Plekhanov, 2023), the effects of oil embargo and price cap policy (Hilgenstock, Ribakova, Shapoval, Babina, Itskhoki, and Mironov, 2023; Johnson, Rachel, and Wolfram, 2023; Monastyrenko and Picard, 2023; Kilian, Rapson, and Schipper, 2024; Spiro, Wachtmeister, and Gars, 2024; Turner and Sappington, 2024; Bai, Fernández-Villaverde, Li, Xu, and Zanetti, 2025; Cardoso, Salant, and Daubanes, 2025), exit of multinational enterprises (Wellhausen and Zhu, 2024), effects on exporters (Aytun et al., 2025), effect on third countries (Corsetti, Demir, and Javorcik, 2024; Li, Li, Park, Wang, and Wu, 2024) and financial sanctions (Efing, Goldbach, and Nitsch, 2023).

provides the most comprehensive assessment of the economic impact of trade sanctions on Russia to date.[10]

The rest of the paper is organized as follows. Section 2 provides the background on the Russian invasion of Ukraine in February 2022 as well as the sanctions that followed. Section 3 describes the data. Section 5 presents the results for the evolution of sanctioned import flows. Section 6 presents the results for the impact on firms that were importing to-be-sanctioned country-product varieties before the war. Section 7 concludes.

2 Background

Following the Russian aggression against Ukraine in February 2022, Western countries imposed an unprecedented level of sanction measures against Russia. The total number of sanctions imposed on Russia—exceeding 19,000—makes Russia one of the most sanctioned countries in world history (Trefanenko, 2025). In fact, this figure is greater than the combined number of sanctions currently imposed on Iran, Venezuela, Myanmar, and Cuba (Forbes, 2025).

These were not the first international sanctions against Russia. Prior to 2022, sanctions were imposed after the annexation of Crimea in 2014 and the start of the Donbas War. However, these sanctions were much more limited in scope and primarily targeted the politically connected and state-owned firms. On the contrary, the post-2022 sanctions were much more comprehensive.

Post-2022 sanctions included measures that targeted Russia's financial system, including the freezing of more than $300 billion of the Russian Central Bank's reserves and the exclusion of key Russian banks from the SWIFT international payment system. Sanctions have also been levied against individuals, freezing assets and imposing travel bans on Russian elites and government officials. Additionally, Western companies have been barred from providing Russia with services in IT, consulting, and legal fields, with many large multinational companies exiting Russia voluntarily. Furthermore, Russian airlines and shipping companies have faced transportation bans, further isolating the country from global supply chains.

[10] We also add to the literature on armed conflict and trade. This literature has documented the negative impact of conflicts on international trade as well as the peace-inducing effects of trade integration (Martin, Mayer, and Thoenig, 2008a,b; Thoenig, 2023). Closely related to our context, Korovkin and Makarin (2023) and Korovkin, Makarin, and Miyauchi (2024) examine the negative impact of the 2014 Russia-Ukraine conflict on Ukrainian firms' trade with Russia and the disruption and reorganization of production networks within Ukraine, respectively.

While the above sanctions play an important role and deserve to be studied separately, in this paper, we will focus on the post-2022 trade sanctions. Trade sanctions against Russia were of two types: against Russian exports and against Russian imports. Sanctions targeting Russian imports started being implemented almost immediately after February 2022, while sanctions against Russian exports started being introduced only towards the end of 2022. Measures against Russian exports included a ban of maritime oil export from Russia to G7 countries and the EU, along with a price cap on exports to all other countries (Johnson et al., 2023). Eventually, similar restrictions were applied to other raw materials. In this project, however, we focus exclusively on the impact of sanctions against Russian imports, with the goal of understanding whether restricted access to banned inputs disrupted the production processes of Russian firms.

Sanctions on Russian imports, the focus of this paper, have severely limited Russia's access to high-tech exports, particularly in sectors like semiconductors, aerospace, and energy. In the words of the EU official sources, they included bans on the Western exports of "cutting-edge technology (e.g. quantum computers and advanced semiconductors, electronic components and software), certain types of machinery and transportation equipment, specific goods and technology needed for oil refining, energy industry equipment, technology and services, aviation and space industry goods and technology (e.g. aircraft, aircraft engines, spare parts or any kind of equipment for planes and helicopters, jet fuel), maritime navigation goods and radio communication technology, a number of dual-use goods (goods that could be used for both civil and military purposes), such as drones and software for drones or encryption devices, luxury goods (e.g. luxury cars, watches, jewellery), civilian firearms, their parts and other army materials, chemicals, lithium batteries and thermostats, and other goods which could enhance Russian industrial capacities."[11] We present more details on the scope of these import sanctions and our data collection process below.

The impact of these trade sanctions on the Russian economy remains highly debated. Some observers argue that they have inflicted long-term damage by restricting access to crucial technologies and foreign capital, forcing Russia to pay higher prices for components and depend on a narrower set of trading partners (Luck, 2025). Meanwhile, others note that the country has proven more

[11] https://www.consilium.europa.eu/en/policies/sanctions/restrictive-measures-against-russia-over-ukraine/sanctions-against-russia-explained/

resilient than anticipated, with redirected trade routes through Turkey, China, and other neutral states fully mitigating some of the initial supply shocks (Krueger, 2024). The resulting landscape has led to a complex "cat-and-mouse" dynamic, where sanctions pressure is met by increasingly inventive evasion tactics, from parallel imports to disguised rerouted shipments.

Rigorous estimates of the pass-through of import sanctions on Russia remain scarce. Surveying over 1,800 Russian firms, Simachev et al. (2023) found that nearly two-thirds of the firms in their sample experienced negative effects from sanctions in the first year of the war. The adverse impacts of sanctions were more pronounced among importing firms, with 30% of the surveyed firms reporting difficulties with importing necessary goods and services and 17% facing issues with importing and servicing essential machinery. However, it remains unclear whether these survey responses match objective estimates based on a panel of Russian firms not subject to selection biases inherent in survey data and to what extent affected firms actually reduced output as a result.

3 Data

Data on the Import Sanctions Against Russia. One of the key challenges we face in our analysis is the absence of readily available data detailing which countries imposed trade sanctions on what specific product codes and when these sanctions were enacted. To address this gap and facilitate our analysis, we manually compiled a novel dataset on import sanctions imposed by nine major trading partners of Russia following February 2022: Australia, Canada, the EU, Japan, South Korea, Switzerland, Taiwan, the UK, and the US.

As a starting point for our dataset, we used the records available on the online platform Alta.ru, which provides comprehensive information on the sanctioned products and their description, the sanctioning countries, and the type of trade flow being sanctioned: Russian exports, Russian imports, re-exports to Russia, or transit through Russia.[12] This dataset was methodically cross-referenced with the enforcement dates extracted from official legal documents. Through this process, we have identified around 72,000 distinct country-product sanctioned varieties with 50 unique dates of sanction imposition. Due to the challenges of identifying precise sanction dates, in addition to a staggered difference-in-differences approach, we will also rely on a difference-in-

[12] Available at https://www.alta.ru/tnved/forbidden_codes/.

differences strategy comparing country-product trade flows before and after the start of the war.

Customs Data. To study the impact of sanctions on trade flows, we rely on a transaction-level dataset of international shipments as recorded by the Federal Customs Service of Russia. For each transaction, the dataset contains the country of shipment, the ten-digit product code (where the first six digits match the Harmonized System (HS) product classification), the product description, information on the sending and buying firms (including the tax ID for the firms located in Russia), unit value, total weight of each shipment, and its total contract value.

To investigate the completeness of this dataset, Figure A.1 presents the total value of all imports recorded in these data (in dark orange) benchmarked against the mirror data from UN Comtrade reported by other countries (purple), World Trade Organization (WTO, green), and the official data from the Russian Statistics Service (yellow, stopped reporting in January 2022). When aggregated, our data matches almost exactly the Russian official import statistics and closely matches the UN Comtrade mirror exports to Russia and the WTO Russian imports. While there is a difference in levels between the mirror trade data and our dataset, this difference most likely stems from the cost of transportation and insurance. Overall, these estimates suggest that our data correctly reflects the volume and evolution of Russian imports. This is in line with Babina et al. (2023) and Chupilkin et al. (2023), who also find that the quality of the Russian customs data was not severely affected by the start of the war.[13]

When merging the customs data with the import sanctions dataset, we account for changes in HS codes introduced in January 2022. Following Pierce and Schott (2012), we retire the HS codes and replace them with synthetic product codes that remain consistent throughout our study period. Specifically, for cases where HS codes split or merged during the classification transition, synthetic codes represent the connected set of altered codes. Throughout, we define each product's HS2 or HS3 codes based on the modal HS2 or HS3 codes within its respective connected set.

Firm Accounting Data. Further, we use the universe of reporting firm balance sheets and financial statements from 2014 through 2023. These data are collected and made available by the Federal

[13]Nevertheless, in results available upon request, we replicate our trade estimates using mirror data from UN COMTRADE. While these data are only available at the more aggregated HS6 product code level, likely biasing the estimates of sanctions on trade flows toward zero, the results remain consistent with our main findings.

Tax Authority. Firm balance sheets record the firm yearly revenues, profits, capital, material, and labor expenditures, along with other firm-level variables. We merge this dataset with the import transactions using buyer firm tax ID ("INN") to assess the impact of import sanctions on firms.

Data on Domestic Railway Shipments. We also use data on firm-to-firm railway shipments. For each shipment, the dataset records its weight, product code and description, buyer and seller information, and the nature of the shipment (import, export, or domestic shipment). In our context, railway shipment data are helpful as they offer granular proxy measures for the quantity of firms' domestic outgoing and incoming shipments and provide insight into the structure of the firm-to-firm production network. As such, we restrict our attention to domestic shipments.

Government Procurement Data. We extract the data on military procurement purchases from the Goszakupki database for the years 2012–2024 using the keywords related to military procurement. We then also apply filters to restrict our search to government procurement only. In total, we have identified 10,588 firms that engaged in military procurement as buyers and 24,240 firms that engaged in military procurement as suppliers at any point in this dataset.

Summary Statistics. Tables A.1 and A.2 display the summary statistics for Russian imports and firms, respectively. Table A.1 describes quarterly import flows between 2017Q1 and 2023Q4, showing significant variation in import values, transaction counts, and weights. Notably, 28% of country-product-quarter observations involve flows ever subject to sanctions, with 7% under active sanctions at the given quarter. Table A.2 presents firm-level statistics for Russian enterprises from 2014 to 2023, highlighting substantial heterogeneity in their sales, capital, and profitability. Only 2% of firms were directly exposed to import sanctions, i.e., imported country-product flows that were sanctioned after the war's onset. About 9.4% and 9.0% of all firms are in the manufacturing and science and technology industries, respectively. The sample has substantial geographic variation, with most firms (34.8%) located in the Central region. Additional data on railway shipments in Panel C of Table A.2 highlight the firms' extensive domestic logistical networks, showing substantial variation in shipment weights and the number of trading partners.[14]

[14]For summary statistics in Panels A and B of Table A.2, we exclude one firm with an abnormally high reported revenue of 30 trillion rubles—an amount exceeding the entire Russian federal budget. The inclusion or exclusion of this outlier does not affect our results.

4 Stylized Facts

Using our comprehensive data, we first establish several stylized facts about the sanctions against Russian imports after February 2022. These patterns highlight substantial variation in sanctions and imports across countries, products, and time, enabling our empirical analysis.

Magnitude and Evolution of Import Sanctions. First, we examine the size of imposed sanctions as well as how it evolves with the timeline of the sanctions' introduction. Figure 1 depicts the cumulative shares of all sanctioned country-product and product-level imports over time. According to our calculations, more than 36% of all country-product imports to Russia, weighted by prewar trade value, had been sanctioned by July 2024 (Figure 1a). At the product level, more than 80% of all imports in prewar trade value were sanctioned by at least one country by July 2024 (Figure 1b). Given Russia's status as one of the world's largest economies, these sanctions represent one of the most significant trade shocks in recent history.

The timeline of sanction impositions informs our empirical strategy. Nearly two-thirds of sanctions were introduced within the first few months of the war, making a simple pre-post DiD approach—comparing sanctioned and non-sanctioned import flows before and after the war's onset—a suitable starting point. However, since there was still substantial variation in sanction impositions between July 2022 and July 2024, a staggered DiD approach offers an additional layer of rigor, allowing us to leverage this timing variation to strengthen identification.

Aggregate Trends in Raw Data. Next, we examine the evolution of total Russian imports in the raw data for sanctioned and non-sanctioned products and for sanctioning and other countries.

Figure A.2a reveals a sharp decline in monthly imports from countries that imposed sanctions. These imports plummeted by roughly two-thirds, falling from around $15 billion to just above $5 billion in March 2022, continuing to gradually decline afterwards. In contrast, monthly imports from non-sanctioning countries also experienced an initial drop—by approximately one-third, from $12 billion to $8 billion, likely due to heightened aggregate uncertainty—but then quickly rebounded, eventually surpassing prewar levels and reaching around $15 billion per month.

Figure A.2b highlights trends in imports by the product sanctioned status. Total monthly imports of products sanctioned by at least one country quickly halved, declining from a prewar peak

of $24 billion to $14 billion in March 2022. However, by 2023, these imports had partially recovered to approximately $18 billion, though still remaining below the 2021 monthly average. In contrast, imports of non-sanctioned products remained stable throughout the 2018–2023 period. Together, these patterns suggest that the primary adjustment in Russian import flows occurred through rerouting and substitution between sanctioning and non-sanctioning countries, rather than through extensive relabeling or substitution between sanctioned and non-sanctioned products.

Figure A.3 further disaggregates total import flows into non-sanctioned imports, imports of sanctioned products from sanctioning countries, and imports of sanctioned products from non-sanctioning (friendly) countries, distinguishing between goods originating in the country of shipment and elsewhere. The sharp decline in sanctioned imports is nearly fully offset by the end of 2022 through increased imports from non-sanctioning countries. At first glance, this figure may suggest that import sanctions had minimal impact on either the flow of sanctioned goods or the Russian economy—an assertion we rigorously evaluate in the rest of the paper.

Most Sanctioned Products. Figure A.4a lists the twenty most sanctioned two-digit product categories, ranked by the share of their 2021 imports to Russia (in value) that was later prohibited. The most significant sanctions concentrate in HS2 codes 84, 85, and 87, which include technologically sophisticated goods, such as consumer electronics, drones, vehicles, and microchips. However, even within the three most targeted product groups, there are roughly as many non-sanctioned imports as sanctioned ones. Moreover, sanctions extend well beyond high-tech sectors. This substantial variation allows us to identify the impact of sanctions on trade flows even within a given broad category of products.

Most Sanctioning Countries. Figure A.4b ranks countries by the volume of their 2021 exports to Russia sanctioned while also showing their total prewar exports to Russia. Out of all countries, Germany stands out as the country that contributed the most to sanctions on Russian imports, banning around $25 billion of its own 2021 exports and leaving only $7 billion untouched. Notably, however, for nearly all sanctioning countries, some portion of exports remained non-sanctioned.

Not All Countries Sanctioned the Same Products. Table A.3 reports pairwise correlations between the lists of sanctioned products across countries from Egorov et al. (2025). While some

country pairs, such as the EU and the United Kingdom, exhibit a high degree of alignment in their sanctioned product lists, coordination appears significantly weaker among other country pairs. Notably, there is minimal overlap between the EU's list and those of Australia, Canada, or Taiwan.

Example: Semiconductors and Critical Components. Figure A.5 illustrates the import flows of sanctioned products, broken down by route type, using two examples of products that were especially crucial during the war: semiconductors and critical components.

Figure A.5a focuses on semiconductors and related products identified by HS codes beginning with 8541 and 8542. The blue area represents sanctioned shipments originating from sanctioning countries. Following the war's onset, the value of such shipments dropped to nearly zero. In contrast, semiconductor shipments dispatched from non-sanctioning (friendly) countries surged to approximately twice their 2021 value. Interestingly, for most of these flows, the country of origin differed from the country of shipment (grey area), suggesting that these products may have originated from sanctioning countries and were then rerouted through third countries. However, a smaller but significant portion of the imported value originated and was dispatched from the same friendly country (purple area), indicating direct production substitution.

When we look at a wider list of critical components in Figure A.5b, as identified by Bilousova, Hilgenstock, Ribakova, Shapoval, Vlasyuk, and Vlasiuk (2024), we also see a large drop in shipments of sanctioned components from sanctioning countries. However, the pattern differs for other types of flows. First, a substantial share of critical component shipments dispatched from the friendly countries was also produced in the same country, both before and after February 2022. A smaller proportion of total imports, the freight dispatched from friendly countries but originating from elsewhere, did increase after February 2022. However, despite significant growth in these alternative supply routes, the total value of critical component imports remained lower than in 2021, a stark contrast to the trends observed for semiconductors. The following sections will examine the overall effects of sanctions on all Russian imports.

5 Results: Impact on Trade

We start by estimating the impact of import sanctions on Russian trade patterns. Our analysis proceeds in five steps. First, we identify the relative impact of import sanctions on the sanctioned country-product import flows into Russia. Second, we evaluate the extent to which there has been substitution to and rerouting through countries that remained neutral or friendly to the Russian regime following the onset of the war. Third, we examine whether the volumes of substitution and rerouting were sufficient to compensate for the loss of sanctioned imports. Fourth, we connect this analysis to firm-level outcomes by examining the effect of import sanctions on firms' ability to import sanctioned products. Fifth, we investigate the impact of import sanctions specifically on military-related imports and firms involved in military supply chains.

5.1 Impact on Sanctioned Country-Product Imports

We estimate the impact of import sanctions on the sanctioned imports by, first, comparing the import flows of sanctioned and non-sanctioned country-product varieties before and after the onset of the war. Specifically, we estimate the following 'pre-post' DiD equation:

$$y_{gct} = \theta_t Sanctioned_{gc} + \tau_{gc} + \eta_{gt} + \omega_{ct} + \zeta_{gct}. \tag{1}$$

Here, y_{gct} are (log-)trade flows from country c to Russia of a 10-digit product code g at quarter t, measured either by total value or by total weight shipped; $Sanctioned_{gc}$ is an indicator that takes a value of 1 if a country-c-product-g trade flow has been sanctioned at any point, and 0 otherwise; τ_{gc} are the product-country fixed effects; η_{gt} are the product-quarter fixed effects; and ω_{ct} are the country-quarter fixed effects, netting out country boycotts and other country-level shocks as well as any changes in trade routing that do not depend on product type. The standard errors are two-way clustered at the product and country level.

Figure 2 displays the results. We observe no differential trends prior to the war, and then a sharp drop in the trade volume of the sanctioned country-product import flows compared to non-sanctioned imports after the war started. The negative impact is of considerable magnitude and grows over time, reaching -1.5 log points in value by the fourth quarter of 2023, equivalent to

around 80% decline. In Table 1, we estimate a nondynamic version of Equation (1), interacting $Sanctioned_{gc}$ with a simple post-February-2022 indicator instead of the yearly indicators and gradually adding the various fixed effects. Column (7) suggests a 60% ($= \exp^{-0.913} - 1$) relative decline in the value of sanctioned imports, on average, after the war's onset.

To further demonstrate that the observed declining patterns are attributable to sanctions rather than other country-product-specific shocks caused by the war, we employ a staggered DiD design. This approach exploits variation in the timing of sanctions across different country-product pairs, comparing import flows that were recently sanctioned to those not yet sanctioned and those never sanctioned at a given point in time. Specifically, we estimate the following equation, allowing for flexible patterns of heterogeneity in sanctions' impacts across time and treated flows:

$$y_{gct} = \sum_{e} \sum_{s \geq e} \beta_{es} \mathbb{1}(E_{gc} = e) \times \mathbb{1}(t = s) + \tau_{gc} + \eta_{gt} + \omega_{ct} + \zeta_{gct}, \tag{2}$$

where E_{gc} is the month when sanctions take effect on product g by country c (for non-sanctioned imports, $E_{gc} = \infty$). The rest of the notation follows equation (1), though, importantly, t now represents a month (instead of a quarter) to closely examine the timing of the introduction of the sanctions. Under the assumption that absent sanctions, sanctioned and non-sanctioned import flows would have followed parallel trends, the coefficients β_{es} capture the causal dynamic impact of trade sanctions on each cohort e.

Following the recent research highlighting potential biases in staggered DiD designs when treatment effects vary substantially across units and over time (Arkhangelsky and Imbens, 2023), we estimate equation (2) using the ETWFE estimator from Wooldridge (2021), which is particularly well-suited for estimating computationally intensive gravity models (Rios-Avila et al., 2024).

Figure 3 presents the resulting estimates averaged across all cohorts. The same figure contains our pre-trend coefficients, which we estimate separately closely following specification (2) but omitting all treated observations from this estimation (*cf.* Borusyak, Jaravel, and Spiess, 2024). Similar to the pre-post DiD design, the estimates indicate that sanctions have an immediate adverse impact on the sanctioned import flows, which intensifies over time. For the log value of imports, the decline reaches approximately $-.65$ log point (equivalent to a 48% reduction) within 5–7 months

of the sanctions' imposition, and then continues to intensify, eventually reaching close to -1.2 log points (a 70% reduction) in the following months.[15] In the first two columns of Table A.4, we further aggregate these dynamic estimates to a single average. Column (1) suggests a 54% ($= \exp^{-0.767} - 1$) relative decline in the value of sanctioned imports after the sanctions' imposition.

Such a large decline is perhaps not surprising—if anything, one may wonder why the bans did not result in a complete halt in sanctioned imports. This likely reflects a combination of imperfect enforcement, the presence of sanction exemptions, or measurement limitations, as some sanctions may apply only to specific product descriptions even within a given ten-digit HS code. Nevertheless, the sharp reduction in sanctioned imports, observed without pretrends despite numerous simultaneous shocks, provides strong validation of our identification strategy and establishes a robust first stage necessary for examining further pass-through effects of import sanctions.

Robustness. We demonstrate that our findings are robust to several checks. First, we show that our results are not dependent on the transformation of outcome variables using a logarithm with an additive constant of 1, which we employ to retain country-product-quarter cells with zero trade while ensuring computational feasibility. Specifically, columns 2–3 of Table A.5 show that the coefficients remain negative and substantial when using a simple logarithm transformation that omits zero trade flows. In turn, column 1 indicates large effects at the extensive margin—the probability of sanctioned imports being positive in a given quarter drops by 6.8 percentage points.

Second, we explore whether the patterns in Figures 2 and 3 are overly inflated due to SUTVA violations, as some countries have likely increased their exports of sanctioned products to Russia after the sanctions' imposition—a channel we further investigate in the next section. We assuage this concern by estimating Equation (1) only within a group of enemy countries. This exercise is likely overly conservative because Russia saw a decline even in non-sanctioned imports from those countries, e.g., due to the general disruption of trade and financial ties. Nevertheless, the results displayed in Figure A.6 and columns (1)–(2) of Table A.6 show large negative effects of similar magnitudes.[16] These estimates strongly suggest that our baseline results are not substantially

[15] The patterns of decline remain similar after we remove the first cohort of sanctions from the analysis, thus further assuaging the concerns of simultaneous war-related shocks.

[16] Since the types of product sanctioned are highly correlated within this group of countries, we omit the product-quarter fixed effects from this particular specification.

biased by control group contamination.

5.2 Rerouting and Substitution

We quantitatively examine the extent to which third-country imports of sanctioned products to Russia have increased—either through the re-export of goods originally produced in sanctioning countries (*rerouting*) or through the independent production of those goods within third countries (*substitution*). To operationalize this analysis, we first identify a set of countries that we classify as relatively friendly to the Russian regime.[17] We also designate as "enemy" countries those that imposed any export sanctions on Russia during our sample period. Using these classifications, we then estimate a modified version of Equation (1):

$$y_{gct} = \theta_t Sanctioned_{gc} + \gamma_t Sanctioned_g Friendly_c + \tau_{gc} + \eta_{gt} + \omega_{ct} + \zeta_{gct}, \tag{3}$$

where $Sanctioned_g$ is an indicator for whether a product g was ever sanctioned by any country, and $Friendly_c$ is an indicator for whether country c was friendly to the Russian regime. As such, under the corresponding parallel trend assumption, γ_t's document the dynamic changes in the imports of sanctioned products from countries that remained friendly to Russia after the war's onset.

Figure 4 presents the results. The estimates show an increase in Russian imports of sanctioned products from friendly countries, indicating substitution to or rerouting through these countries. After the friendly countries are removed from the comparison group, the impact on sanctioned import flows remains negative and of similar magnitude to Figure 2. At the same time, the magnitudes of rerouting and substitution are substantial: for value, imports of sanctioned products from friendly countries rose by 1.1–1.2 log points (equivalent to 200–232% increases) by the end of 2023. Table 2 further presents the non-dynamic version of these estimates, showing that these imports increased by 150% ($= \exp^{0.916} - 1$) on average across periods.

We note that although the estimates for θ_t and γ_t are similar in absolute magnitude, the total volume of prewar imports, indicated via dashed lines on Figure 4, was significantly larger for the enemy countries than for the friendly ones. As such, the increase in imports from the friendly

[17] We define friendly countries as Armenia, Belarus, China, Georgia, Hong Kong, Kazakhstan, Kyrgyzstan, Serbia, Turkey, and the UAE. This classification is based on journalistic accounts documenting these countries as common rerouting hubs for Russian imports. However, our results are robust to alternative classifications.

countries due to substitution and rerouting was unlikely to fully compensate for the decline in sanctioned flows—a point we further investigate below.

Figure A.7 replicates this analysis using a staggered DiD design, revealing similar patterns and magnitudes. However, while the impact on sanctioned imports is immediate, the increase in imports of sanctioned products from friendly countries takes a few months to materialize, becoming statistically significant for both value and weight starting in the fourth month after sanctions are imposed. This pattern broadly mirrors the gradual decline in sanctioned imports but may also reflect firms' search frictions in finding alternative suppliers or a gradual depletion of their inventories.

We further disentangle the effect of substitution and rerouting in Figure A.8. Specifically, we decompose each import flow of sanctioned products from friendly countries into two parts: products produced within friendly countries (substitution) and products produced elsewhere (rerouting). Then, we run the same regression as in Figure A.7, but we replace total imports of sanctioned products from friendly countries with these two separate flows corresponding to substitution and rerouting. We exclude directly sanctioned flows from this estimation, and thus, imports from neutral countries serve as a control group. We find that the overall increase in trade from friendly countries is almost completely driven by rerouting, while substitution plays only a minor role.

Overall, our findings in this section indicate a significant increase in the inflows of sanctioned products from third countries, primarily driven by rerouting rather than substitution. This pattern suggests that firms and intermediaries actively adapted to trade restrictions, potentially undermining their effectiveness. In the next section, we assess whether these channels fully offset the decline in sanctioned imports by conducting estimation at a more aggregate product level.

5.3 Impact of Import Sanctions on Total Trade of Sanctioned Products

Next, we assess whether the rerouting and substitution documented earlier fully compensated for the decline in sanctioned imports. Specifically, we investigate whether trade sanctions resulted in an overall reduction in the total imports of sanctioned products, regardless of the country of origin. To do so, we estimate a product-level version of Equation (1):

$$y_{gt} = \theta_t Sanctioned_g + \omega_{h(g)t} + \tau_g + \eta_t + \zeta_{gt}, \tag{4}$$

where y_{gct} are the total (log-)import flows of a product g into Russia at quarter t; $Sanctioned_g$ is an indicator that takes a value of 1 if the product g has been sanctioned by *any* country and at any point, and zero otherwise; $\omega_{h(g)t}$ are the higher-level (in our baseline specification, two-digit) product category time fixed effects; and the τ_g and η_t are the ten-digit-product-code and quarter fixed effects. The standard errors are clustered at the product level.

Figure 5 presents the results. The total imports of sanctioned products to Russia went down dramatically and persistently, albeit by a smaller magnitude relative to the decline in the country-product-level specification—by -0.4 to -0.5 log points, equivalent to a 32–39% decline. Table 3 displays the nondynamic estimates, confirming the overall estimates and also showing that the sanctioned products' unit values did not differentially increase.

Figure A.9 further confirms these patterns and magnitudes in a staggered DiD design, where the treatment timing is defined as the month when the earliest sanctions have been imposed on the product by any country. The last two columns of Table A.4 further aggregate these dynamic estimates to a single average, implying that, following the earliest introduction of import sanctions on a given product, total monthly imports of that product in value decline by 17.8% ($= \exp^{-0.196} - 1$).

These patterns suggest that while rerouting and substitution significantly mitigated the decline in sanctioned country-product import flows, these two adjustment channels did not fully offset the overall reduction in total imports of sanctioned product categories, which remained large and persistent. Given this sustained decline, one would expect further pass-through effects on firm production within Russia. However, before investigating this, we first confirm the negative impact of import sanctions on firm-product imports.

5.4 Impact of Import Sanctions on Firm-Level Imports of Sanctioned Products

Before estimating the pass-through of import sanctions onto Russian firms, we first assess whether these sanctions negatively affected *firm-level* imports. This exercise serves two key purposes. First, it establishes a firm-level first stage, crucial for interpreting the subsequent firm-level regressions. Second, it provides an additional robustness check by incorporating firm-time fixed effects, thereby addressing concerns that import sanctions may have coincided with other industry-specific shocks affecting firms that import certain types of products.

We estimate the impact of import sanctions on firms' imports via the following DiD equation:

$$y_{fgt} = \theta_t Sanctioned_{fg(c)} + \tau_{fg} + \eta_{gt} + \omega_{ft} + \zeta_{fgt}, \tag{5}$$

where y_{fgt} represent the total (log-)imports of product g by Russian firm f in quarter t, measured either by total value or by total weight shipped; $Sanctioned_{fg(c)}$ is an indicator that equals 1 if, before the war, a firm f imported product g from a country c that later imposed sanctions on its exports of that product to Russia. The specification includes firm-product fixed effects (τ_{fg}), product-quarter fixed effects (η_{gt}), and firm-quarter fixed effects (ω_{ft}), with the latter accounting for any firm-level shocks that may influence its imports independent of the product type. The standard errors are clustered at the product-firm level.

Figure A.10 presents the results. Following the war's onset, the firm's total imports of products where at least some of firm-product flow came from country-product varieties that were later sanctioned decreased by 10–15% in value and 5–10% in weight relative to other firm-product import flows. These estimates suggest that firms were unable to fully compensate for the increased difficulty of importing sanctioned products. As a result, we may expect import sanctions to have a non-negligible pass-through effect on domestic production, which we investigate below.

5.5 Impact of Military-Related Imports

Given that one of the primary objectives of import sanctions was to disrupt military-related production, it is crucial to examine their impact specifically on military-related imports. We investigate this question in two ways.

First, we assess whether import sanctions were as effective in reducing imports of military-related products as they were in curbing imports more generally. Figure A.11 shows no significant decline in the imports of sanctioned critical components identified by Main Directorate of Intelligence of Ukraine (2025) as being used for military applications by Russia. If anything, we observe a relative *increase* in the total value of these flows, though the absence of a corresponding increase in weight suggests a potential rise in import prices. Instead, the sharp decline in imports documented in Figure 5 was primarily concentrated among other, not military-related products.

Second, we examine whether import sanctions affected the imports of firms that we identified

as being part of military supply chains based on the publicly available government procurement data. Figure A.12 presents estimates of Equation (5) specifically for these firms and shows negative and significant effects, comparable in magnitude to the estimates obtained in Figure A.10.

Together, these findings suggest a nuanced impact of import sanctions on Russia's military-related production. While the Russian government appears to have taken measures to maintain access to critical components, import sanctions may have still disrupted military supply chains by restricting access to other inputs that are not directly used in weapon production.

6 Results: Impact on Firms

While the results in Section 5 suggest that import sanctions were effective in reducing imports of targeted products, it remains unclear whether they were also effective in disrupting production in the target economy. In this section, we leverage the richness of our data and assess the downstream implications of import sanctions for the performance of firms that were affected by their inability to import certain critical inputs.

To this end, we estimate a series of firm-year DiD regression, comparing firms before and after the war's onset by the degree to which a given firm has been importing sanctioned products prewar from countries that eventually sanctioned them. First, we construct an annual panel of firms and merge it with the customs data to calculate a firm-specific prewar sanctions exposure. That is, for a given firm f, we combine all of its imports from January 2019 to February 2022 and identify whether a firm ever imported any country-product varieties that were later sanctioned. We then estimate the following difference-in-differences specification:

$$y_{ft} = \beta_t Exposure_f + \delta_t \mathbf{X}_f + \mu_f + \epsilon_{ft} \tag{6}$$

Here, $Exposure_f$ is an indicator for whether a firm f ever imported a sanctioned country-product variety, y_{ft} represents firm-year outcomes such as yearly revenues, μ_f denotes firm fixed effects, while $\delta_t \mathbf{X}_f$ flexibly controls for year fixed effects interacted with firm characteristics that could be correlated with import sanctions exposure but may also have an independent time-varying influence on firm outcomes. These characteristics include whether the firm was ever an importer,

an exporter, or subject to targeted sanctions, as well as its industry classification. The coefficients of interest are β_t's, which, under the conditional parallel trends assumption, estimate the causal impact of import sanctions on firm outcomes. We cluster the standard errors at the firm level.

Firm Performance. Figure 6 presents the estimates of Equation (6) for firm revenues as an outcome. Firms exposed to sanctions through their imports saw a sharp 13–15% decline in their revenues after the war's onset, after having their revenues evolve in parallel with firms that never imported sanctioned varieties before the war. This negative effect persists throughout both 2022 and 2023, indicating that any adaptation strategies that firms may have employed did not result in a successful recovery. At the same time, the stability of the effect also suggests that the impact was not substantially delayed due to firms depleting existing inventories.[18]

Table 4 presents the nondynamic estimates of the impact of import sanctions on firm performance in the target country. Column (1) confirms a significant 14.3% decline in revenues among exposed firms.[19] Consistent with this revenue decline reflecting a real contraction in output, we observe similar negative effects on other firm-level outcomes: a 5.9% reduction in capital expenditures (column 3), an 8.1% decrease in labor expenditures (column 4) and a 14.0% reduction in material expenditures (column 5). Affected firms also became substantially less profitable (column 2). Additionally, there is a 4.6 percentage point increase in the likelihood of missing sales data, which may indicate a higher firm exit rate. When we impute missing sales as zeroes, we observe a massive 63.5% ($= \exp^{-1.007} - 1$) decline in affected firms' sales (column 7). However, caution is warranted in interpreting this magnitude, as some missing data may stem from reporting issues rather than firm closures.

Figure A.13 further demonstrates that firms reliant on government procurement contracts experienced a sharp 33% ($= \exp^{-0.4} - 1$) decline in the total yearly value of contracts won if they were exposed to import sanctions. This finding not only reinforces the evidence of a contraction

[18] These findings provide indirect support for the negative impact on sanctioned imports in Section 5, alleviating concerns that Russian customs data might be missing significant volumes of black-market transactions.

[19] Table A.7 demonstrates that these baseline estimates remain robust after incorporating additional controls, including yearly fixed effects interacted with whether a firm imported any sanctioned products from friendly and neutral countries before the war, as well as yearly fixed effects interacted with whether a firm had a railway-connected buyer or supplier that was exposed to import sanctions. In the results available upon request, we further probe robustness by re-estimating the specifications in this table with additional controls for firms' macro-region-by-year fixed effects, and the coefficients remain virtually unchanged.

in affected firms' output but also suggests that the government was unable to compensate these firms through increased procurement spending. This contrasts with the findings of Nigmatulina (2021), who documented that targeted sanctions against Russian firms post-2014 were offset by government subsidies, including in the form of procurement sales.

Overall, these estimates provide strong evidence of a substantial pass-through effect, demonstrating that import sanctions and the resulting decline in sanctioned imports had a meaningful negative impact on firm performance in the target economy.

Effects By Industry. Figure A.14 displays the estimates for differential changes in firm revenue by industry. We find that the downstream impact of import sanctions on firm revenue is present even when focusing exclusively on firms in the manufacturing sector (Panel A) and the science and technology sector (Panel B). Table A.8 provides a tabular representation of these industry-specific heterogeneity patterns, showing that similar effects extend beyond revenue to other key firm outcomes. Notably, the table suggests that firms in the science and technology sector are particularly affected compared to other industries.

These findings align with one of the primary objectives of import sanctions against Russia, which was to disrupt production inside the country by depriving its manufacturing and technological sectors of critical inputs. They are also consistent with one of the stylized facts documented in Section 4, suggesting that high-tech and manufacturing inputs are among the most heavily sanctioned products in our dataset. However, the negative impact is present in the wholesale and transportation sectors, as well as other industries, including, for example, agriculture.

Domestic Propagation Effects. Next, we examine whether production disruptions caused by import sanctions propagate through domestic supply chains, affecting firms downstream (buyers) and upstream (suppliers). To do so, we leverage detailed firm-to-firm railway shipment data, which enables us to identify a subset of buyers and suppliers for each firm. We then assess two key questions: (i) whether firms directly exposed to import sanctions experience changes in their domestic shipments, and (ii) whether firms that are indirectly exposed—by having a buyer or supplier affected by import sanctions—also suffer performance declines.

Table A.9 addresses the first question by examining whether firms exposed to import sanc-

tions experience a contraction in their domestic trade, both in terms of volume and number of partners. Specifically, we estimate Equation (6) looking at both measures of trade intensity for firms' in-shipments, out-shipments, and total trade. The results in columns (1)–(3) show a significant negative impact on total shipments, driven primarily by a decline in in-shipments, while out-shipments exhibit an insignificant response. Columns (4)–(6) examine the effect of import sanctions on firms' total number of suppliers, buyers, and overall trading partners. The estimates reveal a significant contraction across all three measures, indicating that affected firms not only lose suppliers but also face challenges in maintaining their buyer networks. Overall, these findings suggest that firms exposed to import sanctions do not compensate by expanding domestic trade but instead experience an overall reduction in economic activity, implying that the disruptions caused by import sanctions likely reverberate throughout domestic supply chains.

We take the results of Table A.9 seriously and incorporate measures of higher-level exposure into our baseline specifications from Table 4. This analysis is presented in Table 5, where we introduce indicator variables for whether a firm's buyer or supplier was itself exposed to import sanctions. The results in Table 5 confirm that the baseline coefficient remains stable, continuing to indicate a decline of approximately 14%. However, we also find that having a supplier exposed to sanctions imposes an additional negative effect of more than two-thirds of the main effect. The analogous effect for exposure through buyers is smaller and becomes statistically insignificant in the full specification of column (4), where both buyer and supplier exposures are included simultaneously. These findings suggest that import sanctions not only caused direct disruptions by depriving certain Russian firms of critical inputs but also led to substantial indirect disruptions through supply chain dependencies. Firms that relied on domestic suppliers, which in turn depended on sanctioned imports, experienced additional negative spillover effects. These propagation effects amplify the overall economic impact of import sanctions, further constraining domestic production.

7 Conclusion

In an era of nuclear weapons and the general hesitancy to engage in large-scale international conflicts, countries often resort to sanctions as a tool of foreign policy and influence. Import sanc-

tions serve as a strategic tool to deprive the targeted country of essential inputs, thereby disrupting its production capabilities. But how effective are import sanctions in achieving this objective?

We study this question in the context of the 2022 Russian invasion of Ukraine and the subsequent import sanctions imposed on Russia, which were unparalleled in their scope. Combining Russian data on the universe of international trade transactions, accounting data for a near-universe of Russian firms, firm-to-firm railway shipments, and government procurement data, we provide the most granular and comprehensive evidence on the impact of import sanctions to date.

Our findings indicate that import sanctions had a large negative impact on the sanctioned country-product trade flows. While we observe significant evidence of rerouting and, to a lesser extent, substitution, these adjustment mechanisms were not sufficient to fully offset the decline in overall imports of sanctioned products. However, our estimates suggest that the Russian government was able to fully recover imports of critical components used in direct war applications.

Further, we document substantial pass-through of import sanctions onto Russian firms. Firms exposed to import sanctions through their prewar import composition experience declines in sales, cost expenditures, profitability, and government contracts along with increased exit rates. Additionally, firms with exposed suppliers also suffer revenue reductions.

Taken together, our findings suggest that, contrary to claims that import sanctions against Russia were rendered ineffective by roundabout trade, these measures resulted in significant disruptions to Russian firms' production capacity and supply chains.

References

Ahn, D. P. and R. D. Ludema (2020). The sword and the shield: The economics of targeted sanctions. *European Economic Review 130*, 103587.

Alekseev, M. and X. Lin (2024). Trade policy in the shadow of conflict: the case of dual-use goods. Technical report, Technical Report.

Arkhangelsky, D. and G. Imbens (2023). Causal models for longitudinal and panel data: A survey. Technical report, National Bureau of Economic Research.

Aytun, U., J. Hinz, and C. Özgüzel (2025). Shooting down trade: Firm-level effects of embargoes. *Journal of Economic Behavior & Organization 231*, 106821.

Babina, T., B. Hilgenstock, O. Itskhoki, M. Mironov, and E. Ribakova (2023). Assessing the

Impact of International Sanctions on Russian Oil Exports. *SSRN Electronic Journal*.

Bai, X., J. Fernández-Villaverde, Y. Li, L. Xu, and F. Zanetti (2025). The (un) intended consequences of oil sanctions through the dark shipping of sanctioned oil.

Becko, J. S. (2024). A theory of economic sanctions as terms-of-trade manipulation. *Journal of International Economics 150*, 103898.

Becko, J. S. and D. O'Connor (2024). Strategic (dis) integration. Technical report, Working Paper.

Berthou, A. (2022). International sanctions and the dollar: Evidence from trade invoicing.

Bianchi, J. and C. Sosa-Padilla (2024). On wars, sanctions, and sovereign default. *Journal of Monetary Economics 141*, 62–70.

Bilousova, O., B. Hilgenstock, E. Ribakova, N. Shapoval, A. Vlasyuk, and V. Vlasiuk (2024). Challenges of export controls enforcement: how russia continues to import components for its military production.

Borusyak, K., X. Jaravel, and J. Spiess (2024). Revisiting event-study designs: robust and efficient estimation. *Review of Economic Studies 91*(6), 3253–3285.

Broner, F., A. Martin, J. Meyer, and C. Trebesch (2024). Hegemonic globalization. Technical report, Working Paper.

Cardoso, D. S., S. W. Salant, and J. X. Daubanes (2025). The dynamics of evasion: The price cap on russian oil exports and the amassing of the shadow fleet.

Chupilkin, M., B. Javorcik, A. Peeva, and A. Plekhanov (2023). Exorbitant privilege and economic sanctions.

Chupilkin, M., B. Javorcik, A. Peeva, and A. Plekhanov (2024). Economic sanctions and intermediated trade.

Chupilkin, M., B. Javorcik, and A. Plekhanov (2023). The Eurasian Roundabout: Trade Flows Into Russia through the Caucasus and Central Asia. Technical report, European Bank for Reconstruction and Development.

Clayton, C., M. Maggiori, and J. Schreger (2024). A theory of economic coercion and fragmentation. *Available at SSRN 4767131*.

Conway, E. (2023). Surge in Sale of UK-made Cars to Russia's Neighbours Shows How It's Beating Sanctions. https://news.sky.com/story/how-uk-made-cars-are-finding-their-way-to-russias-showrooms-13092809. Accessed: 05 February 2025.

Corsetti, G., B. Demir, and B. Javorcik (2024). Trading around geopolitics. *Robert Schuman*

Centre for Advanced Studies Research Paper (2024/43).

Draca, M., J. Garred, L. Stickland, and N. Warrinnier (2023). On target? sanctions and the economic interests of elite policymakers in iran. *The Economic Journal 133*(649), 159–200.

Eaton, J. and M. Engers (1992). Sanctions. *Journal of Political Economy 100*(5), 899–928.

Efing, M., S. Goldbach, and V. Nitsch (2023). Freeze! financial sanctions and bank responses. *The Review of Financial Studies 36*(11), 4417–4459.

Egorov, K., V. Korovkin, A. Makarin, and D. Nigmatulina (2025). Trade sanctions against russia: Stylized facts. *AEA Papers & Proceedings*.

European Commission (2022). Sanctions Adopted Following Russia's Military Aggression Against Ukraine. https://finance.ec.europa.eu/eu-and-world/sanctions-restrictive-measures/sanctions-adopted-following-russias-military-aggression-against-ukraine_en. Accessed: 05 February 2025.

Fajgelbaum, P. D. and A. K. Khandelwal (2022). The economic impacts of the us–china trade war. *Annual Review of Economics 14*(1), 205–228.

Forbes (2025). The most sanctioned countries. https://forbes.ge/en/the-most-sanctioned-countries/ (accessed January 26, 2025).

Gopinath, G., P.-O. Gourinchas, A. F. Presbitero, and P. Topalova (2025). Changing global linkages: A new cold war? *Journal of International Economics 153*, 104042.

Haidar, J. I. (2017). Sanctions and export deflection: evidence from Iran. *Economic Policy 32*(90), 319–355.

Hilgenstock, B., E. Ribakova, N. Shapoval, T. Babina, O. Itskhoki, and M. Mironov (2023). Russian oil exports under international sanctions. *Available at SSRN 4430053*.

Hinz, J. and E. Monastyrenko (2022). Bearing the cost of politics: Consumer prices and welfare in Russia. *Journal of International Economics 137*, 103581.

Itskhoki, O. and D. Mukhin (2022). Sanctions and the exchange rate. Technical report, National Bureau of Economic Research.

Itskhoki, O. and E. Ribakova (2024). The economics of sanctions. *Brookings Papers on Economic Activity*.

Johnson, S., L. Rachel, and C. Wolfram (2023). Design and implementation of the price cap on russian oil exports. *Journal of Comparative Economics 51*(4), 1244–1252.

Juhász, R. (2018). Temporary protection and technology adoption: Evidence from the napoleonic blockade. *American Economic Review 108*(11), 3339–3376.

Kilian, L., D. Rapson, and B. C. Schipper (2024). The impact of the 2022 oil embargo and price cap on russian oil prices.

Kooi, O. (2024). Power and resilience: An economic approach to national security policy.

Korovkin, V. and A. Makarin (2023). Conflict and Intergroup Trade: Evidence from the 2014 Russia-Ukraine Crisis. *American Economic Review 113*(1), 34–70.

Korovkin, V., A. Makarin, and Y. Miyauchi (2024). Supply Chain Disruption and Reorganization: Theory and Evidence from Ukraine's War. *Available at SSRN 4825542*.

Krueger, A. O. (2024). Why the russia sanctions are failing. https://www.project-syndicate.org/commentary/how-russia-circumvented-western-sanctions-by-anne-o-krueger-2024-01 (accessed January 26, 2025).

Li, H., Z. Li, Z. Park, Y. Wang, and J. Wu (2024). To comply or not to comply: Understanding neutral country supply chain responses to russian sanctions. *Available at SSRN 5031650*.

Liu, E. and D. Yang (2024). International power.

Luck, P. (2025). How sanctions have reshaped russia's future. https://www.csis.org/analysis/how-sanctions-have-reshaped-russias-future (accessed January 26, 2025).

Mackinnon, A. (2024). Russia's War Machine Runs on Western Parts. https://foreignpolicy.com/2024/02/22/russia-sanctions-weapons-ukraine-war-military-semiconductors/. Accessed: 05 February 2025.

Main Directorate of Intelligence of Ukraine (2025). War & Sanctions. Accessed: 19 March 2025.

Martin, P., T. Mayer, and M. Thoenig (2008a). Civil wars and international trade. *Journal of the European Economic Association 6*(2-3), 541–550.

Martin, P., T. Mayer, and M. Thoenig (2008b). Make trade not war? *The Review of Economic Studies 75*(3), 865–900.

Mayer, T., I. Mejean, and M. Thoenig (2024). The fragmentation paradox: How de-risking trade undermines global safety. Technical report, mimeo.

Mohr, C. and C. Trebesch (2025). Geoeconomics. *Kiel Working Paper*.

Monastyrenko, E. and P. M. Picard (2023). Welfare implications of trade sanctions against russia.

Morgan, T. C., C. Syropoulos, and Y. V. Yotov (2023). Economic sanctions: Evolution, consequences, and challenges. *Journal of Economic Perspectives 37*(1), 3–29.

Nigmatulina, D. (2021). Sanctions and misallocation. how sanctioned firms won and russia lost. *Working Paper*.

Pierce, J. R. and P. K. Schott (2012). Concording us harmonized system codes over time. *Journal of Official Statistics 28*(1), 53–68.

Rios-Avila, F., A. Nagengast, and Y. Yotov (2024). Jwdid: Stata module to estimate difference-in-difference models using mundlak approach.

Simachev, Y. V., A. Yakovlev, V. Golikova, N. Gorodnyi, B. Kuznetsov, M. Kuzyk, and A. Fedyunina (2023). Russian industrial companies under the "second wave" of sanctions: Response strategies. *Voprosy Ekonomiki* (12).

Spiro, D., H. Wachtmeister, and J. Gars (2024). Assessing the impact of oil sanctions on russia. *Available at SSRN 4860148*.

Thoenig, M. (2023). *Trade Policy in the Shadow of War: A Quantitative Toolkit for Geoeconomics*. Centre for Economic Policy Research.

Trefanenko, O. (2025). Fortune hunting: Russia and sanctions evasion. https://hir.harvard.edu/fortune-hunting-russia-and-sanctions-evasion/ (accessed January 26, 2025).

Turner, D. C. and D. E. Sappington (2024). On the design of price caps as sanctions. *International Journal of Industrial Organization 97*, 103099.

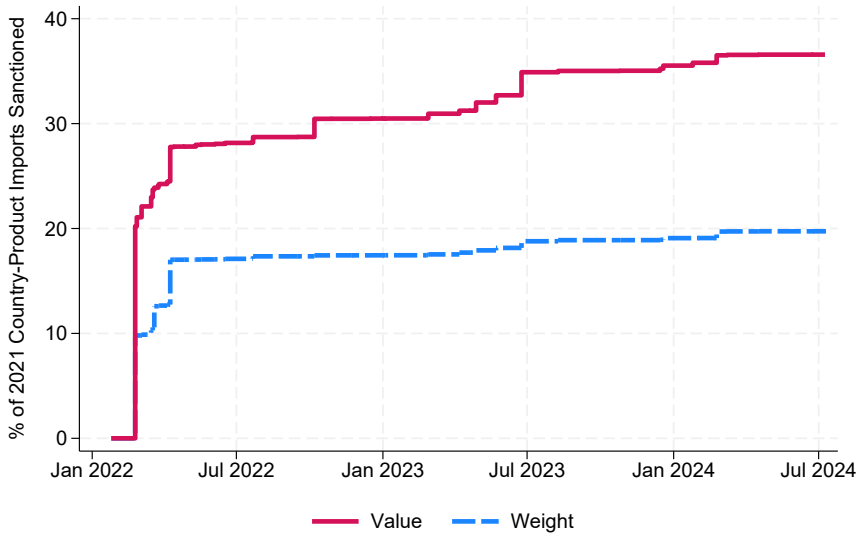
Tyazhelnikov, V. and J. Romalis (2024). Russian counter-sanctions and smuggling: Forensics with structural gravity estimation. *Journal of International Economics 152*, 104014.

Wellhausen, R. L. and B. Zhu (2024). Exiting russia. Technical report, Working Paper.

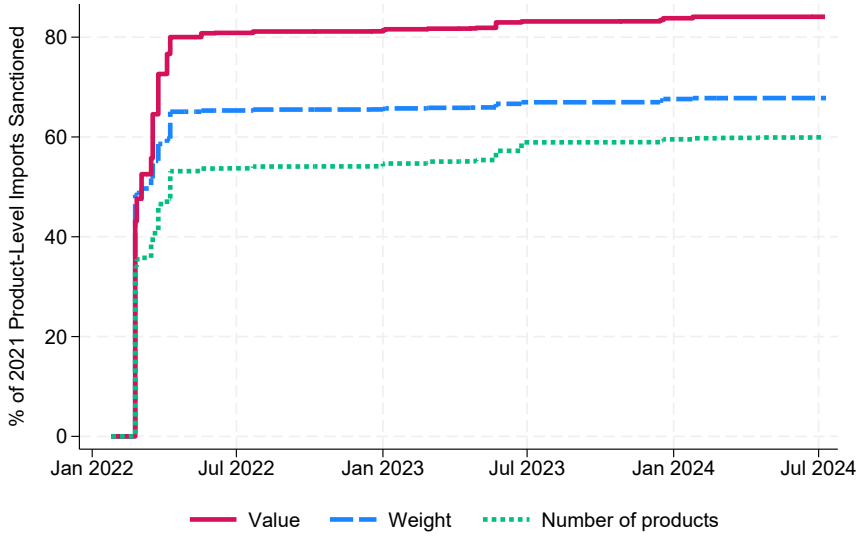
Wooldridge, J. M. (2021). Two-way fixed effects, the two-way mundlak regression, and difference-in-differences estimators. *Available at SSRN 3906345*.

World Bank (2023). ICP 2021 Data Visualization. https://www.worldbank.org/en/programs/icp/brief/ICP2021_DataViz_1. Accessed: 05 February 2025.

Figure 1: Timing of Sanctions' Introduction on Russian Imports, Expressed as a Share of 2021 Trade Volume



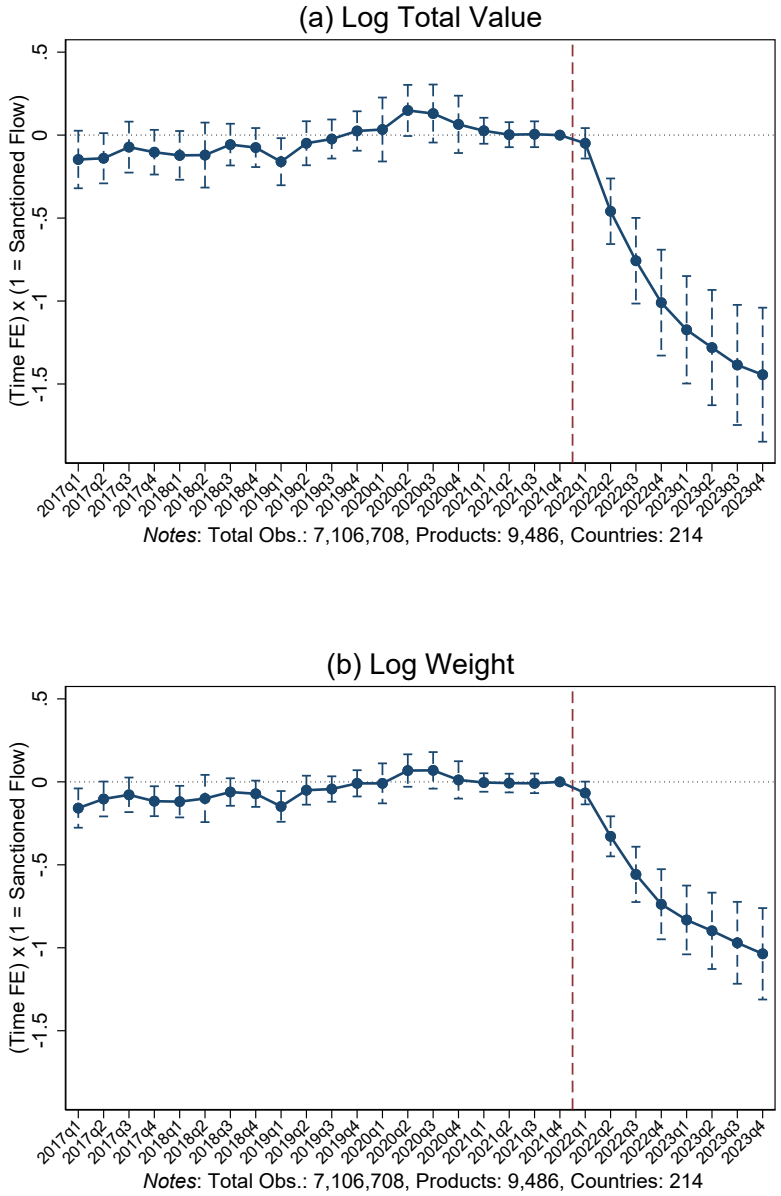
(a) Country-Product-Level Imports



(b) Product-Level Imports

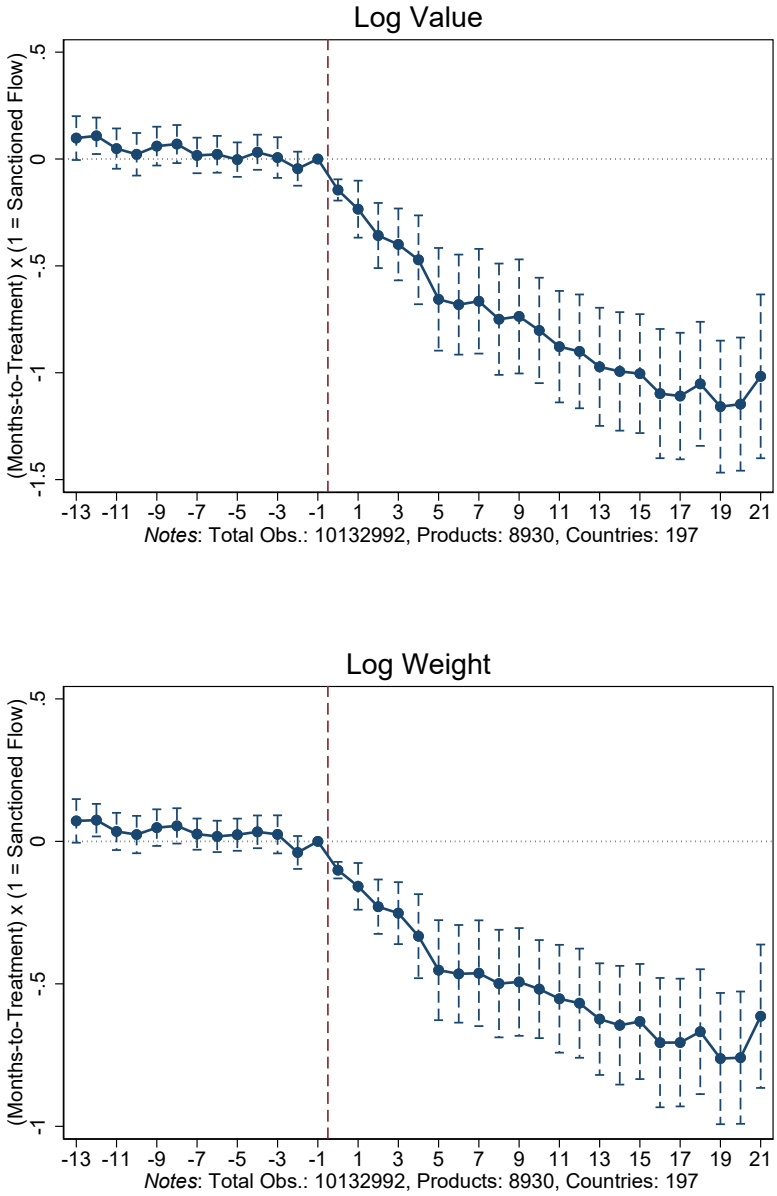
Notes: This figure displays the timing and volume of sanctions imposed on Russia's imports, measured based on their prewar levels. Specifically, for each date from February 2022 to July 2024, we compute the share of Russian imports sanctioned by any country, using 2021 trade data as a baseline. Panel (a) calculates this share at the country-product level. Panel (b) calculates this share at the product level, assigning each product the earliest date at which it was sanctioned by any country. The shares are reported across three dimensions: by value (in red), by weight (in blue, long-dashed), and, for Panel (b) only, by the number of sanctioned products (in green, short-dashed).

Figure 2: The Impact of Sanctions on Russian Imports, Country-Product-Level



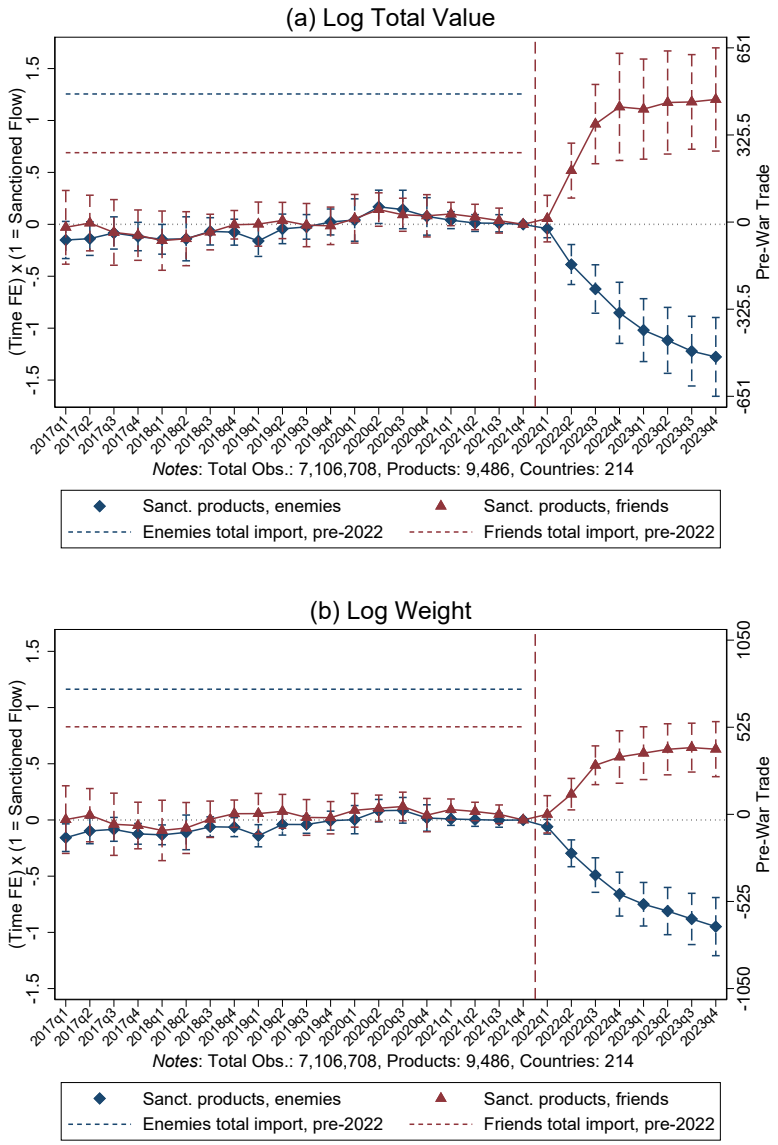
Notes: These figures present the dynamic difference-in-differences estimates of Equation (1), which assess the impact of sanctions on Russian imports by comparing the volume of sanctioned country-product imports to that of non-sanctioned imports before and after the war's onset. The data is aggregated quarterly, with 2021Q4 serving as the baseline period. The top (bottom) figure uses the total import value (net weight) of a given product from a given country in a given quarter as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

Figure 3: The Impact of Sanctions on Russian Imports, Country-Product-Level, Staggered Design



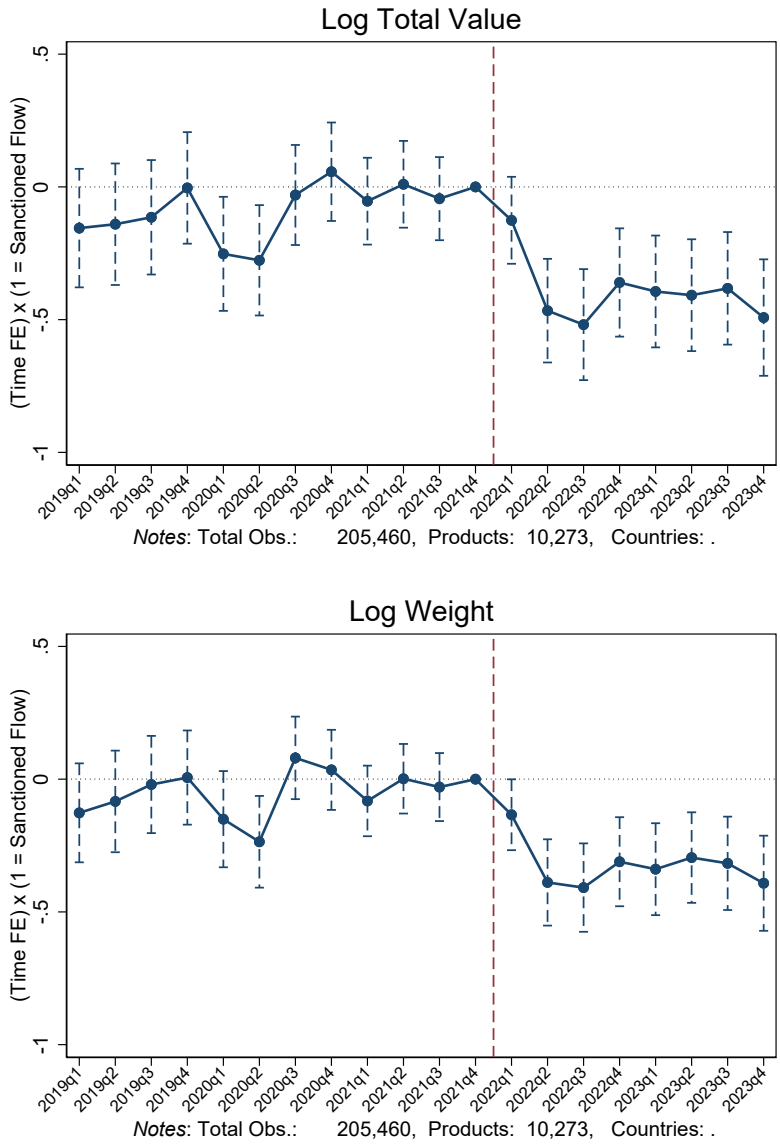
Notes: These figures present the staggered difference-in-differences estimates of Equation (2), which assess the impact of sanctions on Russian imports by comparing the volume of sanctioned country-product imports to that of non-sanctioned imports before and after the imposition of sanctions on the former. The data is aggregated at the monthly level, and the estimates are aggregated across cohorts at the time level. Pre-trend coefficients are estimated based on a separate regression, where all treated observations are omitted. The top (bottom) figure uses the total import value (net weight) of a given product from a given country in a given month as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

Figure 4: The Impact of Sanctions on Russian Imports, Country-Product-Level, Accounting for Substitution and Rerouting via Friendly Countries



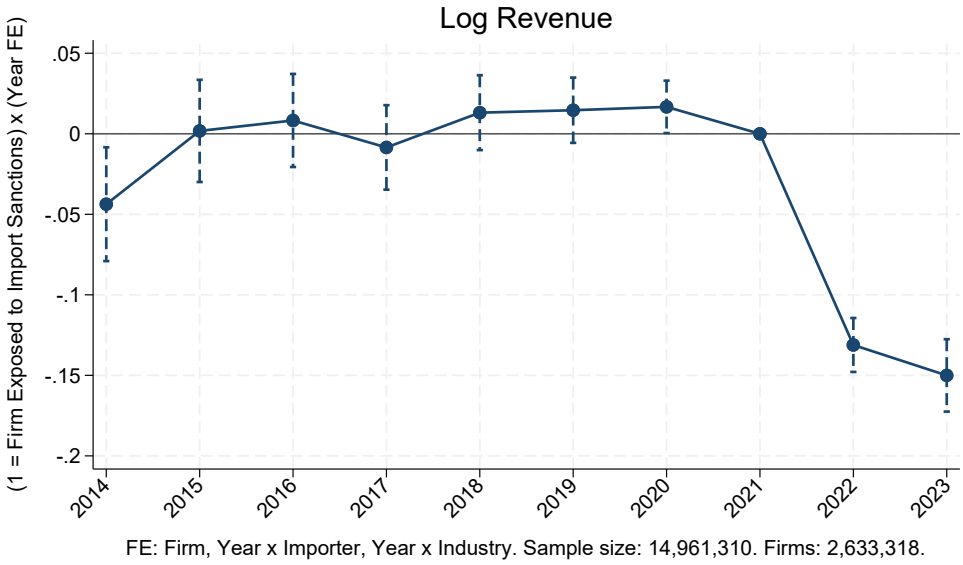
Notes: These figures investigate the presence of substitution to and rerouting through third countries by estimating Equation (3), which compares the volume of sanctioned country-product imports to that of non-sanctioned imports, before and after the war's onset, but separating out the imports of ever-sanctioned products from the 'friendly' countries. 'Friends' are the countries that remained relatively friendly to the Russian regime after the war's onset: Armenia, Kazakhstan, Kyrgyzstan, Georgia, Turkey, Belarus, Serbia, China, Hong Kong, and the UAE. 'Enemy' countries include countries that have ever imposed trade sanctions on Russia. The data is aggregated at the quarterly level, with 2021Q4 serving as the baseline period. The top (bottom) figure uses the total import value (net weight) of a given product from a given country in a given quarter as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The short-dashed lines represent the total volume of prewar trade with friendly and enemy countries. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

Figure 5: The Impact of Sanctions on Russian Imports, Product-Level



Notes: These figures assess the impact of sanctions on the total imports of sanctioned products, independent of the identity of countries-importers. Specifically, they present the dynamic difference-in-differences estimates of Equation (4), which compares the volume of sanctioned product imports to that of non-sanctioned imports before and after the war's onset. The data is aggregated at the quarterly level, with 2021Q4 serving as the baseline period. The top (bottom) figure uses the total import value (net weight) of a given product in a given quarter as an outcome. The logarithms add 1 to the argument's value to avoid missing values. Regressions control for HS2-product-year fixed effects. The bars represent 95% confidence intervals. Standard errors are clustered at the product level.

Figure 6: The Impact of Import Sanctions on Exposed Firms' Sales



Notes: This figure examines the impact of import sanctions on the revenues of firms that, prior to the war, imported any country-product variety that was later sanctioned. Specifically, it presents the dynamic difference-in-differences estimates of Equation (6), which compares firm revenues between firms with and without prewar exposure to future import sanctions, before and after the war's onset. The revenue data come at the yearly level, and 2021 serves as the baseline period. The logarithms add 1 to the argument's value to avoid missing values. The bandwidths represent 95% confidence intervals. Standard errors are clustered at the firm level.

Table 1: The Impact of Sanctions on Russian Imports

	(1) Log Total Value	(2) Log Total Weight	(3) Log Total Value	(4) Log Total Weight	(5) Log Total Value	(6) Log Total Weight	(7) Log Total Value	(8) Log Total Weight
Post-War × Sanctioned Flow	-2.137***	-1.567***	-2.408***	-1.634***	-0.700***	-0.506***	-0.913***	-0.631***
	(0.161)	(0.116)	(0.350)	(0.250)	(0.084)	(0.064)	(0.134)	(0.090)
Product-Country FE	✓	✓	✓	✓	✓	✓	✓	✓
Product-Quarter FE			✓	✓			✓	✓
Country-Quarter FE					✓	✓	✓	✓
Mean Dep. Var.	3.65	2.55	3.66	2.55	3.65	2.55	3.66	2.55
SD Dep. Ver.	5.09	4.00	5.09	4.00	5.09	4.00	5.09	4.00
Observations	7,128,940	7,128,940	7,106,904	7,106,904	7,128,744	7,128,744	7,106,708	7,106,708
Number of Countries	221	221	221	221	214	214	214	214
Number of Products	10,273	10,273	9,486	9,486	10,273	10,273	9,486	9,486

Notes: This table presents the estimates of equation (1) studying whether imports into Russia at the product-country-quarter level declined following the onset of the Russian invasion of Ukraine in 2022, depending on whether that product-country variety was later sanctioned. The outcome variable in the even-numbered columns is the log of total value imported, while in the odd-numbered columns, it is the log of total weight imported. The logarithms add 1 to the argument's value to avoid missing values. The time span is from 2017Q1 through 2023Q4. Products refer to ten digit HS codes, unless they were aggregated due to changes in HS classification following Pierce and Schott (2012). Standard errors in parentheses are two-way clustered at the country and product levels. * p<0.1, ** p<0.05, *** p<0.01.

Table 2: The Impact of Sanctions on Russian Imports, Accounting for Substitution and Rerouting via Friendly Countries

	(1) Log Total Value	(2) Log Total Weight	(3) Log Total Value	(4) Log Total Weight	(5) Log Total Value	(6) Log Total Weight	(7) Log Total Value	(8) Log Total Weight
Post-War × Sanctioned Flow	-2.137***	-1.567***	-1.743***	-1.212***	-0.700***	-0.506***	-0.786***	-0.569***
	(0.161)	(0.116)	(0.319)	(0.229)	(0.084)	(0.064)	(0.119)	(0.081)
Post-War × Sanctioned Product ×	1.889***	1.107***	2.395***	1.521***	0.992***	0.558***	0.916***	0.448***
× Friendly Country	(0.357)	(0.243)	(0.445)	(0.302)	(0.112)	(0.060)	(0.141)	(0.069)
Product-Country FE	✓	✓	✓	✓	✓	✓	✓	✓
Product-Quarter FE			✓	✓			✓	✓
Country-Quarter FE					✓	✓	✓	✓
Mean Dep. Var.	3.65	2.55	3.66	2.55	3.65	2.55	3.66	2.55
SD Dep. Ver.	5.09	4.00	5.09	4.00	5.09	4.00	5.09	4.00
Observations	7,128,940	7,128,940	7,106,904	7,106,904	7,128,744	7,128,744	7,106,708	7,106,708
Number of Countries	221	221	221	221	214	214	214	214
Number of Products	10,273	10,273	9,486	9,486	10,273	10,273	9,486	9,486

Notes: This table examines whether imports into Russia at the product-country-quarter level declined following the onset of the Russian invasion of Ukraine in 2022, even accounting for substitution and rerouting through countries that remained relatively friendly to the Russian regime. Specifically, it presents the estimates of equation (1), modified to include an additional interaction term capturing whether a given country-product import flow involved a product that was ever sanctioned and originated from a friendly country, interacted with a post-war indicator. Friendly countries are defined as Armenia, Kazakhstan, Kyrgyzstan, Georgia, Turkey, Belarus, Serbia, China, Hong Kong, and the UAE. The outcome variable in the even-numbered columns is the log of total value imported, while in the odd-numbered columns, it is the log of total weight imported. The logarithms add 1 to the argument's value to avoid missing values. The time span is from 2017Q1 through 2023Q4. Product codes refer to ten digit HS codes, unless they needed to be aggregated due to changes in HS classification over time following Pierce and Schott (2012). Standard errors in parentheses are two-way clustered at the country and product levels. * p<0.1, ** p<0.05, *** p<0.01.

Table 3: The Impact of Sanctions on Russian Imports, Product-Level

	(1) Log Total Value	(2) Log Total Weight	(3) Log Unit Price	(4) Log Total Value	(5) Log Total Weight	(6) Log Unit Price
Post-War × Sanctioned Product	-0.273***	-0.168***	-0.074***	-0.310***	-0.273***	0.010
	(0.049)	(0.043)	(0.015)	(0.073)	(0.063)	(0.022)
Quarter FE	✓	✓	✓			
Product FE	✓	✓	✓	✓	✓	✓
2-Digit Product-Quarter FE				✓	✓	✓
Mean Dep. Var.	10.24	8.49	3.24	10.24	8.49	3.24
SD Dep. Var.	6.00	5.49	2.53	6.00	5.49	2.53
Observations	205,460	205,460	160,127	205,460	205,460	160,127
Number of Products	10,273	10,273	9,417	10,273	10,273	9,417

Notes: This table examines whether total imports of sanctioned products into Russia, independent of country-exporter, declined following the onset of the Russian invasion of Ukraine in 2022. Specifically, it presents the estimates of equation (4) modified by replacing θ_t with a single post-war indicator. The outcome variable in columns (1) and (4) is the log of total value imported; in columns (2) and (5)—log of total weight imported; and in columns (3) and (6)—log-unit price, defined as value per weight calculated for each transaction and then averaged at the product-code level weighted by transactions' value. The time span is from 2019Q1 through 2023Q4. Product codes refer to ten digit HS codes, unless they needed to be aggregated due to changes in HS classification over time following Pierce and Schott (2012). The logarithms add 1 to the argument's value to avoid missing values. Standard errors in parentheses are clustered at the product level. * p<0.1, ** p<0.05, *** p<0.01.

Table 4: The Impact of Trade Sanctions on Russian Firms

	(1) Log Sales	(2) IHS Profit	(3) Log Capital	(4) Log Labor	(5) Log Materials	(6) Missing Sales	(7) Log Sales (Zeroes if Missing)
Post-2022 ×	-0.143***	-0.399***	-0.059***	-0.081***	-0.140***	0.046***	-1.007***
× Firm Exposed to Import Sanctions	(0.010)	(0.072)	(0.014)	(0.013)	(0.017)	(0.002)	(0.052)
Firm FE	✓	✓	✓	✓	✓	✓	✓
Year-Importer FEs	✓	✓	✓	✓	✓	✓	✓
Year-Exporter FEs	✓	✓	✓	✓	✓	✓	✓
Year-Industry FE	✓	✓	✓	✓	✓	✓	✓
Year-Target Sanctioned FE	✓	✓	✓	✓	✓	✓	✓
Mean Dep. Var.	15.81	7.45	14.27	15.35	17.10	0.31	8.79
SD Dep. Ver.	2.30	11.48	2.62	2.37	2.73	0.46	8.04
Observations	15,204,981	15,204,443	6,497,026	1,830,818	1,909,746	27,362,200	27,359,791
Number of Firms	2,736,220	2,736,138	1,191,454	387,610	409,578	2,736,220	2,736,220

Notes: This table examines the impact of import sanctions on the performance of the exposed Russian firms. Specifically, it presents the non-dynamic version of the estimates of equation (6), comparing firm revenues with a higher versus lower prewar exposure to future import sanctions, before and after the war's onset. A firm is considered exposed if prior to the war, it imported any country-product variety that was later sanctioned. All dependent variables are denominated in the logarithm of Russian rubles. The firm outcome variables come at the yearly level from 2014 through 2023. Standard errors in parentheses are clustered at the firm level. * p<0.1, ** p<0.05, *** p<0.01.

Table 5: The Impact on Firms Through Production Network Linkages

	(1)	(2)	(3)	(4)
	Log Sales			
Post-2022 ×	-0.143***	-0.145***	-0.144***	-0.145***
× Firm Exposed to Import Sanctions	(0.010)	(0.010)	(0.010)	(0.010)
Post-2022 ×		-0.098***		-0.103***
× Supplier Exposed to Import Sanctions		(0.011)		(0.013)
Post-2022 ×			-0.045**	0.018
× Buyer Exposed to Import Sanctions			(0.017)	(0.019)
Firm FE	✓	✓	✓	✓
Year-Importer FEs	✓	✓	✓	✓
Year-Exporter FEs	✓	✓	✓	✓
Year-Industry FE	✓	✓	✓	✓
Year-Target Sanctioned FE	✓	✓	✓	✓
Mean Dep. Var.	15.81	15.81	15.81	15.81
SD Dep. Ver.	2.30	2.30	2.30	2.30
Observations	15,204,981	15,204,981	15,204,981	15,204,981
Number of Firms	2,736,220	2,736,220	2,736,220	2,736,220

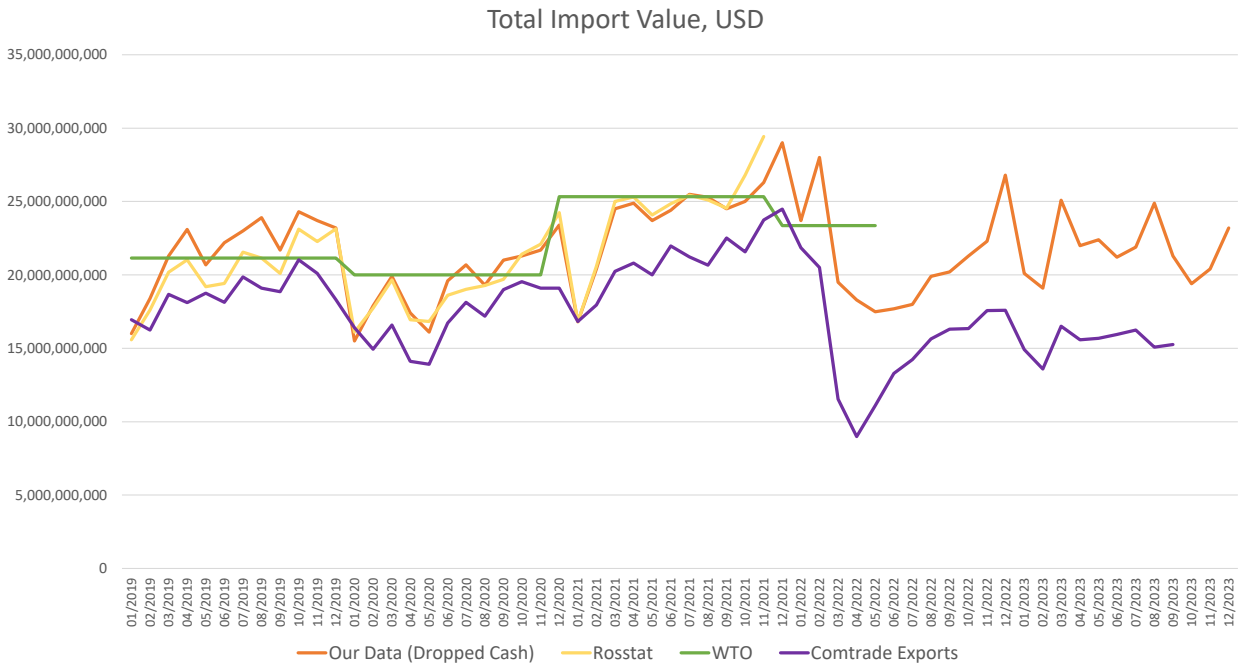
Notes: This table examines the impact of import sanctions on the performance of directly and indirectly exposed Russian firms. Specifically, it extends the baseline estimates in Table 4 by also examining whether firm revenues are affected by whether a given firm's buyers or suppliers were exposed to import sanctions. Data on firm-to-firm connections comes from data on railway shipments within Russia. A firm is considered exposed if, prior to the war, it imported any country-product variety that was later sanctioned. The dependent variable in all columns is the logarithm of yearly sales in Russian rubles from 2014 through 2023. Standard errors in parentheses are clustered at the firm level. * p<0.1, ** p<0.05, *** p<0.01.

Online Appendix for "Trade Sanctions" (not for publication)

Konstantin Egorov, Vasily Korovkin, Alexey Makarin, Dzhamilya Nigmatulina

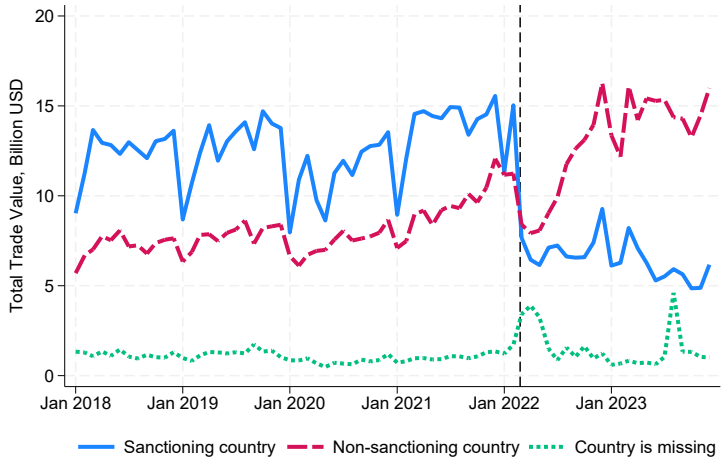
A Appendix Figures & Tables

Figure A.1: Aggregate Trends In Russia's Imports

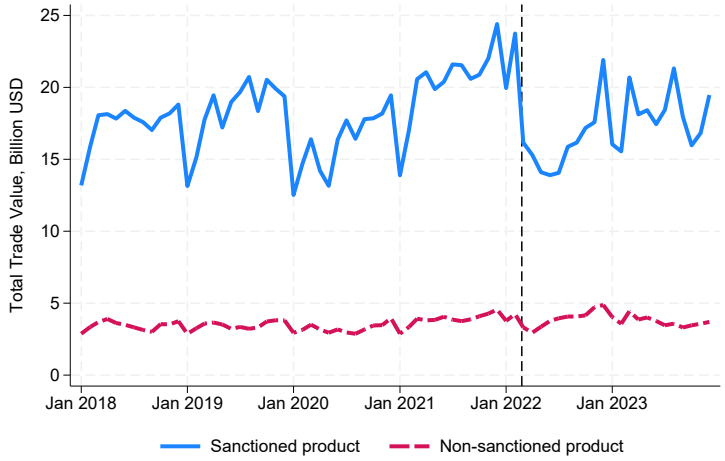


Notes: This figure depicts the total value of goods imported by Russia from January 2019 to December 2023 (in USD), as specified by various data sources: (i) our transaction-level customs data, aggregated to the monthly level (in orange); (ii) UN Comtrade mirror data, reported by other countries (in purple); (iii) official data from the Russian Statistical Service (in yellow); and (iv) data from the WTO (in green).

Figure A.2: Dynamics of the Total Value of Russian Imports (2018–2023), By Country and Product Sanction Status



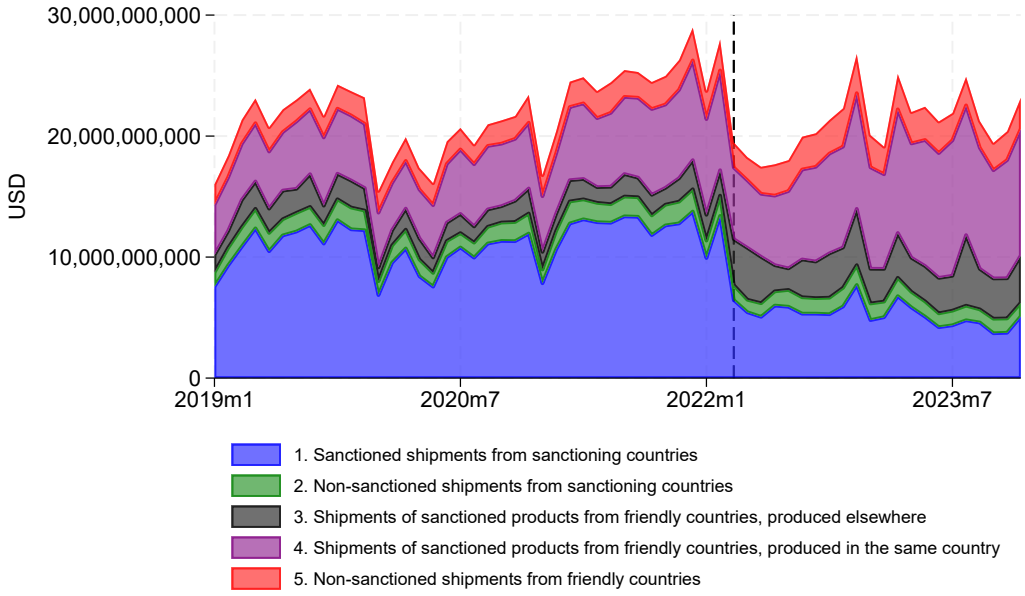
(a) Total Value of Imports: Sanctioning vs. Non-Sanctioning Countries



(b) Total Value of Imports: Products Ever Sanctioned vs. Never Sanctioned

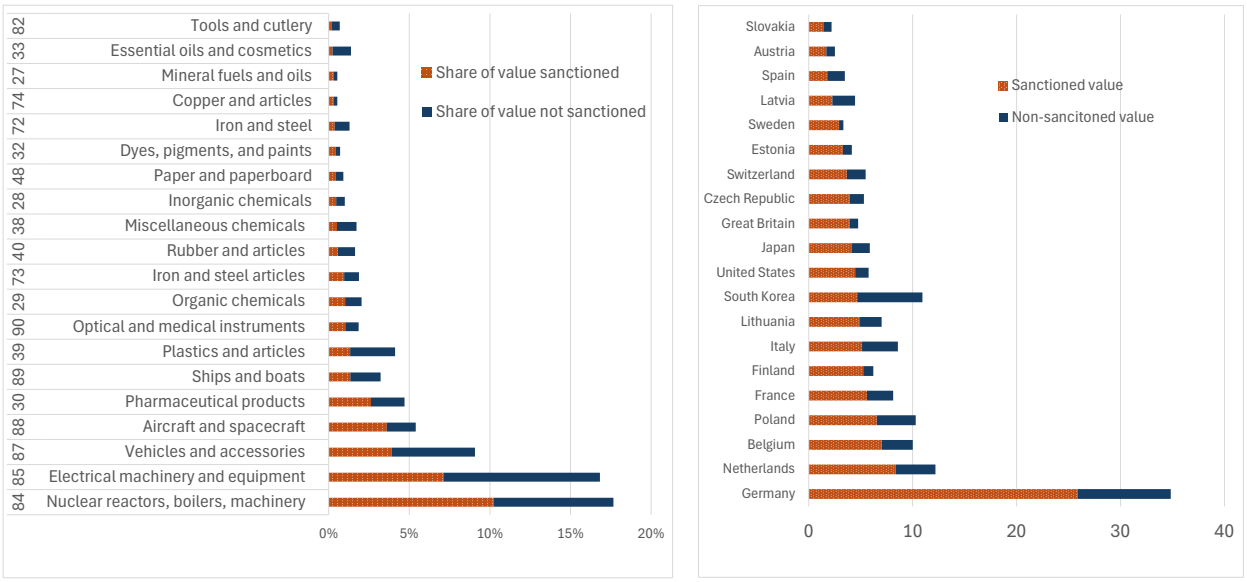
Notes: This figure displays the evolution of Russia's total import value from January 2018 to December 2023. In Panel (a), the data are broken down by whether the exporting country imposed any sanctions or was missing from the data. In Panel (b), the data are broken down by whether the product was sanctioned by any country for export to Russia.

Figure A.3: Total Import Flows by Type



Notes: This figure displays imported value flows of products by their sanctioned status and categories of country of origin and country of shipment from January 2019 to December 2023.

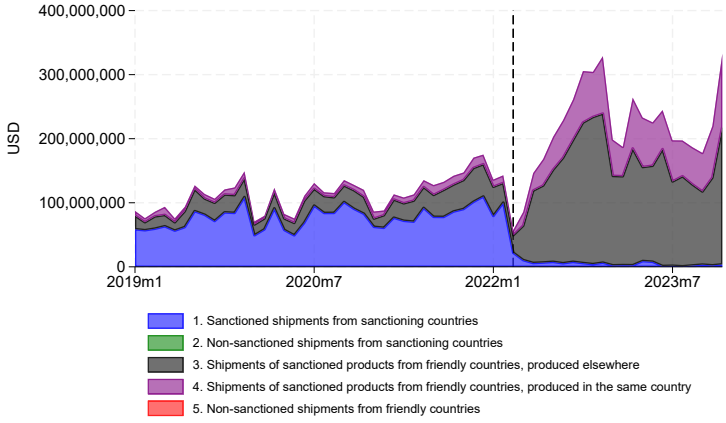
Figure A.4: Sanctioned Volume of Russian Imports: Top-20 Product Categories and Countries



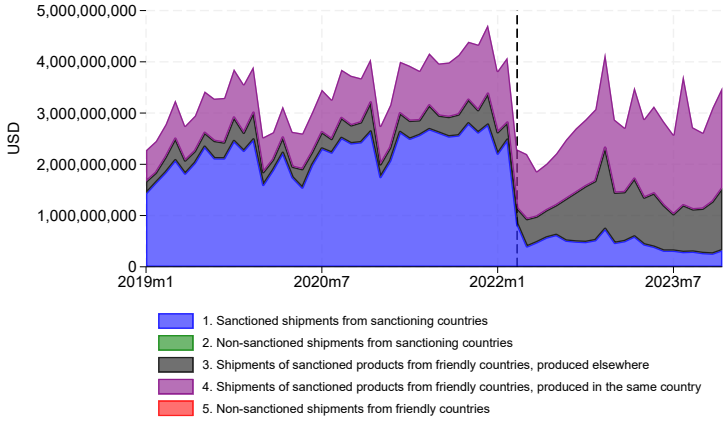
(a) Most Sanctioned Products (% of 2021 Imports) (b) Most Sanctioning Countries (in Bln USD)

Notes: Panel A displays the top-20 sanctioned 2-digit product categories. Each bar shows the share of a category in Russia's total 2021 imports, with the first segment (in orange) indicating the portion of the category that was sanctioned. Panel B similarly displays the top-20 countries with highest value of sanctioned exports to Russia. The total length of each bar represents the size of each country's 2021 exports to Russia (in billion USD), while the first segment (in orange) highlights the sanctioned portion of its export value.

Figure A.5: Example: Imports Semiconductors and Critical Components, By Route Type



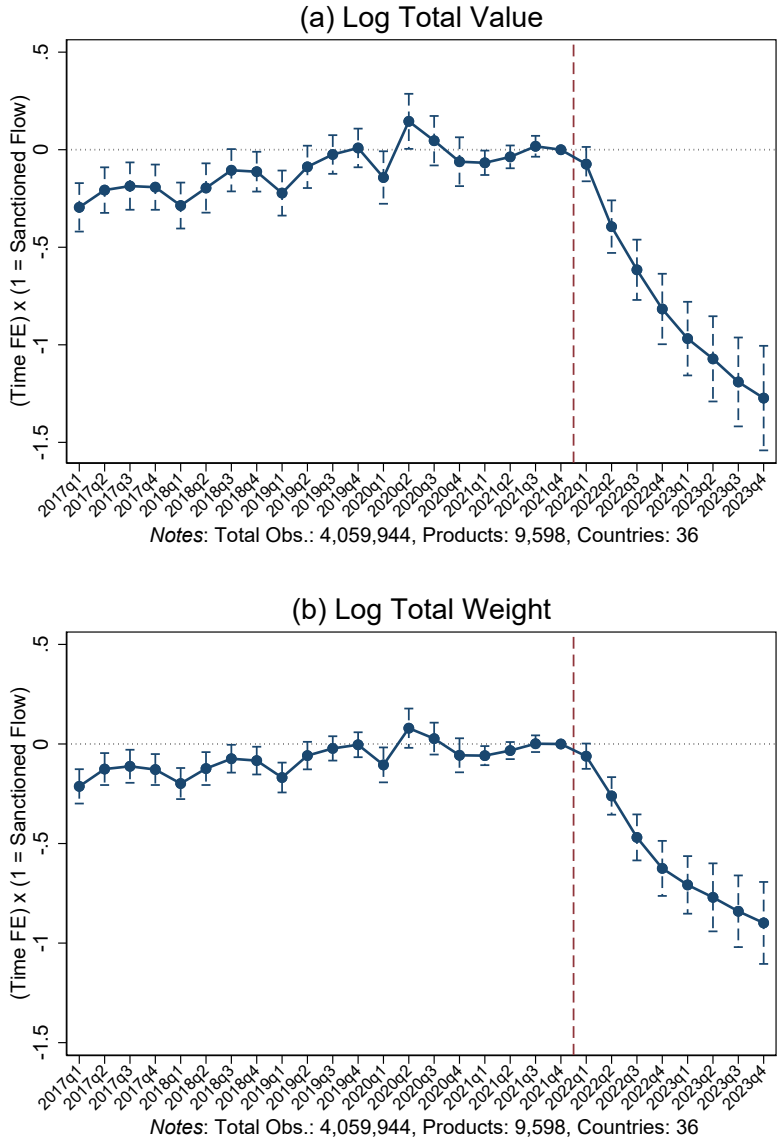
(a) Imports of Semiconductors



(b) Imports of Critical Components

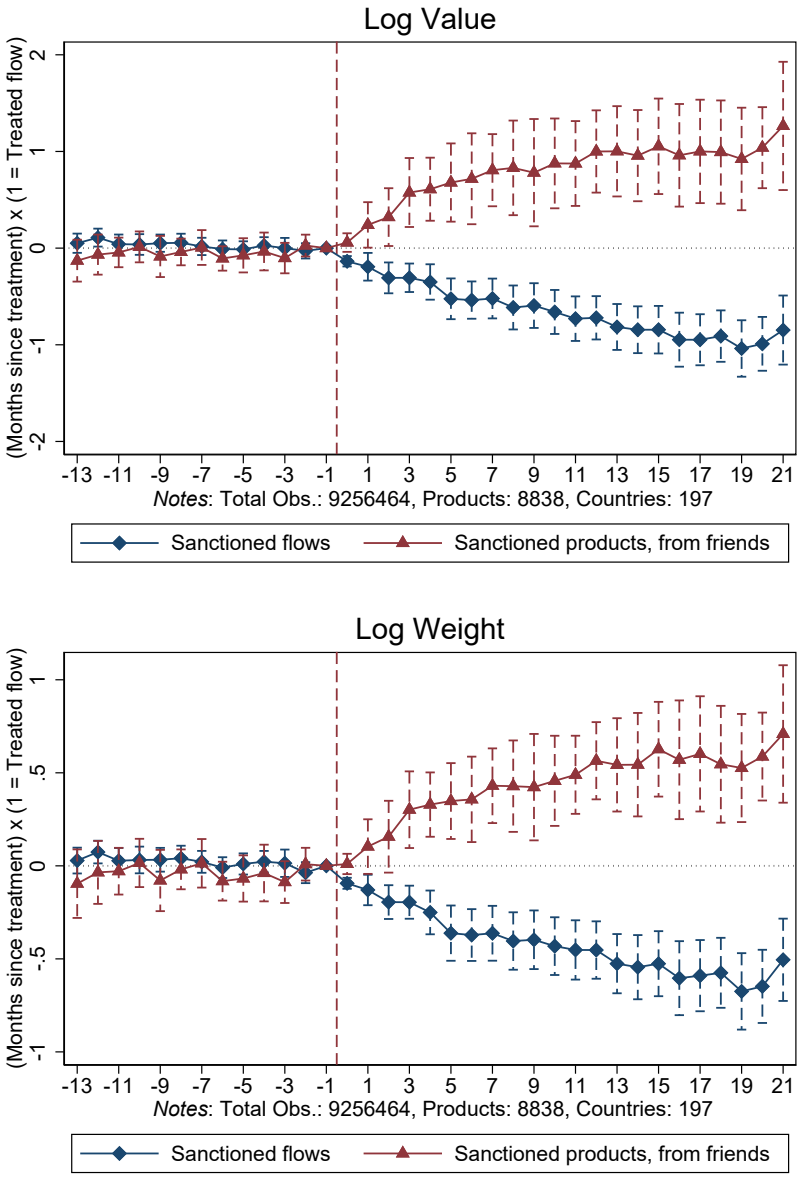
Notes: This figure displays imported value flows of products by their sanctioned status and categories of country of origin and country of shipment from January 2019 to December 2023. In Panel (a) the sample is restricted to semiconductors or related products, identified by HS codes starting with 8541 and 8542. In Panel (b) the sample is restricted to the HS10 list of critical components from Bilousova et al. (2024).

Figure A.6: The Impact of Sanctions on Russian Imports, Sanctioning Countries Only



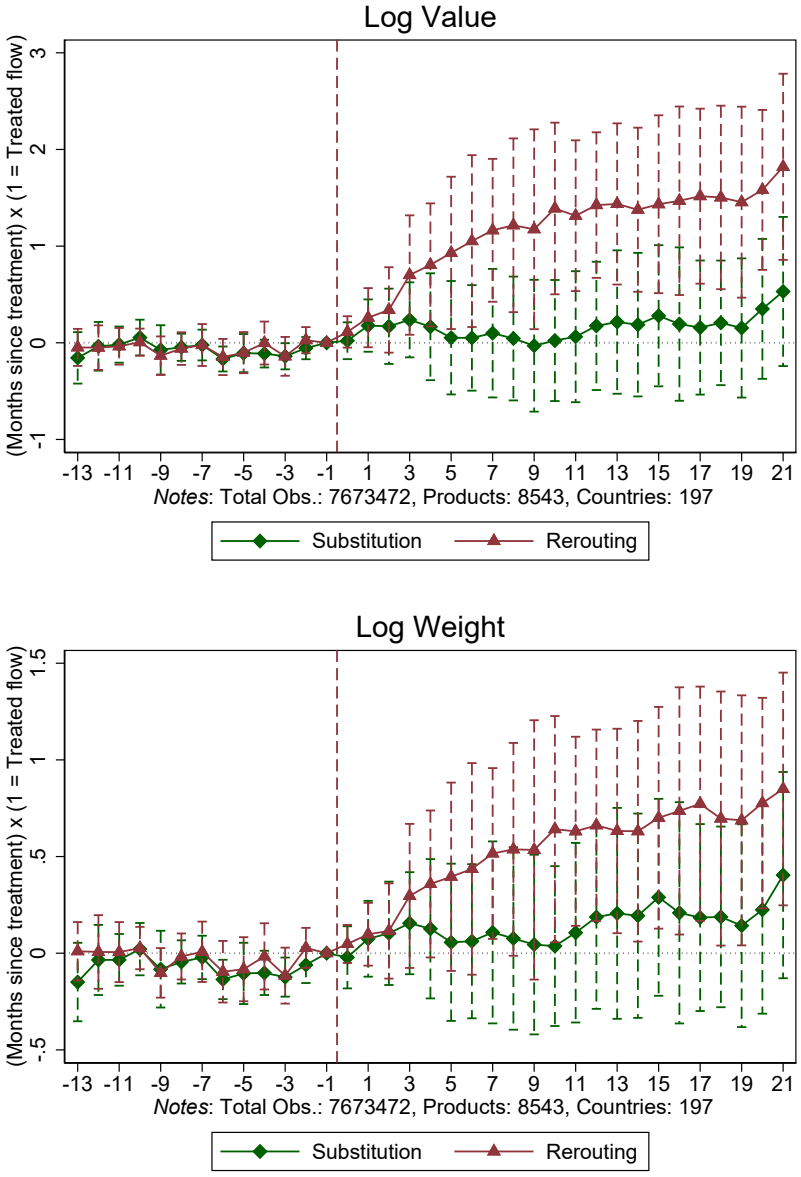
Notes: These figures explore whether the decline in sanctioned imports is present even within a subsample of 'enemy' countries, i.e., those that ever imposed trade sanctions on Russia. Specifically, they present the dynamic difference-in-differences estimates of Equation (1) comparing the volume of sanctioned country-product imports to that of non-sanctioned imports before and after the war's onset, but on a subsample of 'enemy' countries. The data is aggregated at the quarterly level, with 2021Q4 serving as the baseline period. The top (bottom) figure uses the total import value (net weight) of a given product from a given country in a given quarter as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

Figure A.7: The Impact of Sanctions on Russian Imports, Country-Product-Level, Accounting for Substitution and Rerouting via Friendly Countries, Staggered Design



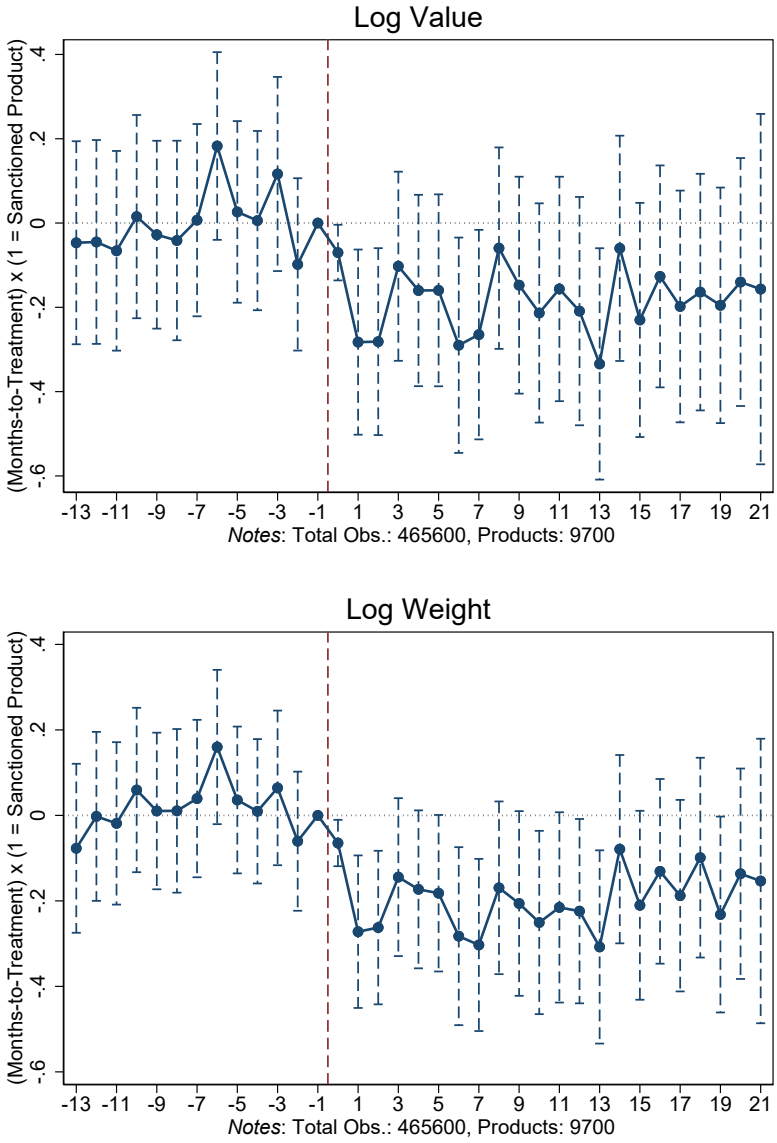
Notes: These figures investigate the presence of substitution to and rerouting through third countries, in a staggered DiD design. Specifically, each figure combines results from two separate regressions: one estimates the impact of import sanctions on sanctioned flows (in blue), and the other estimates the impact of the same sanctions on sanctioned products from friendly countries (in red). In either regression, only one treated group is included, while the non-sanctioned imports from third countries always serve as a control group. Pre-trend coefficients are estimated based on separate regressions, where all treated observations are omitted. An import of a particular product from friendly countries becomes treated during the month when the first sanctioning country imposes sanctions on the same product. Friendly countries are defined as Armenia, Kazakhstan, Kyrgyzstan, Georgia, Turkey, Belarus, Serbia, China, Hong Kong, and the UAE. The data is aggregated at the monthly level, and the estimates are aggregated across cohorts at the time level. The top (bottom) figure uses the total import value (net weight) of a given product from a given country in a given month as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

Figure A.8: The Impact of Sanctions on Russian Imports, Country-Product-Level, Estimating Substitution vs Rerouting via Friendly Countries, Staggered Design



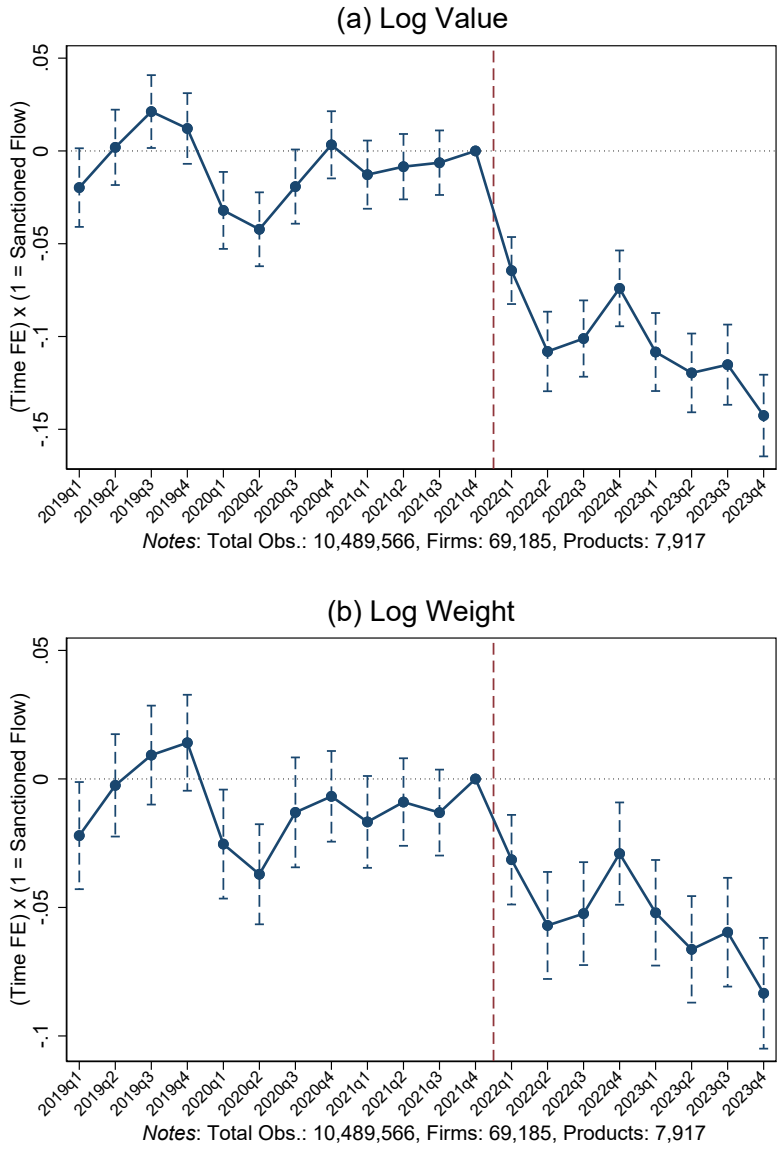
Notes: These figures disentangles the effect of substitution to and rerouting through third countries, in a staggered DiD design. Specifically, each import flow of the sanctioned products from friendly countries is separated into two flows: those produced within the same friendly country (in green) and those produced elsewhere (in red). The impact of import sanctions is estimated on each of these flows, with the non-sanctioned imports from third countries serving as a control group. Directly sanctioned flows from sanctioning countries are not included in the estimation sample. Pre-trend coefficients are estimated based on a separate regression, where all treated observations are omitted. An import of a particular product from friendly countries becomes treated during the month when the first enemy country imposes sanctions on the same product. Friendly countries are defined as Armenia, Kazakhstan, Kyrgyzstan, Georgia, Turkey, Belarus, Serbia, China, Hong Kong, and the UAE. The data is aggregated at the monthly level, and the estimates are aggregated across cohorts at the time level. The top (bottom) figure uses the total import value (net weight) of a given product from a given country in a given month as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

Figure A.9: The Impact of Sanctions on Russian Imports, Product-Level, Staggered Design



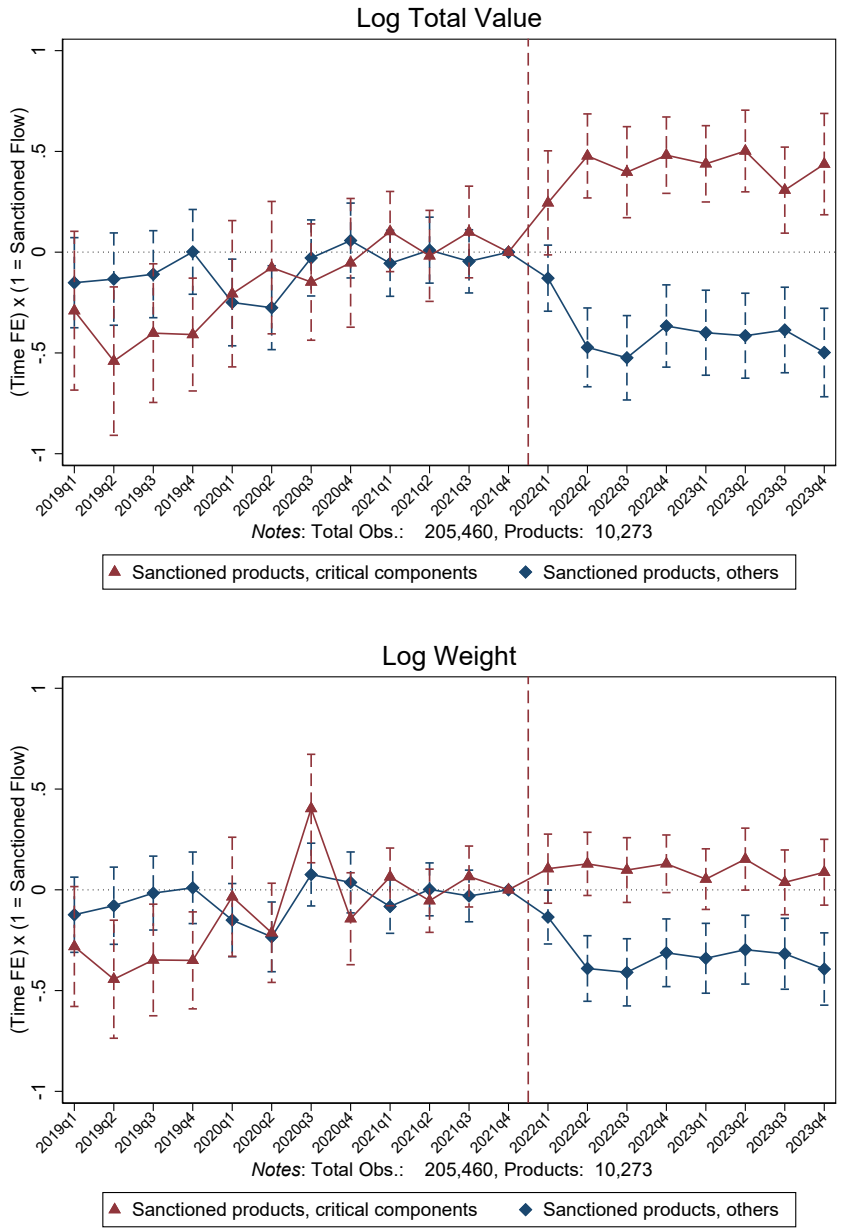
Notes: These figures assess the impact of sanctions on the total imports of sanctioned products, in a staggered DiD design. Specifically, they display the estimates comparing the import volume for sanctioned products to that of non-sanctioned products before and after the imposition of first sanctions on the former. The data is aggregated at the monthly level, and the estimates are aggregated across cohorts at the time level. Pre-trend coefficients are estimated based on a separate regression, where all treated observations are omitted. Products refer to ten digit HS codes, unless they needed to be aggregated due to changes in HS classification over time following Pierce and Schott (2012). The top (bottom) figure uses the total import value (net weight) of a given product in a given quarter as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered at the product level.

Figure A.10: The Impact of Sanctions on Russian Imports, Firm-Product Level



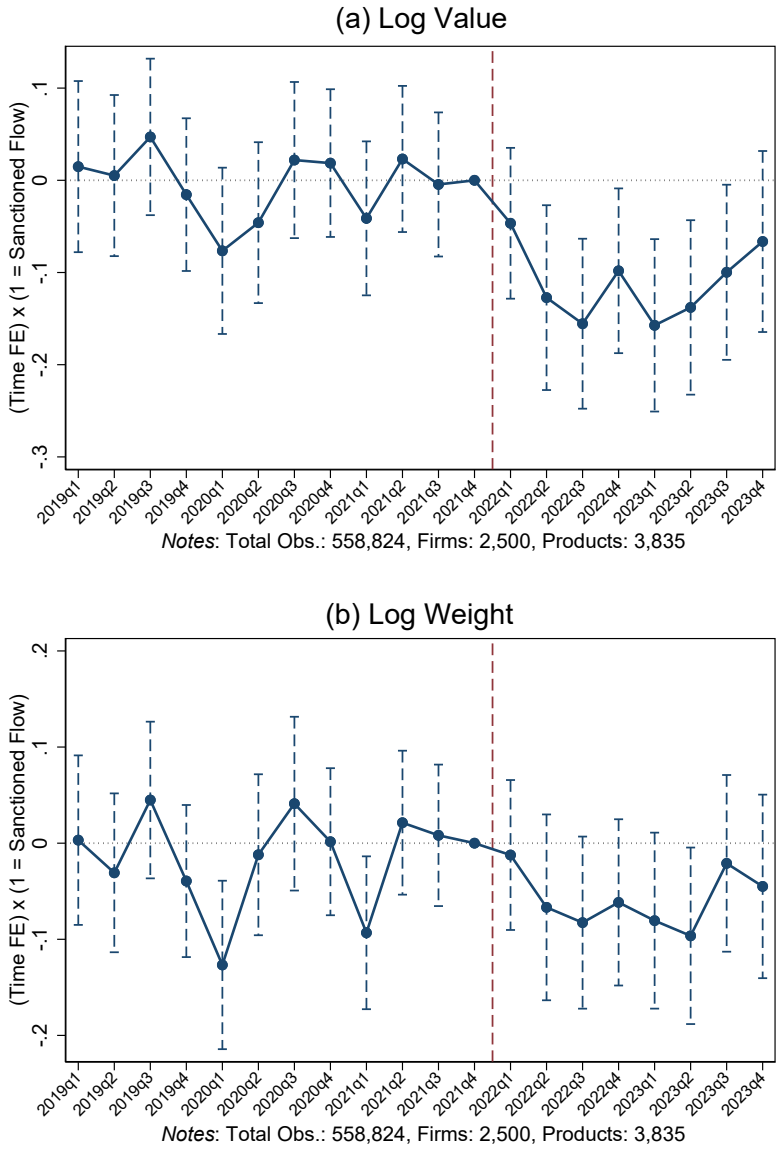
Notes: These figures assess the impact of sanctions on the imports of exposed products for each specific firm. Specifically, they display the estimates comparing the import volume for exposed firm-products to that of non-exposed firm-products before and after the first quarter of 2022. Exposed firm-products are those later-sanctioned 10-digit HS codes, which a firm imported from a sanctioning country at least once prior to 2022. An HS code that was always imported from a non-sanctioning country is not exposed. This specification control for any firm-level shocks that take place at the same time as sanctions. The specification additionally controls for product-by-time fixed effects. The data is at the quarterly level. The top (bottom) figure uses the total import value (net weight) of a given product in a given quarter as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered at the product-by-firm level.

Figure A.11: The Impact of Sanctions on Russian Imports, Product-Level, Critical Components vs. Others



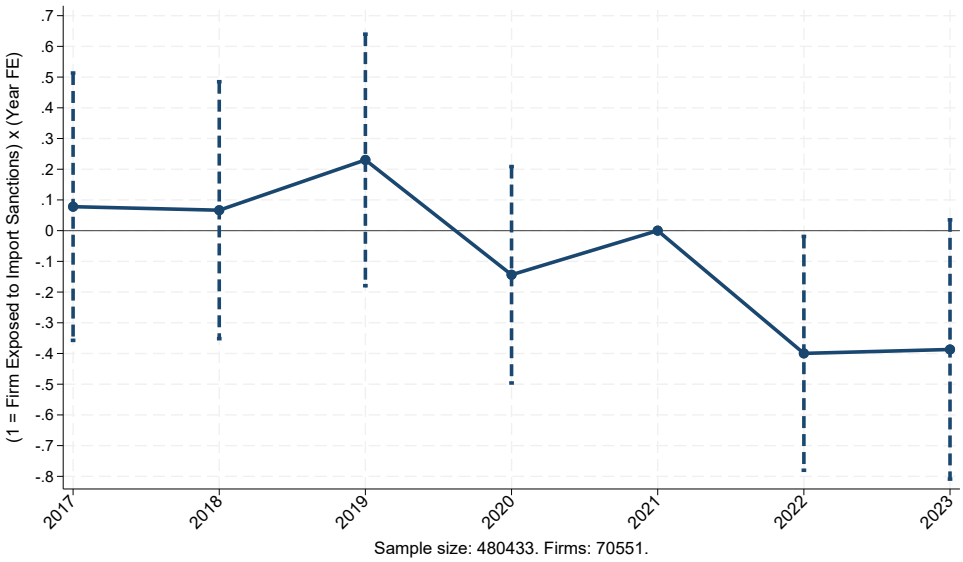
Notes: These figures assess the impact of sanctions on the total imports of sanctioned products, independent of the importing country's identity, distinguishing between critical components and other sanctioned goods. Critical components are "Components in Weapons" and "Instruments of War" as classified in Main Directorate of Intelligence of Ukraine (2025), matched to the closest 6-digit HS code manually and with the help of ChatGPT. Specifically, they present the dynamic difference-in-differences estimates of a modified version of Equation (4), comparing the import volume of sanctioned critical and non-critical products against non-sanctioned imports before and after the war's onset. The data is aggregated at the quarterly level, with 2021Q4 serving as the baseline period. The top (bottom) figure uses the total import value (net weight) of a given product in a given quarter as an outcome. The logarithms add 1 to the argument's value to avoid missing values. Regressions control for HS2-product-year fixed effects. The bars represent 95% confidence intervals. Standard errors are clustered at the product level.

Figure A.12: The Impact of Sanctions on Russian Imports, Firm-Product Level, Firms Part of Military Supply Chains



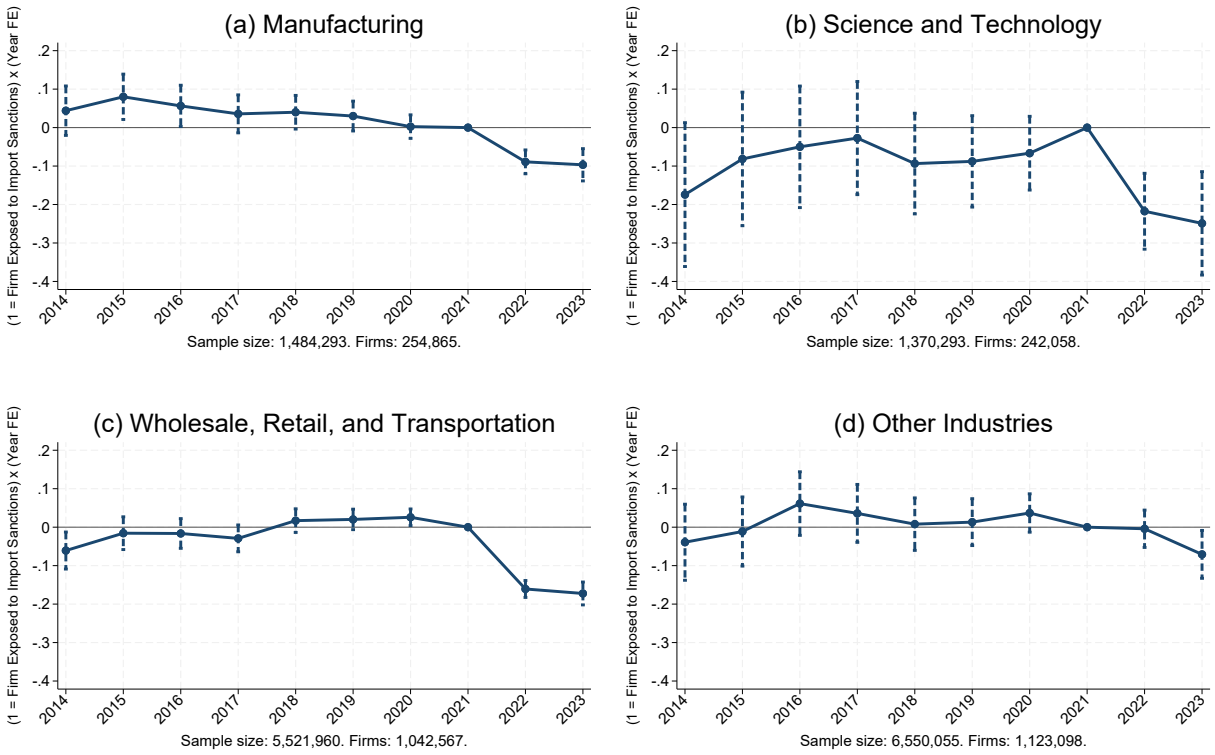
Notes: These figures assess the impact of sanctions on the imports of exposed products for each specific firm. The sample is restricted to a list of firms that were part of military supply chains. This list is created by taking all buyers and sellers of procurement contracts that feature "Military Procurement" or related keywords in the contract wording. Specifically, they display the estimates comparing the import volume for exposed firm-products to that of non-exposed firm-products before and after the first quarter of 2022. Exposed firm-products are those later-sanctioned 10-digit HS codes, which a firm imported from a sanctioning country at least once prior to 2022. An HS code that was always imported from a non-sanctioning country is not exposed. This specification control for any firm-level shocks that take place at the same time as sanctions. The specification additionally controls for product-by-time fixed effects. The data is at the quarterly level. The top (bottom) figure uses the total import value (net weight) of a given product in a given quarter as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered at the product-by-firm level.

Figure A.13: The Impact of Import Sanctions on Exposed Firms' Government Contracts



Notes: This figure examines the impact of import sanctions on the government procurement contracts of firms that, prior to the war, imported any country-product variety that was later sanctioned. Specifically, it presents the dynamic difference-in-differences estimates of Equation (6), which compares the total value of all government procurement contracts secured by a firm in given year, between firms with and without prewar exposure to future import sanctions, before and after the war's onset. The sample of firms is restricted to the firms that had government contracts in at least 8 of the years between 2011–2023. The government procurement data come at the yearly level, and 2021 serves as the baseline period. The logarithms add 1 to the argument's value to avoid missing values. The bandwidths represent 95% confidence intervals. Standard errors are clustered at the firm level.

Figure A.14: The Impact of Import Sanctions on Exposed Firms' Sales, By Industry



Notes: This figure examines the impact of import sanctions on the revenues of exposed firms by industry. Specifically, the plots display the dynamic difference-in-differences estimates of Equation (6), comparing firm revenues between firms with and without prewar exposure to future import sanctions, before and after the war's onset. A firm is considered exposed if prior to the war, it imported any country-product variety that was later sanctioned. The revenue data come at the yearly level, and 2021 serves as the baseline period. The logarithms add 1 to the argument's value to avoid missing values. The bandwidths represent 95% confidence intervals. Standard errors are clustered at the firm level.

Table A.1: Summary Statistics: Russian Imports

	Observations	Mean	SD	Min	Max
Panel A: Country-Product-Quarter Imports					
Number of transactions	7,128,940	19	248	0	101,874
Total value, USD '000	7,128,940	250	5,385	0	4,715,639
Total net weight, tons	7,128,940	70.8	4,588	0	5,477,937
Log total value	7,128,940	3.65	5.09	0	22
Log total weight	7,128,940	2.55	4	0	22
$\mathbb{1}$[Ever sanctioned]	7,128,940	0.28	0.45	0	1
$\mathbb{1}$[Sanctioned at t by c]	7,128,940	0.07	0.24	0	1
$\mathbb{1}$[Critical component]	7,128,940	0.09	0.29	0	1
Panel B: Product-Quarter Imports					
Number of transactions	287,644	470	3,232	0	282,139
Total value, USD '000	287,644	6,200	50,233	0	4,873,493
Total net weight, tons	287,644	1,754	27,164	0	5,477,937
Unit value, USD '000	227,052	146	22,177	0	7,218,129
Log total value	287,644	10.3	5.94	0	22
Log total weight	287,644	8.57	5.45	0	22
$\mathbb{1}$[Ever sanctioned]	287,644	0.60	0.49	0	1
$\mathbb{1}$[Critical component]	287,644	0.04	0.19	0	1

Notes: This table displays the summary statistics for Russian imports. Panel A depicts the summary statistics for country-product quarterly import flows from 2017Q1 through 2023Q4. Panel B depicts the summary statistics for product-level quarterly import flows from 2017Q1 through 2023Q4. Unit value is not defined for quarters with zero imports of a particular product. Products refer to ten digit HS codes, unless they were aggregated due to changes in HS classification following Pierce and Schott (2012).

Table A.2: Summary Statistics: Russian Firms

	Observations	Mean	SD	Min	Max
Panel A: Accounting Outcomes					
Sales, Rub '000 000	15,204,977	154	7,156	2.0e-06	7,979,027
Capital, Rub '000 000	15,188,413	52	9,579	-720	14,596,295
Material Costs, Rub '000 000	7,164,350	160	7,257	-2,958,326	4,820,694
Labour Costs, Rub '000 000	7,158,055	16.7	691	-123,851	536,828
Profits, Rub '000 000	15,204,516	9.82	2,323	-3,454,793	3,362,240
Log of Sales	15,204,977	15.8	2.3	.69	30
Panel B: Measures of Exposure, Firm Characteristics					
𝟙[Firm Exposed to Import Sanctions]	2,736,219	.020	.139	0	1
Firm Exposure to Import Sanctions	2,736,219	.011	.094	0	1
𝟙[Firm Imported Sanctioned Products from Enemy Countries]	2,736,219	.023	.15	0	1
𝟙[Firm Imported Sanctioned Products from Neutral Countries]	2,736,219	.007	.084	0	1
𝟙[Firm Imported Sanctioned Products from Friendly Countries]	2,736,219	.017	.127	0	1
𝟙[Supplier Exposed to Import Sanctions]	2,736,219	.003	.050	0	1
𝟙[Buyer Exposed to Import Sanctions]	2,736,219	.005	.073	0	1
𝟙[Importer]	2,736,219	.035	.185	0	1
𝟙[Exporter]	2,736,219	.018	.133	0	1
𝟙[Firm Is Target-Sanctioned]	2,736,219	.002	.040	0	1
𝟙[Industry=Manufacturing]	2,736,218	.094	.289	0	1
𝟙[Industry=Wholesale]	2,736,218	.331	.467	0	1
𝟙[Industry=Transportation]	2,736,218	.063	.24	0	1
𝟙[Industry=Science and Technology]	2,736,218	.090	.285	0	1
𝟙[Industry=Other]	2,736,218	.421	.49	0	1
𝟙[Region=Central]	2,736,219	.348	.476	0	1
𝟙[Region=Volga]	2,736,219	.176	.381	0	1
𝟙[Region=North-West]	2,736,219	.137	.344	0	1
𝟙[Region=South]	2,736,219	.066	.248	0	1
𝟙[Region=Caucasus]	2,736,219	.019	.137	0	1
𝟙[Region=Ural]	2,736,219	.085	.279	0	1
𝟙[Region=Siberia]	2,736,219	.112	.315	0	1
𝟙[Region=Far East]	2,736,219	.047	.212	0	1
Panel C: Railway Shipments					
In-Shipments Weight, Tons	226,665	51.9	694	0	56,932
Out-Shipments Weight, Tons	226,665	56	806	0	70,587
Total Shipments Weight, Tons	226,665	108	1,243	0	92,236
Num. of Suppliers	226,665	5.67	15.8	0	895
Num. of Buyers	226,665	5.84	34	0	2,080
Total Partners	226,665	8.03	43.4	0	2,607

Notes: This table presents summary statistics for Russian firms. Panel A provides summary statistics for firm-level yearly accounting outcomes spanning the years 2014 to 2023. Panel B reports various measures of firms' exposure to import sanctions based on their prewar import flows and firm characteristics. Buyers and suppliers are identified using railway shipment data. Panel C summarizes firms' yearly railway shipments from 2014 to 2023.

Table A.3: Correlation of Sanctioned Product Lists Across Countries

	AU	CA	CH	EU	GB	JP	KR	TW	US
AU: Australia	1								
CA: Canada	0.4099	1							
CH: Switzerland	0.4763	0.2571	1						
EU: European Union	0.1335	0.1599	0.6246	1					
GB: Great Britain	0.1688	0.1851	0.6237	0.9217	1				
JP: Japan	0.2669	0.3443	0.2356	0.5294	0.5278	1			
KR: South Korea	0.1890	0.2492	0.2911	0.4094	0.4095	0.5141	1		
TW: Taiwan	0.2088	0.1842	0.1769	0.1900	0.1834	0.2518	0.4520	1	
US: United States	0.3791	0.4059	0.2312	0.5164	0.5447	0.7794	0.5265	0.2251	1

Notes: The table displays pairwise correlations between the sets of 6-digit products eventually sanctioned by different countries. Each correlation coefficient is calculated based on the correlation between two binary variables, where each variable indicates whether a specific 6-digit product code was sanctioned by a particular country or bloc. These variables are defined over the universe of 6-digit codes imported by Russia in 2021. Reproduced from Egorov et al. (2025).

Table A.4: The Impact of Sanctions on Russian Imports, Staggered Design

	(1) Log Total Value	(2) Log Total Weight	(3) Log Total Value	(4) Log Total Weight
Post-Treatment × Treated Flow	-0.767***	-0.499***	-0.196**	-0.182*
	(0.114)	(0.083)	(0.078)	(0.094)
Product-Country FE	✓	✓		
Product-Month FE	✓	✓		
Country-Month FE	✓	✓		
Product FE			✓	✓
3-Digit Product-Month FE			✓	✓
Observations	10,132,992	10,132,992	465,600	465,600
Number of Products	8,930	8,930	9,700	9,700
Number of Countries	197	197	—	—

Notes: This table examines the effect of sanctions on sanctioned imports from sanctioning countries (columns 1 and 2), as well as the effect of sanctions on sanctioned products imported from any country (columns 3 and 4). Specifically, the table presents the estimates of equation (2) and the corresponding product-level equation, aggregated across cohorts and months into a single non-dynamic average coefficient. In the latter case, the first date of imposed sanctions is used as the treatment date for a product. The outcome variable in the even-numbered columns is the log of total value imported, while in the odd-numbered columns, it is the log of total weight imported. The logarithms add 1 to the argument's value to avoid missing values. Products refer to ten digit HS codes, unless they were aggregated due to changes in HS classification following Pierce and Schott (2012). Standard errors in parentheses are two-way clustered at the country and product levels. * p<0.1, ** p<0.05, *** p<0.01.

Table A.5: Robustness: Extensive and Intensive Margin

	(1)	(2)	(3)	(4)	(5)	(6)
	Country-Product Level			Product Level		
	𝟙[Import>0]	Log Total Value (If Nonzero)	Log Total Weight (If Nonzero)	𝟙[Import>0]	Log Total Value (If Nonzero)	Log Total Weight (If Nonzero)
Post-War × Sanctioned Flow	-0.068***	-0.571***	-0.540***	-0.016***	-0.137***	-0.142***
	(0.012)	(0.113)	(0.127)	(0.006)	(0.031)	(0.036)
Product-Country FE	✓	✓	✓			
Product-Quarter FE	✓	✓	✓			
Country-Quarter FE	✓	✓	✓			
Product FE				✓	✓	✓
2-Digit Product-Quarter FE				✓	✓	✓
Mean Dep. Var.	0.37	9.86	6.77	0.79	13.08	10.84
SD Dep. Var.	0.48	3.01	3.92	0.41	2.93	3.65
Observations	7,106,708	2,564,195	2,562,400	205,460	160,184	160,136
Number of Products	9,486	8,288	8,285	10,273	9,419	9,417
Number of Countries	214	178	178	—	—	—

Notes: This table examines whether the observed decline in sanctioned imports is driven primarily by the extensive or intensive margin. Columns 1–3 present the analysis at the country-product level, while columns 4–6 focus on the product level estimates. Columns 1 and 4 repeat the baseline estimation at their respective levels but use indicators for non-zero imports in a given quarter as the outcome variables. Columns 2–3 and 5–6 restrict the sample to only periods with nonzero imports, omitting observations where imports were entirely absent. The logarithms add 1 to the argument's value to avoid missing values. Products refer to ten digit HS codes, unless they were aggregated due to changes in HS classification following Pierce and Schott (2012). Standard errors, reported in parentheses, are two-way clustered at the country and product levels in columns 1–3 and at the product level in columns 4–6. * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

Table A.6: Robustness: Friends and Enemies Separately

	(1) Log Total Value	(2) Log Total Weight	(3) Log Total Value	(4) Log Total Weight
	Enemy Countries		*Friendly Countries*	
Post-War × Sanctioned Flow	-0.700***	-0.506***		
	(0.085)	(0.065)		
Post-War × Sanctioned Product			0.992***	0.558***
			(0.117)	(0.063)
Country-Quarter FE	✓	✓	✓	✓
Product-Country FE	✓	✓	✓	✓
Mean Dep. Var.	4.32	2.95	4.19	3.19
SD Dep. Ver.	5.22	4.06	5.58	4.66
R^2	0.66	0.68	0.73	0.76
Observations	4,059,944	4,059,944	929,964	929,964
Number of Countries	36	36	10	10
Number of Products	9,598	9,598	8,636	8,636

Notes: This table assesses the robustness of our estimates on the impact of trade sanctions on sanctioned imports. Columns (1)–(2) examine whether the effect of trade sanctions on sanctioned trade flows persists when restricting the sample to only the countries that imposed the sanctions. Columns (3)–(4) analyze whether the increase in imports of sanctioned products from friendly countries remains significant even when restricting the sample to only those friendly countries. Friendly countries are defined as Armenia, Kazakhstan, Kyrgyzstan, Georgia, Turkey, Belarus, Serbia, China, Hong Kong, and the UAE. The outcome variable in the even-numbered columns is the log of total value imported, while in the odd-numbered columns, it is the log of total weight imported. To avoid missing values, we apply a log transformation with an additive constant of 1. Product codes refer to ten digit HS codes, unless they needed to be aggregated due to changes in HS classification over time following Pierce and Schott (2012). Standard errors in parentheses are two-way clustered at the country and product levels. * p<0.1, ** p<0.05, *** p<0.01.

Table A.7: Robustness: The Impact on Firms Controlling for Other Types of Exposure

	(1)	(2)	(3)	(4)	(5)
Dependent Variable:			Log Sales		
Post-2022 × Firm Exposed to Import Sanctions	-0.149***	-0.146***	-0.143***	-0.095***	-0.097***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Firm FE	✓	✓	✓	✓	✓
Year-Importer FE	✓	✓	✓	✓	✓
Year-Exporter FE		✓	✓	✓	✓
Year-Industry FE			✓	✓	✓
Year-Target Sanctioned FE			✓	✓	✓
Post × Imported Sanctioned Products from Friends				✓	✓
Post × Imported Sanctioned Products from Neutrals				✓	✓
Post × Supplier / Buyer Exposed to Import Sanctions					✓
Mean Dep. Var.	15.81	15.81	15.81	15.81	15.81
SD Dep. Ver.	2.30	2.30	2.30	2.30	2.30
Observations	15,215,924	15,215,924	15,204,981	15,204,981	15,204,981
Number of Firms	2,741,496	2,741,496	2,736,220	2,736,220	2,736,220

Notes: This table explores the robustness of the baseline estimates of sanctions' impact on firm revenue by gradually adding fixed effects and controls. A firm is considered exposed if, prior to the war, it imported any country-product variety that was later sanctioned. Column 1 reports the estimates with only Firm and Year-Importer fixed effects. Column 2 adds Year-Exporter fixed effects. Column 3 further adds Year-Industry and Year-Targeted Sanction FEs, which correspond to baseline specification in Table 4. Columns 4 control for firms' prewar imports of sanctioned products from friendly and neutral countries interacted with the post-2022 indicator. Column 5 further controls for whether firms' buyers and suppliers (identified in the railway shipment data) separately were exposed to import sanctions interacted with the post-2022 indicator. The dependent variable in all columns is the logarithm of yearly sales in Russian rubles from 2014 through 2023. Standard errors in parentheses are clustered at the firm level. * p<0.1, ** p<0.05, *** p<0.01.

Table A.8: The Impact of Trade Sanctions on Russian Firms, Heterogeneity By Industry

	(1) Log Sales	(2) IHS Profit	(3) Log Capital	(4) Log Labor	(5) Log Materials	(6) Missing Sales	(7) Log Sales (Zeroes if Missing)
Post-2022 × Firm Exposed to Import Sanctions	-0.123***	-0.347**	-0.131***	-0.109***	-0.012	0.043***	-0.760***
	(0.021)	(0.170)	(0.025)	(0.028)	(0.022)	(0.005)	(0.102)
Post-2022 × Firm Exposed to Import Sanctions × Manufacturing	0.040*	0.808***	0.025	0.037	-0.025	0.106***	-1.945***
	(0.023)	(0.193)	(0.026)	(0.029)	(0.024)	(0.006)	(0.123)
Post-2022 × Firm Exposed to Import Sanctions × Wholesale	-0.048**	-0.350**	0.123***	-0.071**	-0.111***	-0.042***	0.460***
	(0.021)	(0.173)	(0.026)	(0.029)	(0.023)	(0.005)	(0.104)
Post-2022 × Firm Exposed to Import Sanctions × Transportation	0.019	-0.104	0.076	-0.078	-0.184***	0.020**	-0.377**
	(0.038)	(0.317)	(0.050)	(0.052)	(0.040)	(0.009)	(0.184)
Post-2022 × Firm Exposed to Import Sanctions × Science and Tech.	-0.091**	-0.867***	0.093*	-0.161***	-0.083*	0.054***	-1.330***
	(0.041)	(0.326)	(0.050)	(0.057)	(0.046)	(0.009)	(0.196)
Firm FE	✓	✓	✓	✓	✓	✓	✓
Year-Importer FE	✓	✓	✓	✓	✓	✓	✓
Year-Exporter FE	✓	✓	✓	✓	✓	✓	✓
Year-Industry FE	✓	✓	✓	✓	✓	✓	✓
Year-Target Sanctioned FE	✓	✓	✓	✓	✓	✓	✓
Mean Dep. Var.	15.81	7.45	14.27	17.10	15.35	0.31	8.79
SD Dep. Ver.	2.30	11.48	2.62	2.73	2.37	0.46	8.04
Observations	15,204,981	15,204,443	6,497,026	1,909,746	1,830,818	27,362,200	27,359,791
Number of Firms	2,736,220	2,736,138	1,191,454	409,578	387,610	2,736,220	2,736,220

Notes: This table examines the impact of import sanctions on the performance of the exposed Russian firms, taking into account heterogeneity by five industry groups. The groups are: manufacturing, wholesale, transportation, science and technology and all others (the latter is an omitted category). Specifically, it presents the non-dynamic version of the estimates of equation (6), comparing firm revenues with a higher versus lower prewar exposure to future import sanctions, before and after the war's onset. A firm is considered exposed if prior to the war, it imported any country-product variety that was later sanctioned. All dependent variables are denominated in the logarithm of Russian rubles. The firm outcome variables come at the yearly level from 2014 through 2023. Standard errors in parentheses are clustered at the firm level. * p<0.1, ** p<0.05, *** p<0.01.

Table A.9: Impact on Firms' Railway Shipments

	(1) Log In-Ship.	(2) Log Out-Ship.	(3) Log Total Ship.	(4) Num. of Suppliers	(5) Num. of Buyers	(5) Total Partners
Post-2022 × Firm Exposed to Import Sanctions	-0.145***	-0.022	-0.083**	-0.630	-1.954***	-2.617***
	(0.052)	(0.064)	(0.037)	(0.384)	(0.616)	(0.795)
Post × Imported Sanctioned Products from Neutrals	✓	✓	✓	✓	✓	✓
Post × Imported Sanctioned Products from Friends	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓
Year-Importer FE	✓	✓	✓	✓	✓	✓
Year-Exporter FE	✓	✓	✓	✓	✓	✓
Year-Industry FE	✓	✓	✓	✓	✓	✓
Mean Dep. Var.	6.27	3.27	7.82	5.67	5.84	8.03
SD Dep. Ver.	3.60	4.25	2.63	15.81	33.98	43.37
Observations	226,665	226,665	226,665	226,665	226,665	226,665
Number of Firms	41,253	41,253	41,253	41,253	41,253	41,253

Notes: This table examines the effects of sanctions on firms' railway shipments. Column (1) focuses on $\log(1+$ incoming shipments, while column (2) redoes it for outgoing shipments of a firm. Column (3) sums up incoming and outgoing shipments under the $\log$. Columns (4)-(6) repeat the exercise focusing on the extensive margin, i.e., on the number of trading partners – supplies, buyers, and total, respectively. A firm is considered exposed if, before the war, it imported any country-product variety that was later sanctioned. All dependent variables are denominated in the logarithm of Russian rubles. The firm outcome variables come at the yearly level from 2014 through 2024. Standard errors in parentheses are clustered at the firm level. * p<0.1, ** p<0.05, *** p<0.01.