Decision to leave:
Economic sanctions and intermediated trade[*]

Maxim Chupilkin
University of Oxford[†]and EBRD[‡]

Beata Javorcik
University of Oxford[§] EBRD and CEPR[¶]

Aleksandra Peeva
Humboldt University of Berlin[‖]

Alexander Plekhanov
EBRD

May 2024

Abstract

This paper documents a substantial change in regional trade patterns precipitated by the war on Ukraine and the subsequent introduction of trade sanctions on Russia. The analysis is based on transaction-level records of Russia's imports from economies outside the Eurasian Economic Union (EEU). The data shows a sharp drop in direct exports from sanctioning economies to Russia following the introduction of sanctions in March 2022. At the same time, imports of sanctioned goods originating in sanctioning economies or under Western trademarks and routed via a trading company in neutral countries increased significantly, offsetting more than a third of the reduction in the direct exports of these goods to Russia. We document two equally important types of intermediated trade: one involving goods originating in sanctioning economies and one involving goods originating in neutral economies but sold under Western trademarks. The intermediated trade increased significantly more rapidly for industrial-capacity goods under international sanctions and dual-use technology. The use of neutral intermediaries was associated with higher unit values of imported goods, with additional increases averaging 15 to 55 percent and higher mark-ups observed on the newly established trade routes. Both intermediated trade volumes and mark-ups were higher for firms with more restrictive self-declared attitudes to serving the Russian market.

Keywords: sanctions, unit values, intermediated trade, trade diversion, Russia

JEL Classification Number: F14, F15, F51

1 Introduction

Economic warfare in response to war has a long history (see, for instance, Harrison (2023)). Trade and financial sanctions more or more frequently accompany conflict (Felbermayr et al. (2020)). They pursue three broad groups of objectives: limiting export revenues of a sanctioned economy, restricting access to technology and inflicting costs on individual firms and on the economy at large (for example, by making imports more expensive). Sanctions are typically found to be effective to some extent, with a negative impact on bilateral trade and the performance of targeted firms (Frank (2017); Crozet and Hinz (2020); Ahn and Ludema (2020); Draca et al. (2022)). Yet systematic evidence on their overall effectiveness is scarce and mixed. This is due to partial compliance and various ways in which sanctioned entities and firms can circumvent sanctions by redirecting trade flows or finding alternative suppliers (Bergeijk (1995); Haidar (2017)).

This study provides comprehensive evidence on the effectiveness of sanctions with respect to their two key objectives: the extent of technological switching in the sanctioned economy and the inflicted cost. To do so, the paper documents the scale of intermediated trade via third countries used to circumvent sanctions, the speed with which such trades were established and the associated increases in unit values of goods experienced by importers. Crucially, the analysis distinguishes between two types of intermediated trade. The first type involves goods originating in sanctioning economies and traded via intermediaries in neutral economies. The second type, which proves to be equally important, involves goods that never pass through sanctioning economies but are traded under trademarks owned by firms in sanctioning jurisdictions. Tracing such intermediated trade is crucial for estimating the (smaller) extent of technology switching following the imposition of sanctions and the additional costs incurred by importers (in terms of unit values of goods).

Our analysis focuses on the restrictions on exports of goods to Russia imposed by the European Union and other Western economies in the aftermath of its invasion of Ukraine on the 24th of February 2022. It exploits transaction-level data on Russia's imports from outside the Eurasian Economic Union between January 2016 and December 2022, including details of product, trademark, the country of origin and exporting trader.

Comprehensive economic sanctioned imposed on Russia by the EU and other large economies in response to the war on Ukraine present a unique case for studying the changes in trade patterns resulting from the imposition of wide-scale economic sanctions. Russia's GDP at market exchange rates in 2021 amounted to US$1.8 trillion making Russia 11th largest economy in the world. Export sanctions covered an extensive yet diverse set of goods, from dual-use technology to industrial goods to luxury consumer goods. In addition, sanctions were simultaneously upheld by the vast majority of advanced economies, ruling out diversion of trade from sanctioning parties towards other advanced economies or close allies of the countries imposing sanctions (as found by Yang et al. (2009) in another context). A swift imposition of sanctions with little or no advance notice also ruled out building up of stocks of imported goods (as documented in other cases by Afesorgbor (2019)).

Our analysis focuses on trade patterns in the aftermath of the sanctions being introduced. The disaggregated data allow us to identify products or product groups partially or fully subject to the EU sanctions (EU being Russia's main trading partner before the invasion). We focus on imports from sanctioning economies of origin and those from neutral economies of origin. For goods produced in neutral economies, we distinguish between those traded under Western trademarks (for example, Apple smartphones originating in China) and those traded under other trademarks (for example, Huawei smartphones originating in China). We further distinguish between imports routed via traders in a neutral jurisdiction and traders in sanctioning jurisdictions.

These detailed data enables us to distinguish between (i) direct trade between sanctioning economies and Russia; (ii) intermediated trade of two types – goods originating in sanctioning economies or traded under Western trademarks and exported by a trader in a neutral jurisdiction; (iii) neutral trade – goods originating in neutral countries of origin and sold by a trader in a neutral jurisdiction not under Western trademark and (iv) a small residual representing other trade. Western trademarks, in turn, are identified as those where prior to the imposition of sanctions most imports were accounted for by exporting traders in sanctioning jurisdictions.

In this analysis we document two equally important types of intermediated trade. One involves goods originating in sanctioning economies (for example, Germany) and sold by a trader in a neutral economy (such as Turkiye). Another involves involving goods originating in neutral economies but sold under Western trademarks (for example, smartphones designed in the US and manufactured in China). Under normal circumstances they tend to be sold by distributors in a Western economy (for example, Ireland) while under sanctions they may be sold by a trader in a neutral economy (for instance, the UAE).

The intermediated trade increased significantly more rapidly for industrial-capacity goods under international sanctions and dual-use technology and the use of neutral intermediaries was associated with higher unit values of imported goods.

In the regression analysis, we follow a triple-differencing approach comparing (i) imports from traders in sanctioning vs neutral jurisdictions (ii) the pre- to the post-sanction period; (iii) various types of sanctioned goods to non-sanctioned goods. Each comparison is run separately for goods originating in sanctioning economies or traded under Western trademarks and other goods. We use comprehensive sets of fixed effects (for example, product-origin-month fixed effects to account for industrial and logistical capacity on certain routes as well as seasonality and fluctuations in demand and product-trader-origin fixed effects to take into account differential supply patterns across exporters). Standard errors are clustered on products. Our outcome variables are either the logarithm of the value of exports or an indicator variable capturing non-zero flows of a given product on a certain trading route (a combination of the country of origin and exporting trader) in a given month (we further use hyperbolic sine transformation to account for the effects on the intensive and extensive margins of trade). We also look at imports in quantity terms and their unit values. An event-study analysis shows no differential trends in the EU exports of sanctioned vs non-sanctioned products before March 2022.

Both summary statistics and our regression analysis reveal several striking regularities. After the imposition of economic sanctions on Russia in March 2022, direct exports from sanctioning economies to Russia more than halved. At the same time, intermediated trade in sanctioned goods originating in sanctioning economies or under Western trademarks and routed via a trading company in neutral countries increased substantially. Around 60 percent of combinations of products, countries of origin and trading countries ("routes") involved in intermediated trade were not seen in the data before the imposition of sanctions while the remaining routes were used at some point in the past, for instance, during the Covid-19 supply chain disruptions.

Nine months after the introduction of sanctions, intermediated trade in sanctioned industrial and dual-use goods amounted to roughly half of the reduction in their direct exports to Russia (the substitution rates were higher in the case of dual-use technology). For these goods, available technology has not changed while for the remainder (equivalent to a third of pre-sanctions imports) we observe technology switching towards non-Western trademarks. To the extent that this represents a constrained choice, this technological switching may undermine the growth of productivity in the longer term.

The use of neutral intermediaries is associated with higher unit values of imported goods (for the same product group and country of origin), with additional increases averaging 15 to 55 percent. This increases apply to roughly one third of pre-sanction imports from the sanctioning economies providing a ballpark estimate of the costs inflicted by trade sanctions. Unit values increased relatively more in the case of industrial-capacity goods and dual-use technology originating in sanctioning economies and in the case of industrial goods originating in neutral economies and traded under Western trademarks. Increases were higher for intermediated trade involving new routes than for previously established routes.

Event studies show that on the intensive margin intermediated trade (and its unit values) stabilized at new levels 5-6 months after the introduction of sanctions. On the extensive margin, new routes continued being added, from month to month, at an approximately constant rate.

We also provide the first evidence on the role of the so-called "private sanctions". In particular, the declared attitudes of Western firms to serving the Russian markets differed, with some firms fully withdrawing form serving the Russian markets while others maintaining business-as-usual as much as the legal regime allows. More restrictive attitudes can be rationally explained by consumer pressure in the sanctioning economies (see (Hart et al. (2023))). This paper provides evidence that firms' individual

attitudes can boost the overall effectiveness of sanctions, but only partially. In particular, we show that imports of goods collapsed more where firms announced withdrawal and less where firms were buying time or remaining, with intermediate effects for firms suspending or scaling back their operations, based on records in the database compiled by Sonnenfeld et al. (2022). On the other hand, intermediated trade increased progressively more for firms with more restrictive attitude to serving the Russian market, and so did unit values of respective goods at the point of imports. This suggests that while more restrictive attitudes of trademark owners were associated with greater technology switching and higher cost inflicted on end-consumers in Russia, the effects were attenuated through the use of intermediated trade.

We further show that the patterns observed for unit values cannot be easily explained by importers' monopolistic power and their ability to charge based on consumers' willingness to pay. By implication, differential increases in unit values of imports likely reflect differences in the cost of intermediated trade. Those differences, in turn, may reflect some knowledge of the nature of this trade on the part of exporting firms in sanctioning jurisdictions.

Our paper contributes to several strands of the economic literature. First, we contribute to the literature on intermediated (or "entrepot") trade (see, for instance, Ganapati et al. (2024)) by documenting a large and ever-changing variety of pre-existing and new routes involving intermediate trade and used to work around comprehensive trade sanctions. Such intermediated trade has been earlier shown to facilitate evasion of tariffs and taxes (Fisman et al. (2008)). Fisman et al. (2024) show that intermediated trade via Russia was used by Donbas region to circumvent embargo on Donbas-Ukraine trade following the 2014 conflict. We further identify a particular type of intermediated trade involving Western trademarks where neither the country of origin nor the trading country uphold sanctions and show that this trade can be as important in terms of volume and technological content as intermediated trade involving goods of sanctioning origin sold by traders in neutral economies.[1]

By using comprehensive transaction-level data on imports of the sanctioned economy we document, in a triple-differenced setting, the extent of technology switching and additional costs faced by importers after taking into account intermediated trade. We thus shed light on two main objectives of comprehensive trade sanctions.[2] The existing evidence on the use of intermediaries and the overall effectiveness of sanctions has been mixed. Baronchelli et al. (2022) study the history of small arms embargoes and do not find evidence of sanction-busting through abnormal trade patterns among sanctioned countries' neighbours. Crosignani et al. (2023) show that US firms' trade with China falls in response to export controls on specific goods with no offsetting increases in trade with other partners. Gutmann and Neumeier (2022) and Frank (2017) find no evidence of sanction busting through diverted trade. Crozet and Hinz (2020) find that the earlier round of sanctions on Russia resulted in a broad-based decline in sanctioning countries' exports to Russia, which can be mostly attributed to increased country risk affecting all transactions with Russia. Tyazhelnikov et al. (2023) show that intermediated trade via Belarus was used to circumvent restrictions on import of food from the EU imposed by Russia in the aftermath of the annexation of Crimea in 2014 while Crozet et al. (2021) show that firms that exported both to Russia and to neighbouring countries prior to 2014 reduced their direct sales to Russia by more than other firms in the aftermath of the 2014 round of sanctions.

Second, we contribute to the nascent literature on private sanctions" (Hart et al. (2023), Sonnenfeld et al. (2023), Sonnenfeld et al. (2023)) by providing the first quantitative evidence of how such private sanctions further restrict the sanctioned economy's access to technology and inflict further costs and how these effects are attenuated through greater use of intermediated trade for goods subject to private sanctions. The scope of of intermediated trade in our analysis is much broader than in the investigation by De Lucio et al. (2024) who show that private sanctions by Spanish firms were associated with lower exports to Russia without any increase in intermediated trade.

---

[1] Our dataset draws on customs data it does not systematically cover goods entering from other members of the Eurasian Economic Union, a customs-free bloc. In this regard, the analysis complements Chupilkin et al. (2023b) who document the use of trade via EEU to circumvent sanctions.

[2] There is also a literature focusing on exports of sanctioned countries that sheds light on the other objective of sanctions related to reducing export revenues. Haidar (2017) shows a decline in Iranian non-oil exports to countries that introduced sanctions relative to other countries in the post-sanction period, while Babina et al. (2023) show that Russian oil shipments were largely redirected to alternative markets in response to the EU embargo and G7 price cap on Russian seaborne crude oil, both of which took effect in December 2022. Chupilkin et al. (2023a) further document increasing use of non-Western currencies of invoicing in international trade in response to sanctions.

The rest of the paper is structured as follows. Section 2 sets the stage by outlining the economic sanctions imposed on Russia in 2022, presenting the data sources and describing the broad patterns found in the data. Section 3 lays out our empirical approach, while Section 4 presents the results and discusses their implications. The last section concludes.

2 Setting and Data

2.1 Sanctions on the Russian economy: An overview

Prior to Russia's full-scale invasion of Ukraine in 2022, a narrower set of sanction was already in place. These earlier sanctions were introduced in response to the annexation of Crimea in 2014 and the armed conflict in Eastern Ukraine that started in the same year. Those sanctions predominantly targeted specific companies and individuals. They were accompanied by counter-measures imposed by Russia, notably a ban on import of various food products from the EU, the US and the UK (see Peeva (2019) for an overview). Those sanctions and counter-sanctions were found to result in a broad-based reduction in Russia's trade with the sanctioning countries (Crozet and Hinz (2020)), an increase in prices of the affected goods (Hinz and Monastyrenko (2022)), weaker performance of sanctioned companies (Ahn and Ludema (2020)) and possibly an increased popular support for the government (Peeva (2019)).

On 23 February 2022, the EU expanded its sanctions in response to the recognition of the non-government controlled areas of the Donetsk and Luhansk oblasts of Ukraine and the ordering of Russian armed forces into those areas. The sanctions were further expanded in ten waves, with most in place by the mid-March of 2022. Luxury goods, for instance, were added as part of the fourth package on 15 March 2022, while technology-related goods were added as part of earlier packages. Overall, export prohibitions have covered arms, advanced and dual-use technology, quantum computing, advanced semiconductors, sensitive machinery, transportation and chemicals, goods for use in the oil industry and maritime navigation and goods seen to enhance Russia's industrial production capacity as well as luxury products (see Chupilkin et al. (2023b)).

In addition to exports, sanctions have also applied to investments in a number of sectors; use of public funds; imports from Russia of certain goods such as coal, iron and steel, and wood; aviation, Russian freight operators; restrictions on financial services including transactions with Russia's Central Bank; as well as travel bans and financial measures targeting more than 1,200 individuals and 100 companies (see Drott et al. (2023) for a discussion of financial sanctions and their effectiveness).

A total of 45 jurisdictions including Australia, Canada, members of the European Economic Area, Japan, Korea, New Zealand, Switzerland, Taipei China, UK and US adopted their own sanction packages (see Annex Table A1 for a list). At the same time, China and Turkiye are among Russia's main trading partners that did not impose economic sanctions on Russia and are referred to as "neutral" in the analysis.

2.2 Data on imports and exports

Our analysis draws on transaction-level dataset of import and export transactions going through Russia's customs. In 2022, it contains around 12 million import records associated with more than 74,000 unique importing firms. Over the years, it tracks closely Russia's aggregate international trade, whether reported by Russia or by its trading partners via UN Comtrade (see Annex Figure A1; in 2022, Russia suspended publication of aggregate trade statistics). Similar datasets were used, for instance, by Korovkin and Makarin (2023) to analyze Ukraine-Russia trade after 2014, by Babina et al. (2023) to look at exports of oil products from Russia in 2022-23 and by Chupilkin et al. (2023a) to look at the shifts in the use of various currencies of invoicing following the imposition of economic sanctions.

Each record has information on product (using the Harmonized System of classification, HS), value, quantity or weight of good, seller and recipient of goods as well as the currency of invoicing. The dataset only meaningfully covers transactions with counterparts outside the Eurasian Economic Union –

a customs-free bloc comprising Armenia, Belarus, Kazakhstan, the Kyrgyz Republic and Russia (see Isakova et al. (2016) for a discussion of the union).

We distinguish between the exporting (sending) country as well as a country of origin of goods and a trading country. In particular, we aggregate goods originating in sanctioning countries (as country of origin) and either exported directly or via a trading company in another sanctioning economy; goods originating in a neutral economy exported via a trader the same economy or another neutral economy; goods originating in a sanctioning economy exported via a trader in a neutral economy and vice versa, goods originating in a neutral economy exported via a trader in a sanctioning economy. This yields four mutually exclusive categories covering all imports. Goods imported from a neutral origin via a neutral trader form the base category for the analysis. Annex Table A4 summarizes descriptive statistics for Russia's import transactions.

2.3 Sanctioned goods

To define internationally sanctioned goods, we take the regulations adopted by the EU, Russia's main trading partner before the war. This list is also the most comprehensive in terms of product groups covered. We focus on HS6 product groups to ensure full comparability of records across jurisdictions.

In particular, following Chupilkin et al. (2023b), we identify product groups, on which the EU introduced sanctions to export to Russia in the aftermath of the invasion, using information from the EU Council Regulation 833/2014 and its subsequent amendments [3] as well as from the EU list of dual-technology product codes.[4].

Product groups are also marked as subject to sanctions in cases when sanctions cover HS6 codes only partially. For example, exports of "luxury" sports equipment or clothing with prices in excess of a certain threshold (typically €300) are subject to sanctions, while cheaper items in the same product group may not be subject to restrictions. In other cases, only a subset of HS8 product codes within an HS6 code may be covered (for example, champagne but not prosecco among sparking wines). Numerous other exemptions may apply, for instance, on health and environmental grounds or in relation to goods required by Russia to fulfil its contractual obligations with respect to deliveries of gas and oil to Europe. Most packages also include provisions for trade covered by pre-existing contracts to be carried out by a certain date, sometimes into the following year. Thus some of the trade in HS6 product groups coded as sanctioned may in fact be covered by such contract wind-down clauses.

For each product line we record the date when sanctions enter into force (see Annex Figure A4). We code the respective HS6 product line as subject to sanctions starting from the next month (for instance, April 2022 for sanctions adopted in mid-March 2022). The list of product groups partially covered by the sanctions is an eclectic mix of 2,182 HS6 codes (as of December 2022) covering around 40 percent of all product lines. These combine weapons (HS 9301), semi-conductor media (852352), engines and pumps (8412, 8413), containers (860900), aircraft and parts (88), ammonia (281420), steel pipes for oil pipelines (730411), navigation instruments (9014), ski suits (611220), and others.

We distinguish between three broad categories of sanctioned goods: goods that enhance industrial capacity, including those used in transportation and oil and gas industry; dual-technology and military goods and luxury goods. We use a categorical variable distinguishing between different types of sanctioned goods and other goods. Over time, the number of sanctioned product groups increased slightly (see Annex Figure A4). Annex Table A3 summarizes application of sanctions by HS section.

2.4 First look at the data: Broad patterns and case studies

Prior to Russia's invasion of Ukraine in February 2022, most industrial capacity goods were imported from sanctioning economies of origin and the monthly values of imports were relatively stable (see

---

[3]https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:02014R0833-20221007&from=ENtocId108, for instance, Annex II and Annex VII-B

[4]https://trade.ec.europa.eu/doclib/docs/2016/february/tradoc$_1$54240.pdf

Figure 1). After February 2022, shipments from sanctioning economies dropped sharply. In March-December 2022 such imports were 68 percent lower than in the same period of 2021. After initially dropping, imports of industrial capacity goods of neutral origin picked up rapidly. In addition, the value of imports from sanctioning economies via traders, initially small, picked up strongly from month to month.

By way of illustration, consider imports under a major Japanese trademark covering high-end machinery and equipment. Historically these originated primarily in Japan and were mainly exported by traders in Japan (see Annex Figure A2). A small proportion of imports under this trademark came via traders in neutral jurisdictions, primarily Hong Kong SAR, China and Indonesia. In March-December 2022 the respective imports from Japan halved relative to the same period of 2021, with a more pronounced drop towards the end of the year (in the early month shipments were more likely to have been covered by existing contracts). At the same time, trades by exporters in China increased by a factor of 10, from a low base. The same brand was also exported by a variety of traders in neutral jurisdictions with Indonesia, Azerbaijan, the UAE and Turkiye all exporting in excess of US$ 1 million each. Such intermediated trade picked up towards the end of the year as direct trades from Japan dwindled. The patterns were broadly similar for dual-use technology imports (see Figure 1).

A different type of intermediated trade was at play when it comes to luxury goods. By way of illustration, consider first imports of high-end electronics under a major US trademark. The trademark owner was among many Western companies that discontinued direct sales to Russia shortly after the invasion and many of its flagship products including smart phones would be subject to luxury goods provisions of the EU trade sanctions. Prior to 2022, virtually all exports of goods to Russia under this brand listed China (or India or Vietnam, as applicable) as the country of origin and were administered by a trading company in Ireland. After March 2022 trades from Ireland, the UK and other sanctioning economies almost disappeared. At the same time, imports of products under these brands via traders in neutral economies rose sharply reaching levels comparable with pre-invasion total imports. The top exporting trader jurisdictions included Hong Kong SAR, the UAE, Turkiye, China, Serbia and Uzbekistan (see Annex Figure A3, left panel). The number of different products imported (at the HS6 level of disaggregation) first collapsed from around 60 to around 10 core products (smart phones, accessories and computers among them) gradually recovering to more than 40 by the end of the year (see Annex Figure A3, right panel). Indeed, Avdeenko et al. (2023) show that such products remained widely available on Russian websites tracked by Google Analytics in 2022.

In this instance, intermediated trade took the form of moving from goods of neutral origin imported under a Western trademark via a sanctioning trading country to goods of neutral origin being imported under a Western trademark via a neutral trading country. In the absence of information about trademarks involved, it becomes difficult to distinguish between intermediated trade and trade diversion in the case of goods of neutral origin. A change in trader patterns for these goods (from sanctioning to neutral) is consistent with intermediated trade (as in the above example) but it could also be explained by discontinued exports to Russia under Western trademarks and an increase in exports of alternative products, for instance, Huawei smart phones.

2.5 Identifying and classifying Western trademarks

To distinguish between these cases, the empirical analysis looks separately at goods of neutral and sanctioning origin. For goods of neutral origin it further focuses on imports of "Western" trademarks. These trademarks are identified primarily from the import transactions dataset. In particular, we record trademarks where during 2016-21 more than half of the imported volume corresponded to exporters (traders) in sanctioning jurisdictions. Such trademarks account for approximately half of import transactions by volume. Boeing, Airbus, Apple, Mercedes-Benz, Samsung, Toyota, Hyundai, Bosch and BMW are among brands that top this list with imports well in excess of US$ 5 billion each during 2016-21 (see Annex Table A2 listing to trademarks by volume). Top neutral trademarks (listed in the same table) include Huawei, Lenovo (both electronics from China).

We also cross-check the resulting list against the lists in Sonnenfeld et al. (2022) who collate data from announcements of more than 1,500 major companies with global operations as to whether they completely withdraw from the Russian market, continue serving it partially or proceed with business as

usual. The list covers major international companies that are majority-owned by individuals or entities from outside Belarus and Russia and have meaningful operations in their home country, Russia and at least one other economy. These companies recently derived approximately one percent of their global revenue (or more) from Russia and had global revenue in excess of US$ 100 million in at least one year recently. They also had recent verifiable business activity in Russia in terms of sales, investment, sourcing or manufacturing (see Sonnenfeld et al. (2023)). For firms that meet these criteria the list provides information on the jurisdiction of each company.

Building on these lists, we examine the top 1,000 spellings (by volume) appearing in the trademark field of customs records for Russia's imports in 2016-22. Together with the imports of generics, trade covered by this exercise accounts for 68 percent of Russia's total imports in those years.[5] Among these trademark records, 61 are various permutations of "not applicable" (such as "n/a", "does not apply" and so on). We unify these records as "no trademark".

For each remaining trademark on the list, we search if the decision of the corresponding trademark owner is recorded in the database compiled by Sonnenfeld et al. (2022). In some cases, multiple trademarks are matched to the same owner (for example, Hyundai and Kia). A further 40 records are obvious alternative spellings of established trademarks (for example, "BMW AG" vs BMW). These account for 1.7 percent of trade covered in this exercise and are also matched to the respective trademark owners. Reassuringly, alternative spellings of major trademarks are relatively infrequent in the data. A total of 416 records (accounting for less than 10 per cent of 2016-22 trade covered in the exercise) could not be matched to the lists in Sonnenfeld et al. (2022).

Overall, we identify 104 Western trademark owners that announced full withdrawal from the market (for instance, Mercedes, Toyota and Hewlett-Packard). In these cases trademark owners indicated in their official announcements or filings "making a clean break / permanent exit from Russia and / or leaving behind no operational footprint" (see Sonnenfeld et al. (2022)). A further 156 trademark owners suspended almost all operations in Russia without permanently existing / divesting (examples include Boeing, Hyundai and Apple). Another 51 are classed as scaling back – suspending a significant portion but not all of their business in Russia (for example Skoda, General Electric and Linde). A further 110 are buying time – pausing new investments / minor operations in Russia but largely continuing substantive business (examples include Bosch and Philips). A total of 31 are deemed to be digging in, that is, largely doing business-as-usual (Liebherr and Mitsubishi amidst those). A categorical variable tracks all these options.

In addition, 31 major neutral trademark owners are also covered in both our exercise and the dataset (for example, Huawei, Lenovo and Xiaomi). In a handful of cases where the domiciliation of trademark owner (Western or neutral) identified in Sonnenfeld et al. (2022) differs from the one obtained empirically from the dataset, we use the domiciliation information in Sonnenfeld et al. (2022). Examples include Kia and Tefal that were empirically coded as neutral but were re-coded as Western based on Sonnenfeld et al. (2022) or Land Rover and Baccardi that were empirically coded as Western but got re-coded as neutral. These 39 trademarks account for 2.2 percent of trade.

The classified Western trademarks alone (excluding neutral trademarks, generics and Western trademarks that could not be matched to Sonnenfeld et al. (2022)) account for 26 percent of Russia's imports in the dataset in 2016-22.

While for around 35 percent of imports volume information of trademarks is either missing or explicitly recorded as "no trademark" (see Annex Figure A5), there is no evidence that the incidence of missing trademarks in customs declarations increased in 2022 compared with the earlier years. Many goods will naturally not have trademarks, from generic pharmaceuticals to agricultural commodities.

There are also no indications of information about the country of origin becoming prone to misreporting. When we identify goods imported under a certain trademark where a new country of origin appears in a given year (relative to countries of origin recorded against the same trademark in earlier years), the corresponding share of imports is less than 1 percent relatively and stable over time. Those records may to a large extent reflect the opening of new production facilities (such as Apple

---

[5]The first half of this list, the top 500 spellings, account for 63 percent of trade while the next 500 spellings only for 5 percent of imports.

factories in Vietnam or India, for instance).

A small proportion of trade (under 3.5 percent) is accounted by trademarks not imported in previous years (see Annex Figure A5). There is no evidence of an increase in such records in 2022 either. In regression analysis, generics, and new trademarks appearing in 2022 are by default merged with goods traded under neutral trademarks (they are treated separately as part of robustness checks).

2.6 Trends in intermediated trade

Overall, we distinguish between three types of trade and a residual. We identify direct (Western) trade from sanctioning economies as imports with sanctioning countries of origin or under Western trademarks where exporting trader is located in a sanctioning jurisdiction. Similar trades where exporting trader is instead located in a neutral jurisdiction are added up as intermediated trade. Imports from neutral countries of origin under neutral trademarks (including any trademarks not previously imported or goods with no trademark) via neutral traders are added up as neutral trade. An increase in this category after the imposition of sanctions can be interpreted as trade diversion. This leaves a relatively small residual of imports from neutral economies of origin under neutral trademarks routed via traders in sanctioning jurisdictions (other trade). Evolution of these types of trade over time is presented in Figure 2 and Table 1.

Direct Western imports of industrial-capacity goods in March-December 2022 dropped by 67 percent compared with the same period of 2021. Intermediated trade increased more than threefold, compensating for 13 percent of this drop. By the end of the year (December-on-December) it was compensating for 37 percent of lost direct trade with the West.

Trade diversion (increase in neutral trade) compensated for an additional 28 percent of lost direct trade with the West (and 58 percent on a flow basis by December). Taken together, intermediated trade and trade diversion compensated for about 40 percent of lost direct trade with the West in 2022 as a whole and almost 100 percent on a flow basis by December 2022.

Trends for dual-use technology are similar except intermediated trade played a more important role compared with trade diversion. It accounted for 17 percent of lost direct trade with the West in 2022 and more than 70 percent on a flow basis in December.

Direct imports of luxury goods from sanctioning economies also plunged. These imports were to a lesser extent substituted through intermediated trade or imports from neutral economies, largely reflecting lower ability of China and other emerging markets to supply luxury brands under their own trademarks.

For non-sanctioned goods, the drop in direct exports from sanctioning economies was also observed by was less pronounced. Direct trade from neutral economies and intermediated trade increased, resulting in relatively high substitution rates.

Intermediated trade in March-December 2022 was roughly equally split between products of sanctioning origin (53.7 percent) and goods of neutral origin under Western trademarks (46.3 percent). If we look at imports under trademarks where the attitude of the trademark owner to serving the Russian market is identified, 65 percent of these are from sanctioning economies of origin for withdrawing and digging in trademarks alike while the remaining 35 percent, also traded under Western trademarks, originate in neutral economies (being manufactured in East Asia or South-East Asia, for instance, see Table 9). Likewise, around 40 percent of goods previously imported under major neutral trademarks originated in sanctioning economies. This underscores the importance of accounting for both types of intermediated trade in our analysis.

2.7 Trends in China-Russia trade

Another way of looking at these data is to focus on imports originating in Russia's main neutral trading partner, China (depicted in Figure 3). Imports of internationally sanctioned goods from China directly or via another neutral trader increased more rapidly than those of non-sanctioned goods (left panel)

and their share in total imports from China rose from around 40 percent before the invasion to around 60 percent by the end of 2022 (right panel). At the same time, exports of internationally sanctioned goods of China origin by companies registered in sanctioning economies (as in the earlier Ireland example) dwindled.

3   Empirical specifications

3.1   Difference-in-difference analysis

We start by systematically examining trade in goods originating in neutral jurisdictions. In particular, we look at the logarithm of imports (Imp) in each month t for each product group p, country of origin e exported by a trader in jurisdiction c. Product groups are aggregated at the HS6 level.

The difference-in-difference specification distinguishes between neutral and sanctioning traders and between the pre-sanction and sanction periods (see Equation 1). The coefficients of interest are those on the interaction term between an indicator for the sanction period ($Sanction$, which takes value of one from March 2022) and a dummy variable for neutral traders ($Tradertype$).

$$Ln(Imp)_{pect} = \beta Post - sanctions_t * Tradertype_e + \alpha_{pct} + \alpha_{pec} + \epsilon_{pect} \qquad (1)$$

The specification includes product-trader-origin (α_{pec}) fixed effects (capturing differences in demand for a specific product across various exporters related, for instance, to domestic production capacity as well as propensity to use traders in certain jurisdictions). In our single-importer specification, they also capture factors affecting the trading relationship between a given exporter and a given importer, such as distance, linguistic proximity, historical links or common border and allow for a differential impact of these factors across products. Product-origin-month (α_{pct}) fixed effects account for fluctuations in the business cycle in the producer country, its exchange rate, or anything else that may affect the aggregate supply of exports of a particular good. In sum, these fixed effects would subsume broad trends in exports from sanctioning economies in the aftermath of the imposition of sanctions (including a drop in exports of sanctioned goods to Russia) – but not differences in the use of intermediaries before and after the imposition of sanctions.

3.2   Triple-differencing analysis

The triple-differenced specifications further distinguishes between various types of sanctioned goods and other goods (see Equation 2). These specifications trader-origin-month fixed effects that account for increased use of intermediaries after the introduction of economic sanctions. They also include product-origin-month and product-trader-origin fixed effects (Equation 2). These specifications thus also difference out any trends in shipment of specific products from specific countries of origin. They seek to establish if the increases in the use of neutral traders for a particular type of sanctioned goods was greater than the increase in the use of neutral traders for other goods.

$$Ln(Imp)_{pect} = \beta Post - sanctions_{pt} * ProductType_p * Tradertype_e + \alpha_{pet} + \alpha_{ect} + \alpha_{pec} + \epsilon_{pect} \qquad (2)$$

Where the country of origin for an individual transaction is not available, we impute it from the country of origin stated at the start of a customs declaration (which may aggregate several customs transactions). We exclude observations where information on exporting trader outside Russia is not available as well as a small number of observations where destination country is elsewhere in the Eurasian Economic Union.

3.3 Extensive margin of trade

Half or more of observations on bilateral monthly trade at this high level of disaggregation are zeros. With this in mind, it is also useful to look at the extensive margin of trade – the probability that exports in a given month are positive for a given pair of trade partners, a given type of trader (neutral or sanctioning) and a given HS6 product code. Specifications similar to those for the intensive margin of trade are estimated as a linear probability model where the dependent variable takes a value of one for positive trade values on a certain trade path for a given product group and month and zero otherwise.

To combine the estimates on the extensive and the intensive margins of trade, we use the inverse hyperbolic sine transformation of the values of trade, $log(Imp + \sqrt{Imp^2 + 1})$ (seeMacKinnon and Magee (1990)). This formula approximates the logarithmic transformation for large trade volumes while assigning the value of zero to zero trade rather than discarding zero observations.

3.4 Constructing unit values

We also look at trade volumes in quantity terms. These observations are available in 42.6 percent of cases. Data availability is specific to HS6 product groups. For luxury goods quantity data are available in around 70 percent of cases. For non-sanctioned goods, on the other hand, availability drops to around 20 percent of observations, drastically shrinking control group of goods available to us. On the other hand, data on weight of shipment is available in more than 99 percent of cases. Since measuring cars by weight is clearly sub-optimal, our preferred measure of quantity is based on units for product groups where units are available and on weight for other product groups. Product-month fixed effects control for any measurement issues specific to product type.

Unit values are derived as the ratio of the value of imports and the measure of quantity.

Consider first broad trends concerning unit values of Russia's imports over time by looking separately at direct Western trade, intermediated trade and neutral trade (see Figure 4). In all cases unit values exhibit a slight upward trend over time, in line with inflation. This trend is slightly less pronounced for industrial-capacity goods (in line with a well-documented secular drop in the price of investment goods over time relative to other goods).

After the introduction of trade sanctions, the unit values for intermediated trade increased more rapidly than for direct trade with the West or neutral trade. This pattern is observed for all types of goods and is particularly pronounced for dual-use goods. In the case of dual-use goods (the lower-right panel), unit values of neutral trade (corresponding to trade diversion effects) have also increased considerably. For industrial-capacity goods, the unit values in intermediated trade initially dropped, plausibly reflecting composition effects, before increasingly rapidly over time.

4 Results

4.1 Difference-in-difference analysis: Intermediated trade

We start with the difference-in-difference analysis for goods from sanctioning countries of origin (the results are presented in Table 2). On the intensive margin of trade (for existing products and routings), the use of neutral traders for a given country of origin and product tripled after the introduction of sanctions (Column 1).

A combination of a neutral trader and a particular country of origin and product became 20 percentage points more likely to be observed (Column 2). All these effects are statistically significant at the 1 percent level. Note that these estimates capture only intermediated trade routes that were used in the past at least to some extent. A total 15 to 21 percent of combinations of products, country of origin and trading country for goods of sanctioning origin (accounting for approximately 5-6 percent of imports by volume) appeared after the imposition of sanctions. That is, they were never observed prior

to February 2022 and will thus be differenced be the fixed effects. If one zooms in on intermediated trade, such new routes account for more than 60 percent of route combinations observed under sanctions and up to half of intermediated trade for goods of sanctioning origin (see Annex Table A5).

In quantity terms, the estimated effects are also very large, albeit somewhat smaller than in value terms (Column 4). Unit values of goods imported via neutral traders increased by almost 40 percent after the imposition of sanctions relative to what could be otherwise expected (and relative to the average unit value for a given product group imported in Russia in a given month, Column 5).

Next, we focus on goods originating in neutral economies and traded under major trademarks where intellectual property holders are domiciled in sanctioning jurisdictions. We estimate similar difference-in-difference specifications (see Table 3, upper panel). The volumes imported via neutral traders increased by around 150 percent after the imposition of sanctions and the associated unit values increased by an extra 18 percent.

Intermediated trade was also 20 percentage points more likely to be observed (on the extensive margin). As in the case of goods of sanctioning origin, the total extensive margin of intermediated trade in goods under Western trademarks in larger: 20.6 percent of product-origin-trader combinations seen after the imposition of sanctions are new (44 percent of combinations involving intermediated trade). Later we will zoom in on new routes established after the imposition of sanctions separately.

Trade from neutral countries of origin under neutral trademarks (such as Huawei) also increasingly shunned traders in sanctioning jurisdictions (See Table 3, lower panel). The associated increases are smaller, however, in the region of 50 percent for trade volumes, 6 percentage points on the extensive margin and 6 percent for unit value costs.

In sum, on the extensive margin increases in intermediated trade involving goods originating in sanctioning economies and those originating in neutral economies (and traded under Western trademarks) are very similar. On the intensive margin, increases are somewhat greater for goods originating in sanctioning economies and they are associated with higher increases in unit values of imports.

4.2 Triple-differencing analysis: Intermediated trade in sanctioned goods

Next, we turn to triple-differenced analysis, saturating regressions with additional sets of fixed effects to isolate differential use of neutral traders for various types of sanctioned goods after the imposition of sanctions (see Table 4). In these specifications, trade in dual-use goods from sanctioning economies via neutral traders increased by an additional 54 percent (and an additional 42 percent for industrial capacity goods) – relative to the increase in intermediated trade observed for non-sanctioned goods (these specifications otherwise control for a combination of country of origin and exporting trader in a given month, Column 1). These differential effects are similar when measured in quantity terms (Column 4).

The likelihood of observing intermediated trade for a particular combination of sanctioning country of origin and neutral trader increased by an additional 5-6 percentage points for industrial-capacity and dual-use technology goods (Column 2). No statistically significant difference between shipments of luxury goods and non-sanctioned goods via neutral traders is observed in quantity terms (Column 4).

The increases is unit values observed in the earlier regressions appear to be broadly similar for all types of goods, except the increase observed for luxury goods was around 23 percentage points lower (Column 5). In other words, the unit value premium in this case appears to be, on average, specific to indirect routings irrespective of the types of goods involved.

Smaller increases in unit values for luxury goods may reflect the nature of the corresponding sanctions. Since luxury goods are only subject to sanctions when items in question exceed a certain threshold value, more expensive items within the same product group may have no longer been shipped resulting in lower average unit values. Alternatively, goods may have been assigned a lower unit value in the paperwork to remain outside the scope of trade sanctions.

Table 5 presents the results of the triple-differencing analysis focusing on goods originating in neutral economies. For trade under Western trademarks, volumes of intermediated trade increased by extra 23-59 percent for industrial-capacity goods and dual-use technology (upper panel, Column 3). Large statistically-significant differential effects are observed on the intensive and on the extensive margins (Columns 1, 2 and 3), with probability of transactions using traders in new jurisdictions up by an extra 5-6 percentage points relative to non-sanctioned goods (Column 2). Intermediated trade is industrial equipment was also associated with an additional increase in unit values of imports, of 17 percent (Column 5). Intermediated trade in luxury goods under Western trademarks, in contrast, increased less rapidly than for other goods. In part, this may reflect active use of other intermediated trade routes, via the Eurasian Economic Union members, for this type of trade, as documented in Chupilkin et al. (2023b).

4.3 New routes

The analysis so far covered intermediated trade on routes (combinations of product, country of origin and trading country) that had at some point been observed in the data. Next, we look at the trade on new routes established after the imposition of trade sanctions.

To do so, we restrict the sample to the post-sanctions period (March 2022 onwards) and sanctioning economies of origin, focusing on trade by product, trading country, country of origin and month. A categorical variable distinguishes between various types of routes taken by goods on the way to Russia (these routes are specific to a combination of product, trader and country of origin). The base category is trade involving traders in sanctioning economies and pre-existing routes. Other categories are permutations of neutral versus sanctioning traders and old versus new routes. The specifications (see Equation 3) otherwise control for product-origin-month fixed effects zooming in on differences on account of traders (intermediaries, if any). The results are presented in Table 6, Columns 1 and 2.

$$Ln(Imp)_{pect} = \beta RouteType_{pec} + \alpha_{pct} + \epsilon_{pect} \tag{3}$$

During the post-sanction period, a typical pre-existing route involving intermediaries saw 10 percent more trade than a typical direct routing while trade volumes on new routes involving intermediaries were around twice smaller (Column 1). The average unit values (for the same products and countries of origin) were 35 percent higher for intermediated trade involving existing routes and 53 percent higher for intermediated trade involving new routes (Column 2). In other words, where new routes needed to be established, the cost of intermediary services appears to have been substantially higher (the difference between the two coefficients being statistically significant at the 1 percent level). A small percentage of trade was routes via new routes involving sanctioning traders. Volumes involved were small and average costs were around 35 percent above those on old routes involving sanctioning traders.

Next, we repeat this exercise focusing on goods traded under Western trademarks originating in neutral economies. The results are similar to the ones for goods of sanctioning origin except unit value premia on new routes are smaller: 27 percentage points where neutral traders are used (compared with direct trade on old routes) and none where new routes are used by sanctioning traders (in volume terms such trades are small in absolute terms and relative to direct trades using established routes).

When we focus on new routes involving neutral trade, we restrict the sample to neutral trademarks and neutral countries of origin. In this subsample, new routes are less widespread, accounting for less than a quarter of observations and 2 percent of total trade. Here, two, new routes command a unit value premium, albeit of a somewhat smaller magnitude (of 18 percent in the case of neutral traders).

4.4 Decision to leave

Among "Western" firms, some announced early on their decision to discontinue servicing the Russian market while others made no public commitments. We investigate if differences in the stated approach

towards servicing the Russian market had any bearing on imports of the respective goods into Russia, taking into account both direct and indirect channels of trade.

In a difference-in-difference framework, we look at the volume of imports of a particular product group p from a given country of origin c traded under a specific trademark belonging to owner f shipped in month t. The specifications control for product-origin-trademark owner fixed effects (taking into account particularities of trade for any given trademark owner) and product-origin-month fixed effects picking up trends in imports of certain products originating in a given country that are common across all producers – including differential drops in direct trade between sanctioning economies and Russia after the invasion of Ukraine, depending on the type of good and application of sanctions.

When we look at pre-sanctions trade in 2021, we find a mix of exports of goods that were subsequently partially sanctioned and those that were not for all types of trademark owners (see Table 9). While not surprisingly firms withdrawing from the Russian market had a higher share of their baseline exports to Russia falling under sanctions than firms "digging in", all types of firms exported non-negligible amounts of sanctioned goods of various types as well as non-sanctioned goods.

The coefficient of interest in our specifications is one on the interaction term between the categorical variable characterizing trademark owners and a dummy variable for the period covered by the sanctions, as shown in Equation 4. The results are presented in Table 7.

$$Ln(Imp)_{pcft} = \beta PostSanctions_t * TrademarkOwnertype_f + \alpha_{pcf} + \alpha_{pct} + \epsilon_{pcft} \qquad (4)$$

Imports under trademarks owned by firms withdrawing from the Russian market declined by an additional 73 percent compared with imports corresponding to neutral trademark owners. At the same time imports under trademarks where owners are deemed to be "digging in" increased by more than 35 percent relative to the neutral benchmark (column 1). A similar trend is observed on the extensive margin of trade (Column 2). For firms suspending operations or scaling back, these estimated negative differentials are smaller (13-33 percent) but sizeable and statistically significant at the 1 percent level. Imports of goods supplied by companies buying time were comparable in volumes to imports under neutral trademarks but 3 percent more likely to be observed on the extensive margin.

Unit values of goods associated with withdrawing or suspending trademark owners increased by an extra 17 percent compared with unit values of neutral firms (or those digging in or buying time). The unit value differential is estimated at around 9 percent for trademark owners scaling back. The differences between these estimates (0, 9 and 17 percent) are in turn statistically significant at the 1 percent level (Column 6).

When it comes to intermediated trade, over which exporting multinationals may have somewhat less control, the share of imports under "withdrawing" trademarks routed via neutral jurisdictions increased by an additional 13 percentage points under sanctions (Column 4) while for trademarks where owners are digging in the change, if anything, is smaller than for neutral trademarks (where the share of neutral exporters also increased substantially, as can be seen in Figure 8). Importantly, these estimates take into account intermediated trade on the existing and new routes, with the latter accounting for 35 percent of intermediated trade for "withdrawing" and "suspending" trademarks and 23 to 28 percent for "digging in" and neutral ones (see Table 9).

Indeed, while the share of neutral traders for trademark owners scaling back and buying time increased in line with that for neutral trademarks (Column 4), the use of neutral traders (captured by the binary variable in Column 5) increased by an extra three percentage points. For the "suspending" trademarks the magnitudes are in between those estimated for those "scaling back" and "withdrawing".

In sum, the additional increase in intermediated trade in goods produced by firms exiting the Russian market was sizeable but not sufficient to offset the differences in direct exports to Russia across various types of trademark owners, which can be seen clearly in Figure (8 where the scales for direct trade with the West (upper left panel) and intermediated trade (upper right panel) are aligned).

To look at differential increases in unit values in intermediated trade, we repeat the exact same exercise restricting the sample to neutral exporting traders. The results are presented in Table 8. The unit

values in intermediated trade increased more for goods where firms announced their exit from the Russian market, with a 31 percent differential for withdrawing firms vs neutral trademarks compared with a 16 percent differential for "digging in" trademarks and no significant differential effect for those buying time.

Differential increases in unit values at the point of import into Russia depending on firms' stated attitudes to serving the Russian market could reflect differences in costs incurred by intermediaries. They might also be driven by variation in consumers' willingness to pay for certain goods, provided importers have sufficient monopolistic power to extract rents associated with greater willingness to pay for products where Western firms restricted their availability in Russia to a greater extent.

With this in mind, we track market concentration of imports of each trademark owner in each month across Russian importers (proxied by Hirschman-Herfindahl index of market concentration, HHI). The results presented in Annex Figure A6 show that market concentration of Russia's imports actually declined under sanctions as a large number of new firms entered the business of intermediated trade and / or trade with new counterparts in neutral economies. The declines in market concentration of imports were if anything, greater for withdrawing or suspending trademark owners than for those scaling back or digging in. Thus the differential patterns observed for unit values of imports are more likely to reflect differences in costs of intermediated trade.

If differences in unit values at the point of imports reflect differential costs incurred by intermediaries dealing with goods where trademark owners withdrew from serving Russia versus scaled back versus were buying time or digging in, such differences may be indicative of trademark owners having some (albeit imperfect) knowledge of the nature of intermediated trade. In the absence of any such knowledge it is not clear why costs of intermediaries would align with firms' stated attitudes with respect to serving the Russian market.

4.5 Event study analysis

The mostly-unanticipated nature of the war and the clear-cut timing of sanctions means that our setting lends itself well to an event-study analysis. In this simplified exercise, we focus first, separately, on industrial-capacity sanctioned goods originating in sanctioning economies and dual-use goods originating in those economies. The underlying econometric specifications are similar to the difference-in-difference specifications considered earlier, except for an additional battery of interaction terms between the neutral trader dummy and the dummy for each month (in this instance we use a time-invariant indicators for various types of sanctioned goods, as of December 2022). January 2022 serves as the base (omitted) period (see Equation 5).

$$Ln(Imp)_{ecpt} = \sum_t \beta_t Month_t * TraderType_c + \alpha_{pt} + \alpha_{et} + \alpha_{pec} + \epsilon_{ecpt} \tag{5}$$

While monthly trade is volatile and standard errors are larger, a number of distinctive patterns emerge from this analysis. Up until February 2022, the differences between trade volumes of industrial-capacity exported to Russia directly (or via traders in sanctioning economies) and those exported via traders in neutral economies were relatively stable, with the exception of a somewhat greater use of intermediaries during the first Covid-19 lockdowns in the first half of 2022 (see Figure 5).

By March 2022 intermediated trade reaches a level not seen before and keep increasing through August 2022, largely stabilizing afterwards. These trends are similar for all types of goods, while the magnitudes are greater in case of intermediated trade in industrial-capacity and dual-use goods (see Figure 6).

If we run an event study with a triple-differenced specification and all types of goods included, we find that increases in intermediated trade in dual-use technology were statistically significantly larger than for non-sanctioned goods, with the differential increasing from month to month (and a similar, albeit slightly less pronounced, trend for differential intermediated trade in industrial-capacity goods, see Figure 7).

On the extensive margin of trade, new routes of intermediated trade (a combination of country of origin and country of exporting trader) were up and running by April 2023 (with the estimate for that month being statistically significantly higher than for any prior month, (see Figure 5, middle panel). The number of routes continued increasing from month to month, through December 2022. These patterns were observed equally for all types of sanctioned goods as well as other goods (see Figure 6, middle panel).

Unit values of industrial goods and dual-use technology imported via neutral intermediaries increased markedly after the imposition of sanctions (see Figure 5, bottom panel). These increases in unit values occurred within a quarter of the sanctioned being introduced. By May 2022, unit values in intermediated trade had stabilized at their new levels. The pattern for non-sanctioned goods was similar (see Figure 6, bottom right panel).

Overall, it took around 2-5 months to set up alternative ways of importing goods from sanctioning economies into Russia via indirect schemes on the intensive margin of trade, that is, where certain routes (combinations of country of origin, exporting trader and product group) were used at some point in the past (for example, during the disruptions around the first Covid-19 lockdowns in the first half of 2020). Some new trade routes took considerably longer to be discovered.

4.6 Discussion

Taken together, the estimates shed some light on two key objectives of a comprehensive trade sanctions regime. except in the very short term, trade sanctions do not appear to have a meaningful impact on overall imports. Nine month after the introduction of trade sanctions, trade diversion and intermediated trade together fully or almost fully compensated for the loss of direct trade between the sanctioning and sanctioned economies (also taking into account trade in luxury goods via the Eurasian Economic Union, see Chupilkin et al. (2023b)). The routes involved in such intermediated trade (combinations of countries of origin and economies where the exporting trader is registered) are highly diverse and were up and running in a matter of months after the introduction of trade sanctions. Around half were used at some point in the past while others are new.

When it comes to restricting access to technology, direct Western trade in industrial-capacity and dual-use goods contracted by around two thirds. At least half (one-third of baseline trade) was compensated by trade involving intermediaries without visible change in technology content (to the extent that products were traded under Western trademarks). The other half (one-third of baseline trade) was compensated by imports from neutral economies under neutral (different) trademarks, conceivably involving change in technological content of imports. This may have a sizable impact on productivity growth in the sanctioned economy in the long term.

When it comes to inflicting additional cost, sanctions do make imports relatively more expensive for customers in the sanctioned economies. Magnitudes involved are not prohibitive but are comparable with, for instance, tariffs imposed on parts of US-China trade in the late 2010s. The part of imports involving intermediated trade is associated with an increase in unit values at the point of imports of 15 to 55 percent. For trade diversion towards neutral economies, there is some evidence of relatively small increases in the unit price of dual-use imports.

Individual attitudes of companies domiciled in the sanctioning economies appear to matter partially for the effectiveness of sanctions in terms of achieving their objectives. Goods under trademarks where owners declared more restrictive attitudes saw greater reductions in direct exports. At the same time, intermediated exports increased more for those goods – but at a higher premium for end-consumers in the sanctioned economies (of perhaps up to an extra 20 percentage points). In other words, companies' individual attitudes can have some, albeit limited, impact on both the extent of technological substitution and the inflicted cost.

Where the objective of technology switching does not apply (for instance, in the case of most luxury goods subject to trade sanctions), the objective of inflicting additional cost could alternatively be achieved by setting export tariffs commensurate with the cost of sanction evasion through the use of intermediaries. In this case, revenue received by intermediaries would instead accrue to governments in

sanctioning economies.

4.7 Robustness checks

We run a number of robustness checks. First, we repeat the analysis using weight as a unit of quantity for all HS6 product codes. Alternatively, we disregard the records of weight and use only data on unit quantities where available. The results regarding the quantities of imports and their unit values are broadly similar.

We look separately at Western and neutral trademarks when analysing trends from sanctioning countries of origin. The results hold in both subsamples and are qualitatively similar. We also exclude data on generics (where trademark is not identified) or where trademark first appears in 2022 and hence cannot be classified as Western or neutral. The results (for trade under neutral trademarks) remain similar.

The results are also similar when we repeat the analysis using time-invariant definition of sanctioned goods (based on restrictions in place as of December 2022) instead of variables that track the month of adoption of each sanctions package.

5 Conclusion

Using transaction-level data on Russia's imports, we document a number of striking changes in trade flows into Russia after the invasion of Ukraine in February 2022 and the imposition of broad economic sanctions on Russia. This adjustment is remarkable in terms of the comprehensive nature of change in trade flows and the speed with which these changes occurred. While imports collapsed by more than half in the aftermath of the invasion, they by and large recovered to the pre-war trade levels by the end of the year, while the composition and routing of trade flows changed dramatically.

Detailed analysis of patterns of trade for major Western trademarks points to some knowledge of intermediated trade, even if imperfect, on the part of major Western exporters. In particular, unit values of intermediated trade align strongly with companies' self-declared attitudes to serving the Russian market.

If anything, the analysis understates the full changes in Russia's trade as it does not meaningfully cover trade via neighbouring economies in the Eurasian Economic Union, trade that may not have been officially recorded at customs or trade that may have been misreported (for instance, recorded under different product codes). Nonetheless, by revealing rapid shifts in trade flows in response to trade and financial sanctions imposed on Russia, the paper invites further research into ways in which sanctions can be circumvented and ways to make sanctions more effective.

References

Afesorgbor, Sylvanus Kwaku (2019) 'The impact of economic sanctions on international trade: How do threatened sanctions compare with imposed sanctions?' *European Journal of Political Economy* 56, 11–26

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

Avdeenko, Alexandra, Maximilian Kaiser, Krisztina Kis-Katos, and Leonie Reher (2023) 'Sanctions, sales, and stigma: A tale on the performance of international brands in Russia.' Working Paper, University of Goettingen

Babina, Tania, Benjamin Hilgenstock, Oleg Itskhoki, Maxim Mironov, and Elina Ribakova (2023) 'Assessing the impact of international sanctions on Russian oil exports.' CEPR discussion paper 58455, Centre for Economic Policy Research

Baronchelli, Adelaide, Raul Caruso, and Roberto Ricciuti (2022) 'Trade in small arms and light weapons: Are embargoes effective?' *The World Economy* 45(5), 1336–1361

Bergeijk, Peter A. G. van (1995) 'The impact of economic sanctions in the 1990s.' *The World Economy* 18(3), 443–455

Chupilkin, Maxim, Beata Javorcik, Aleksandra Peeva, and Alexander Plekhanov (2023a) 'Exorbitant privelege and economic sanctions.' EBRD Working Paper 281, European Bank for Reconstruction and Development

Chupilkin, Maxim, Beata Javorcik, and Alexander Plekhanov (2023b) 'The Eurasian roundabout: Trade flows into Russia through the Caucasus and Central Asia.' EBRD Working Paper 276, European Bank for Reconstruction and Development

Crosignani, Matteo, Lina Han, Marco Macchiavelli, and Andre F. Silva (2023) 'Geopolitical risk and decoupling: Evidence from U.S. export controls.' SSRN Working Paper, Social Sciences Research Network

Crozet, Matthieu, and Julian Hinz (2020) 'Friendly fire: The trade impact of the Russia sanctions and counter-sanctions.' *Economic Policy* 35(101), 97–146

Crozet, Matthieu, Julian Hinz, Amrei Stammann, and Joschka Wanner (2021) 'Worth the pain? Firms' exporting behaviour to countries under sanctions.' *European Economic Review* 134, 103683

De Lucio, Juan, Raul Minguez, and Asier Minondo (2024) 'Reducing trade with Russia: Sanctions versus reputation.' Working paper

Draca, Mirko, Jason Garred, Leanne Stickland, and Nele Warrinnier (2022) 'On target? Sanctions and the economic interests of elite policymakers in Iran.' *The Economic Journal* 133(649), 159–200

Drott, Constantin, Stefan Goldbach, and Volker Nitsch (2023) 'The effects of sanctions on Russian banks in Target2 transactions data.' Technische Universität Darmstadt Working Paper, Technische Universität Darmstadt

Felbermayr, Gabriel, Aleksandra Kirilakha, Constantinos Syropoulos, Erdal Yalcin, and Yoto V. Yotov (2020) 'The global sanctions data base.' *European Economic Review* 129, 103561

Fisman, Raymond, Giovanna Marcolongo, and Meng Wu (2024) 'The undoing of economic sanctions: Evidence from the Russia-Ukraine conflict.' Working paper

Fisman, Raymond, Peter Moustakerski, and Shang-Jin Wei (2008) 'Outsourcing tariff evasion: A new explanation for entrepôt trade.' *The Review of Economics and Statistics* 90(3), 587–592

Frank, Jonas (2017) 'The empirical consequences of trade sanctions for directly and indirectly affected countries.' FIW Working paper 174

Ganapati, Sharat, Woan Foong Wong, and Oren Ziv (2024) 'Entrepot: Hubs, scale, and trade costs.' *American Economic Journal: Macroeconomics*

Gutmann, Jerg, Matthias Neuenkirch, and Florian Neumeier (2022) 'Do China and Russia undermine US sanctions? Evidence from DiD and event study estimation.' CESifo Working Paper 10100, CESifo

Haidar, Jamal Ibrahim (2017) 'Sanctions and export deflection: Evidence from Iran.' *Economic Policy* 32(90), 319–355

Harrison, Mark (2023) 'Economic warfare: Lessons from two world wars.' CEPR Discussion Paper 18439, CEPR

Hart, Oliver, David Thesmar, and Luigi Zingales (2023) 'Private Sanctions.' *Economic Policy* p. eiad041

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

Isakova, Asel, Zsoka Koczan, and Alexander Plekhanov (2016) 'How much do tariffs matter? Evidence from the customs union of Belarus, Kazakhstan and Russia.' *Journal of Economic Policy Reform* 19(2), 166–184

Korovkin, Vasily, and Alexey Makarin (2023) 'Conflict and intergroup trade: Evidence from the 2014 Russia-Ukraine crisis.' *American Economic Review* 113(1), 34–70

MacKinnon, James G., and Lonnie Magee (1990) 'Transforming the dependent variable in regression models.' *International Economic Review* 31(2), 315–339

Peeva, Aleksandra (2019) 'Did sanctions help Putin?' Discussion Papers 2019/7, Free University Berlin, School of Business Economics

Rauch, James E. (1999) 'Networks versus markets in international trade.' *Journal of International Economics* 48(1), 7–35

Sonnenfeld, Jeffrey, Steven Tian, Steven Zaslavsky, Yash Bhansali, and Ryan Vakil (2022) 'It pays for companies to leave Russia.' SSRN Working Paper, Social Sciences Research Network

Sonnenfeld, Jeffrey, Timofiy Mylovanov, Nataliia Shapoval, Steven Tian, Andrii Onoprienko, Georgia Hirsty, and Michal Wyrebkowski (2023) 'The Russian business retreat – how the ratings measured up one year later.' SSRN Working Paper, Social Sciences Research Network

Tyazhelnikov, Vladimir, John Romalis, and Yongli Long (2023) 'Russian counter-sanctions and smuggling: Forensics with structural gravity estimation.' Working Paper, University of Sydney

Yang, Jiawen, Hossein Askari, John Forrer, and Lili Zhu (2009) 'How do US economic sanctions affect EU's trade with target countries?' *The World Economy* 32(8), 1223–1244

Figure 1: Russia's monthly imports from sanctioning and neutral economies, by type of goods
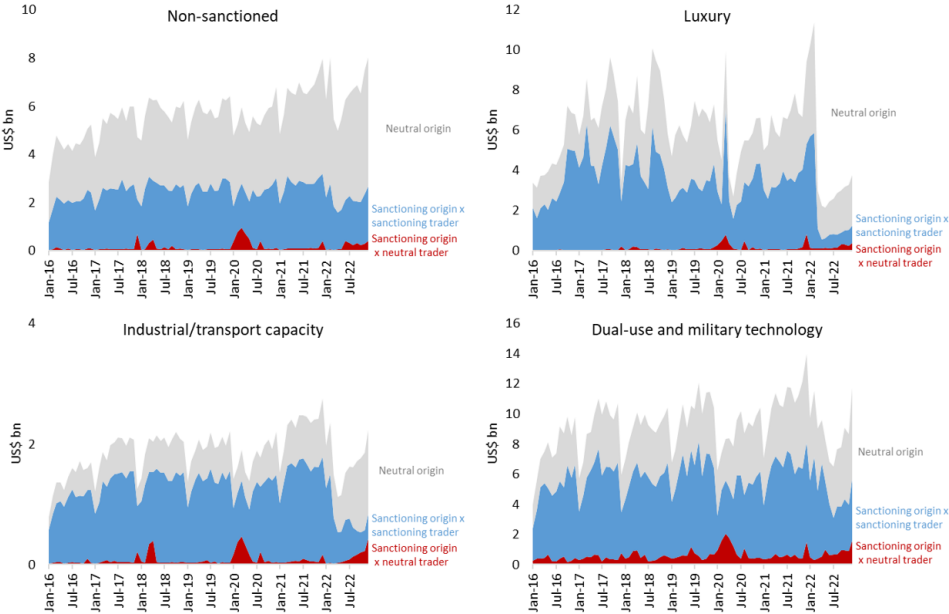
Source: Authors' calculations.

Note: Sanctioning economies are listed in the Annex, all other economies are deemed neutral. Sanctioned good groupings are based on the EU sanction packages.

Figure 2: Russia's monthly imports by type of trade and type of goods
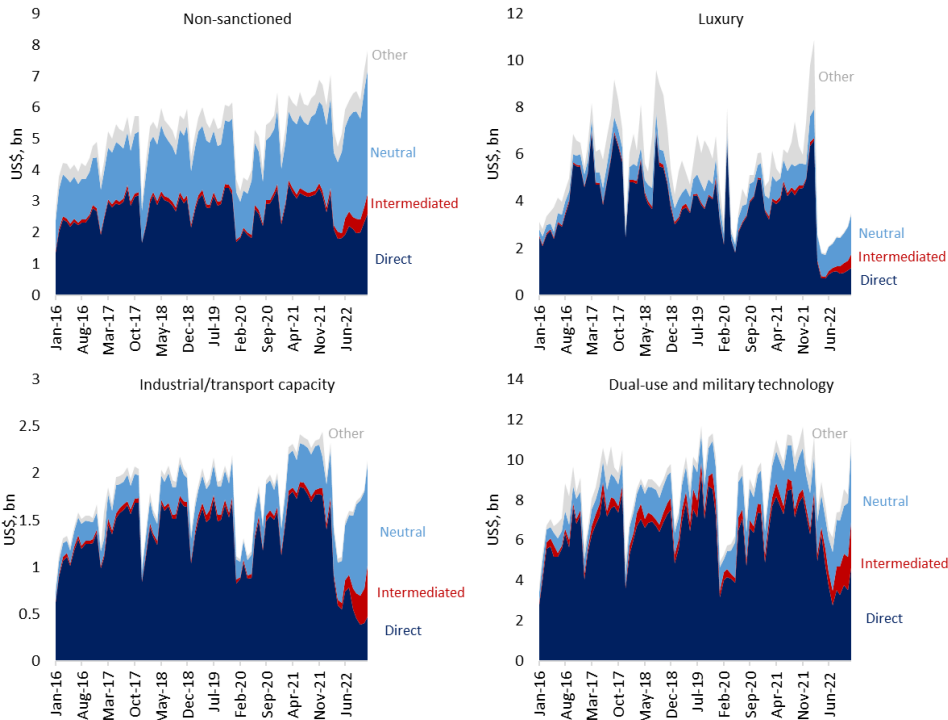
Source: Authors' calculations.

Note: Sanctioning economies are listed in the Annex, all other economies are deemed neutral. Sanctioned good groupings are based on the EU sanction packages. Western trademarks are identified as majority-exported by traders in sanctioning jurisdictions prior to 2022. Substitution rates are with respect to the drop in direct trade with the West (imports from sanctioning countries of origin or under Western trademarks via sanctioning-economy trader). Intermediated trade is as above except exporting trader is in a neutral jurisdiction. Imports from neutral countries of origin under neutral trademarks constitute neutral trade.

Figure 3: Russia's monthly imports of China origin, by type of goods

Source: Authors' calculations.

Note: Sample is restricted to imports where China is a country of origin. Sanctioning economies are listed in the Annex, all other economies are deemed neutral. Sanctioned good groupings are based on the EU sanction packages.
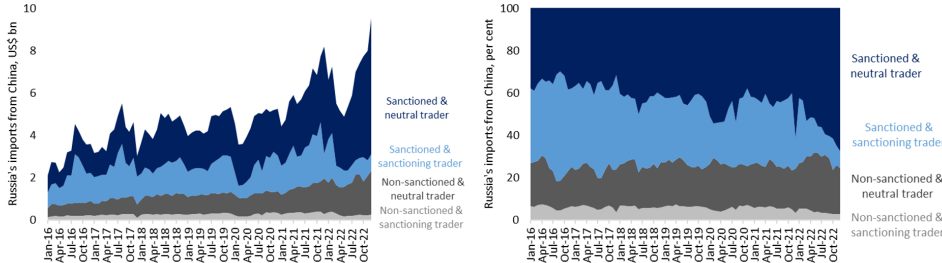
Figure 4: Unit values and intermediated trade
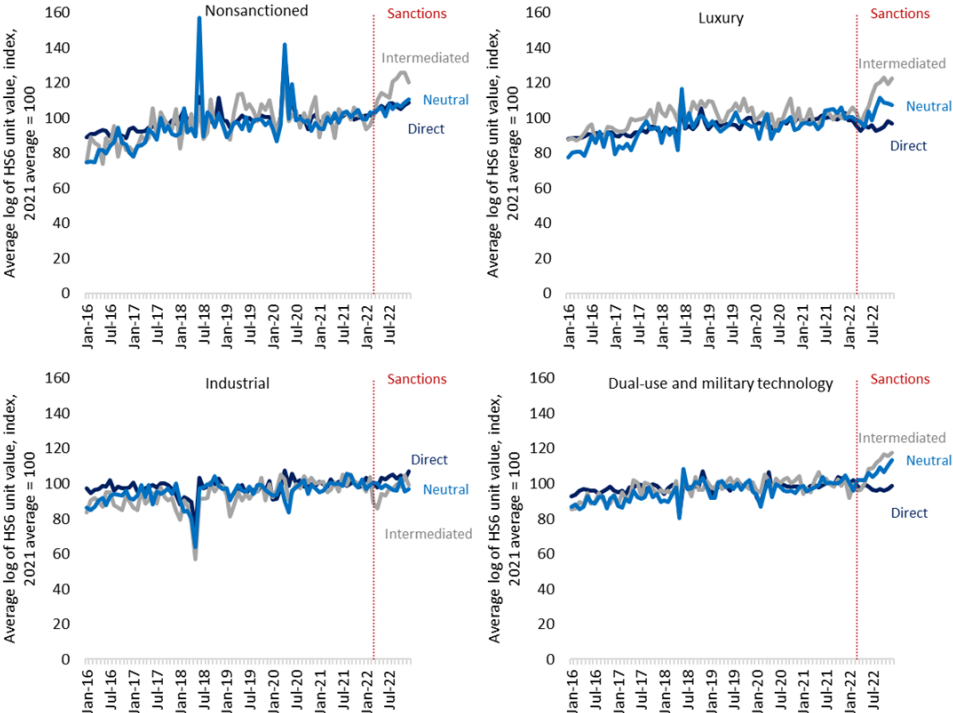
Source: Authors' calculations.

Note: The figure shows average unit values by HS6, month and country of origin. Indices shown where for each type of trade, the average logarithm of unit values across all months in 2021 is set to 100. Sanctioning economies are listed in the Annex, all other economies are deemed neutral. Sanctioned good groupings are based on the EU sanction packages. Western trademarks are identified as majority-exported by traders in sanctioning jurisdictions prior to 2022. Direct Western trade constitutes imports from sanctioning countries of origin or under Western trademarks via sanctioning-economy trader. Intermediated trade is as above except exporting trader is in a neutral jurisdiction. Imports from neutral countries of origin under neutral trademarks constitute neutral trade.

Figure 5: Event study: The rise of intermediated trade in industrial-capacity and dual-use goods after the imposition of trade sanctions
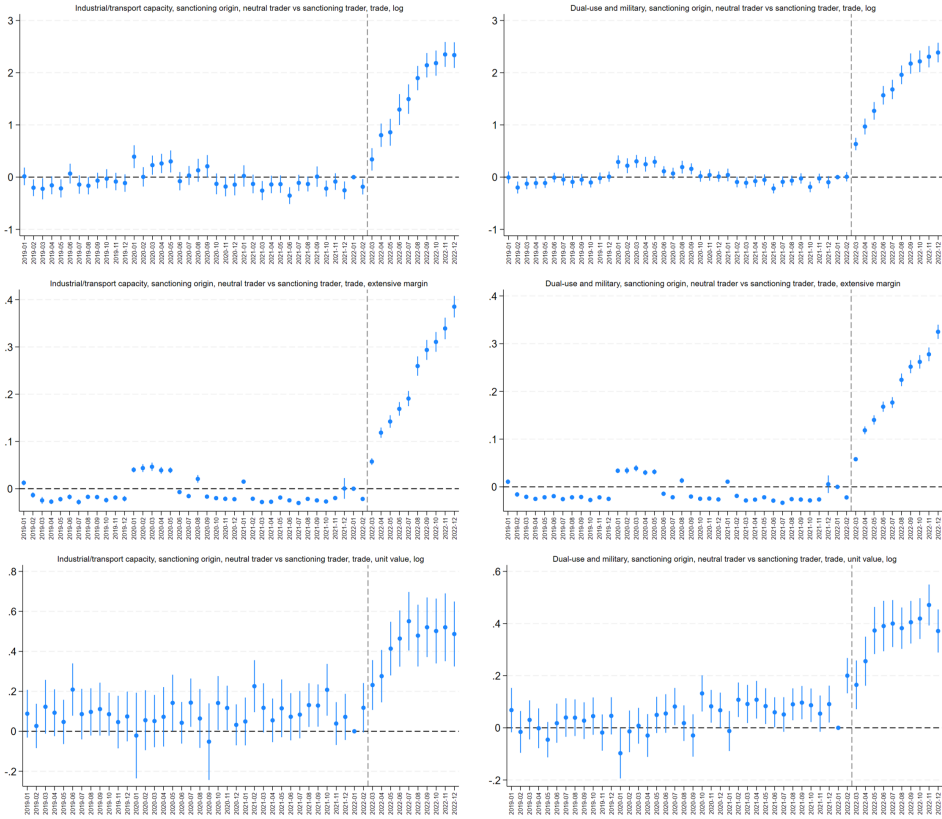
Source: Authors' calculations.

Note: The figure shows coefficients on interaction terms between month dummies and neutral trader dummy. 95 percent confidence intervals based on standard errors clustered on product groups. The sample is restricted to sanctioning economies of origin and industrial-capacity or dual-use goods as indicated. The dependent variable is the value of monthly bilateral imports for a specific product group originating in a given country and exported by a trader in a given jurisdiction (or 0-1 variable for existence of such trades or the logarithm of unit values). All regressions include product-origin-month and product-trader-origin fixed effects. The base period is January 2022. Specifications for the extensive margin of trade are estimated on data from January 2019. Sanctioning economies are listed in the Annex, all other economies are deemed neutral. Sanctioned good groupings are based on the EU sanction packages, as of December 2022.

Figure 6: Event study: The rise of intermediated trade in luxury goods and other goods after the imposition of trade sanctions
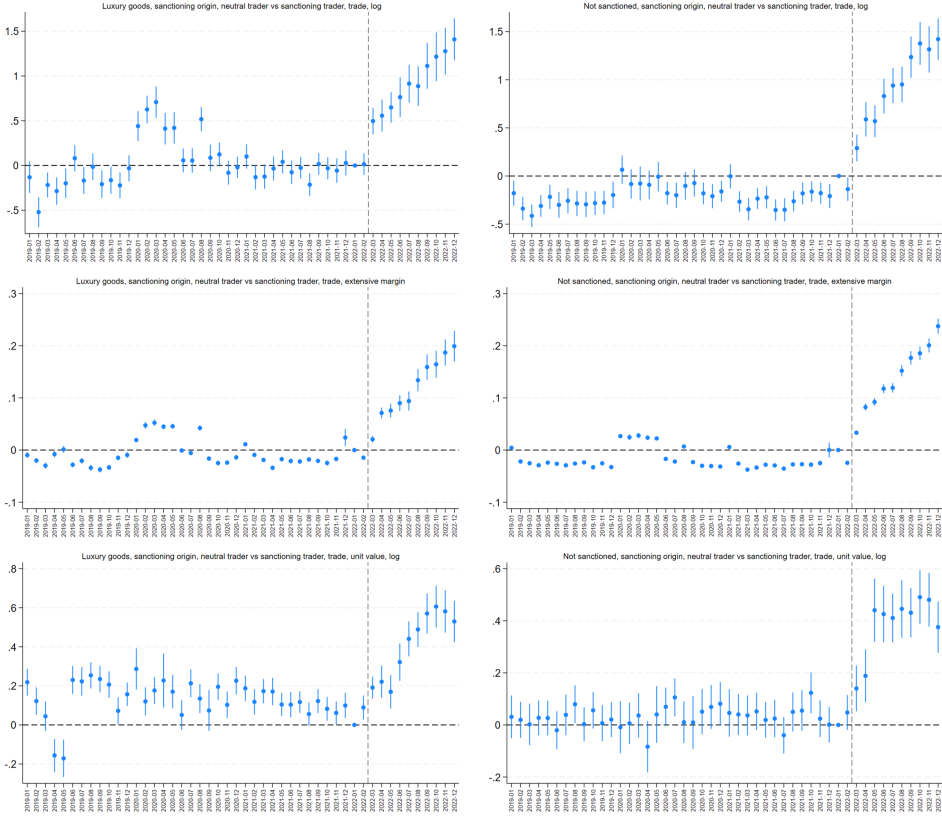
Note: The figure shows coefficients on interaction terms between month dummies and neutral trader dummy. The sample is restricted to sanctioning economies of origin and luxury goods or other (non-sanctioned) goods as indicated. The dependent variable is the value of monthly bilateral imports for a specific product group originating in a given country and exported by a trader in a given jurisdiction (or 0-1 variable for existence of such trades or the logarithm of unit values). Regressions include product-origin-month and product-trader-origin fixed effects. The base period is January 2022. Specifications for the extensive margin of trade are estimated on data from January 2019. Sanctioning economies are listed in the Annex, all other economies are deemed neutral. Sanctioned good groupings are based on the EU sanction packages, as of December 2022, other goods are not subject to sanctions.

Figure 7: Event study, triple-differenced specifications: The rise of intermediated trade in industrial-capacity and dual-use goods after the imposition of trade sanctions
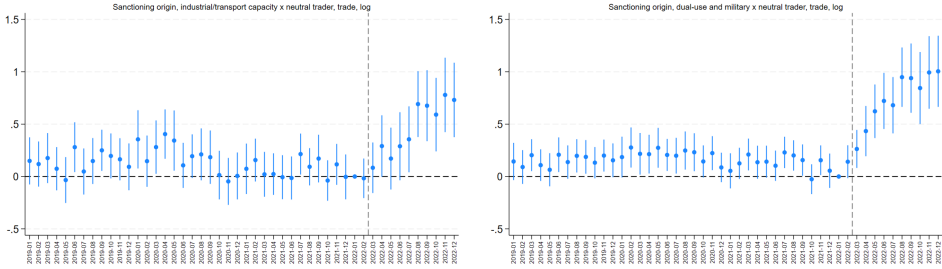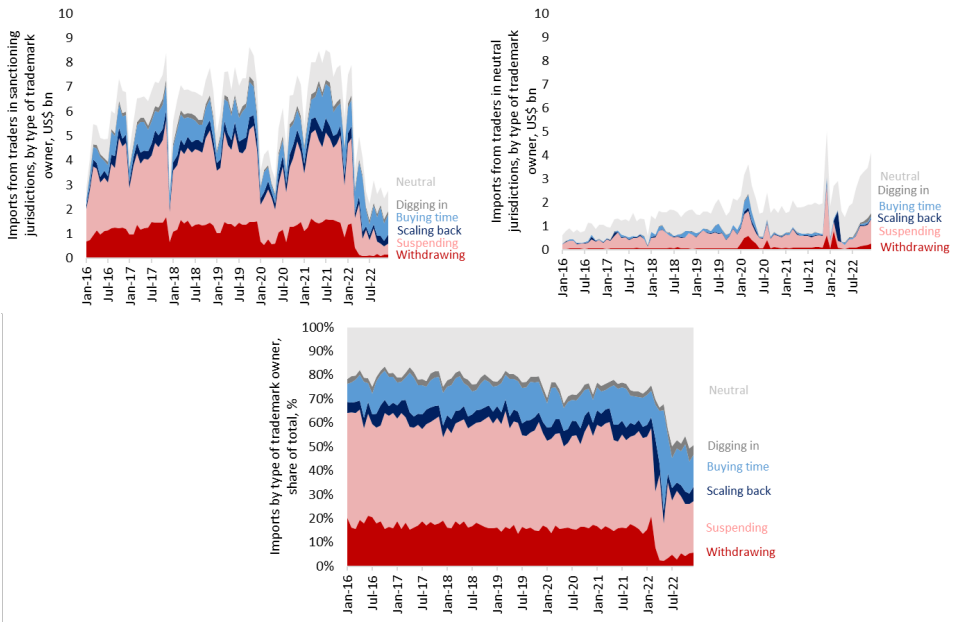

Source: Authors' calculations.
Note: The figure shows coefficients on interaction terms between month dummies, type of sanctioned goods (industrial-capacity or dual use) and neutral trader dummy. The sample is restricted to sanctioning economies of origin. The dependent variable is the value of monthly bilateral imports for a specific product group originating in a given country and exported by a trader in a given jurisdiction. Regressions include product-origin-month, trader-origin-month and product-trader-origin fixed effects. The base period is January 2022. Estimated on the sample from January 2019. Sanctioning economies are listed in the Annex, all other economies are deemed neutral. Sanctioned good groupings are based on the EU sanction packages, as of December 2022.

Figure 8: Imports by attitude of trademark owners to serving the Russian market under sanctions

Source: Authors' calculations based on customs data.
Note: The sample is restricted to transactions where the attitude of trademark owner to serving the Russian market is identified, based on classification in Sonnenfeld et al. (2022). Intermediated trade (upper right panel) involves exporting traders in neutral jurisdictions; direct trade (upper left panel) involves exporting traders in sanctioning jurisdictions. The lower panel panel presenting shares for total trade takes the trademarks included in this exercise as 100 percent in each month.

Table 1: Russia's imports by type of trade and type of goods

| | March-December, US$ bn | | | | December, US$ bn | | | |
	2021	2022	Difference	Substitution	2021	2022	Difference	Substitution
Not sanctioned								
Direct Western	32.5	20.9	-11.6		3.2	2.6	-0.6	
Intermediated	1.5	3.9	2.5	21.2	0.2	0.7	0.5	85.2
Neutral	23.5	30.7	7.3	62.8	2.7	3.9	1.2	204.2
Other	6.2	5.9	-0.2		0.7	0.6	0.0	
Luxury								
Direct Western	43.6	9.8	-33.9		4.9	1.2	-3.7	
Intermediated	1.3	2.5	1.2	3.5	0.1	0.6	0.5	13.4
Neutral	8.9	11.9	3.0	8.9	0.6	1.7	1.1	29.5
Other	8.8	0.5	-8.3		1.8	0.1	-1.7	
Industrial capacity								
Direct Western	17.7	5.8	-11.9		1.8	0.5	-1.3	
Intermediated	0.6	2.2	1.6	13.0	0.1	0.5	0.5	36.7
Neutral	4.1	7.4	3.3	27.5	0.3	1.1	0.7	58.3
Other	1.0	0.4	-0.6		0.3	0.0	-0.2	
Dual-use technology								
Direct Western	78.3	41.1	-37.2		7.3	4.6	-2.6	
Intermediated	4.7	11.1	6.3	17.0	0.4	2.3	1.9	70.5
Neutral	17.2	21.8	4.6	12.3	1.6	3.7	2.1	81.3
Other	5.7	5.4	-0.3		0.5	0.5	0.0	

Source: Authors' calculations based on customs data.

Note: Sanctioning economies are listed in the Annex, all other economies are deemed neutral. Sanctioned good groupings are based on the EU sanction packages. Western trademarks are identified as majority-exported by traders in sanctioning jurisdictions prior to 2022. Substitution rates are with respect to the drop in direct Western trade (imports from sanctioning countries of origin or under Western trademarks via sanctioning-economy trader). Intermediated trade is as above except exporting trader is in a neutral jurisdiction. Imports from neutral countries of origin under neutral trademarks constitute neutral trade.

Table 2: Imports from sanctioning economies of origin: Difference-in-difference analysis

Dep. var.:	Log trade	0-1	Hyperbolic	Log quantity	Log unit value
Neutral trader * Post-sanctions	1.952***	0.202***	1.743***	1.565***	0.383***
	(0.0522)	(0.00324)	(0.0292)	(0.0556)	(0.0188)
Observations	6,816,087	52,525,116	52,525,116	6,802,147	6,802,057
R^2	0.779	0.521	0.599	0.826	0.838

Source: Authors' calculations.

Note: Standard errors are clustered at the product group level. *, **, *** denote statistical significance at the 10%, 5% and 1% levels, respectively. All regressions include product-origin-month and product-trader-origin fixed effects. Sanctioning economies of origin only.

Table 3: Imports from neutral economies of origin: Difference-in-difference estimates

Dep. var.:	Log trade	0-1	Hyperbolic	Log quantity	Log unit value
Neutral economies of origin, Western trademarks [intermediated trade type 2]					
Neutral trader * Post-sanctions	1.469***	0.204***	1.751***	1.291***	0.179***
	(0.0475)	(0.00338)	(0.0317)	(0.0484)	(0.0163)
Observations	2,784,557	19,039,272	19,039,272	2,779,390	2,779,366
R^2	0.736	0.522	0.595	0.782	0.835
Neutral economies of origin, neutral trademarks [trade diversion]					
Neutral trader * Post-sanctions	0.494***	0.0611***	0.576***	0.430***	0.0641***
	(0.0280)	(0.00257)	(0.0215)	(0.0276)	(0.0116)
Observations	1,380,374	14,530,404	14,530,404	1,377,867	1,377,832
R^2	0.805	0.510	0.603	0.847	0.852

Source: Authors' calculations.

Note: Standard errors are clustered at the product group level. *, **, *** denote statistical significance at the 10%, 5% and 1% levels, respectively. All regressions include product-origin-month and product-trader-origin fixed effects.

Table 4: Imports from sanctioning economies of origin: Triple-differencing

Dep. var.:	Log trade	0-1	Hyperbolic	Log quantity	Log unit value
Neutral trader * Post-sanctions * Dual-use	0.535***	0.0571***	0.629***	0.605***	-0.0760**
	(0.108)	(0.00646)	(0.0611)	(0.114)	(0.0382)
Neutral trader * Post-sanctions * Industrial	0.420***	0.0670***	0.679***	0.459***	-0.0401
	(0.126)	(0.0105)	(0.0916)	(0.148)	(0.0604)
Neutral trader * Post-sanctions * Luxury	-0.311**	-0.0217*	-0.00712	-0.0984	-0.208***
	(0.153)	(0.0126)	(0.118)	(0.160)	(0.0534)
Observations	6,782,298	52,475,220	52,475,220	6,768,365	6,768,271
R^2	0.790	0.538	0.614	0.835	0.845

Source: Authors' calculations.

Note: Standard errors are clustered at the product group level. *, **, *** denote statistical significance at the 10%, 5% and 1% levels, respectively. All regressions include product-origin-month; trader-origin-month and product-trader-origin fixed effects. Sanctioning economies of origin only.

Table 5: Imports from neutral economies of origin under Western trademarks: Triple-differencing

Dep. var.:	Log trade	0-1	Hyperbolic	Log quantity	Log unit value
Neutral trader * Post-sanctions * Dual-use	0.594***	0.0586***	0.656***	0.551***	0.0424
	(0.0809)	(0.00626)	(0.0665)	(0.0905)	(0.0386)
Neutral trader * Post-sanctions * Industrial	0.225*	0.0456***	0.376***	0.0534	0.174***
	(0.136)	(0.0113)	(0.113)	(0.160)	(0.0597)
Neutral trader * Post-sanctions * Luxury	-0.161*	-0.0157**	0.0775	-0.127	-0.0344
	(0.0830)	(0.00727)	(0.0711)	(0.0933)	(0.0361)
Observations	2,753,244	18,930,996	18,930,996	2,748,072	2,748,048
R^2	0.754	0.546	0.616	0.796	0.843

Source: Authors' calculations.

Note: Standard errors are clustered at the product group level. *, **, *** denote statistical significance at the 10%, 5% and 1% levels, respectively. All regressions include product-origin-month; trader-origin-month and product-trader-origin fixed effects. Neutral economies of origin only where imports are recorded under Western trademarks.

Table 6: Imports under sanctions: New versus existing routes

Subsample	Sanctioning origin		Neutral origin Western trademark		Neutral origin Neutral trademark	
Dep. var (logarithm).:	Trade	Unit value	Trade	Unit value	Trade	Unit value
Sanctioning trader through new route	-1.013***	0.354***	-0.838***	-0.0169	-0.299***	0.322***
	(0.0379)	(0.0230)	(0.0683)	(0.0331)	(0.0820)	(0.0466)
Neutral trader through old route	0.0954***	0.350***	0.930***	-0.00570	2.677***	-0.249***
	(0.0365)	(0.0213)	(0.0468)	(0.0200)	(0.0498)	(0.0149)
Neutral trader through new route	-0.525***	0.533***	-0.413***	0.266***	-0.264***	0.180***
	(0.0229)	(0.0204)	(0.0381)	(0.0213)	(0.0487)	(0.0343)
Observations	501,320	501,320	208,424	208,424	158,978	158,978
R^2	0.438	0.695	0.418	0.679	0.502	0.725

Source: Authors' calculations.

Note: Standard errors in parentheses are clustered at the product group level. *, **, *** denote statistical significance at the 10%, 5% and 1% levels, respectively. A route is a combination of product, country of origin and trading country. New routes are those not observed in the data before March 2022. All regressions include product-origin-month fixed effects. The sample is restricted to neutral trading partners and post-sanctions period.

Table 7: Imports depending on the attitude of trademark owner to serving the Russian market under sanctions

Dep. var.:	1 Log trade	2 0-1	3 Hyperbolic	4 Neutral traders, share	5 Neutral traders, 0-1	6 Log unit value
Post-sanctions * Digging in	0.357*** (0.0414)	0.0657*** (0.00323)	0.577*** (0.0292)	-0.0854*** (0.00707)	-0.0775*** (0.00687)	-0.00190 (0.0179)
Post-sanctions * Buying time	0.00846 (0.0704)	0.0339*** (0.00340)	0.249*** (0.0302)	0.00533 (0.0134)	0.0319** (0.0148)	-0.0256 (0.0297)
Post-sanctions * Scaling back	-0.328*** (0.0471)	0.00405 (0.00330)	-0.00383 (0.0287)	0.0119 (0.00782)	0.0317*** (0.00825)	0.0910*** (0.0208)
Post-sanctions * Suspending	-0.126*** (0.0338)	-0.00829*** (0.00288)	-0.0267 (0.0245)	0.0355*** (0.00762)	0.0804*** (0.00638)	0.169*** (0.0168)
Post-sanctions * Withdrawing	-0.734*** (0.0590)	-0.0338*** (0.00359)	-0.367*** (0.0339)	0.132*** (0.00674)	0.139*** (0.00614)	0.174*** (0.0207)
Observations	4,833,330	25,448,976	25,448,976	4,855,963	4,857,736	4,816,711
R^2	0.823	0.552	0.652	0.731	0.702	0.863

Source: Authors' calculations.

Note: Standard errors are clustered at the product group level. *, **, *** denote statistical significance at the 10%, 5% and 1% levels, respectively. Observations correspond to monthly imports at the HS6 level from a given country of origin for a specific trademark owner. The sample is restricted to trademarks that could be classified by matching them to the list of firms' decisions in Sonnenfeld et al. (2022). The base group are neutral trademarks. Share intermediated is the share of trade where exporting traders are neutral economies in total trade. Intermediated trade 0-1 is a dummy variable for non-zero intermediated trade. All regressions include product-origin-trademark owner and product-origin-month fixed effects.

Table 8: Unit values in imports from neutral trading partners depending on the attitude of trademark owner to serving the Russian market under sanctions

Dep. var.:	1 Log unit value
Post-sanctions * Digging in	0.157*** (0.0320)
Post-sanctions * Buying time	-0.0697* (0.0386)
Post-sanctions * Scaling back	0.285*** (0.0382)
Post-sanctions * Suspending	0.269*** (0.0250)
Post-sanctions * Withdrawing	0.312*** (0.0336)
Observations	549,083
R^2	0.855

Source: Authors' calculations.

Note: Standard errors are clustered at the product group level. *, **, *** denote statistical significance at the 10%, 5% and 1% levels, respectively. Observations correspond to monthly imports at the HS6 level from a given country of origin for a specific trademark owner. The sample is restricted to trademarks that could be classified by matching them to the list of firms' decisions in Sonnenfeld et al. (2022) and neutral exporting traders. The base group are trademarks owned by firms in neutral jurisdictions. All regressions include product-origin-trademark owner and product-origin-month fixed effects.

Table 9: Share of total trade, by type of trademark owner (percent)

	1 Sanctioned dual-use and industrial products (pre-sanctions)	2 Luxury goods (pre-sanctions)	3 Goods originating in sanctioning economies (pre-sanctions)	4 Trade via new routes (post-sanctions)
Neutral	57.8	23.7	40.1	28.0
Digging in	48.7	26.5	65.1	23.5
Buying time	71.5	8.6	86.9	31.9
Scaling back	60.0	19.7	79.3	31.8
Suspending	69.8	24.9	70.0	35.2
Withdrawing	45.5	43.5	65.1	35.2

Source: Authors' calculations.

Note: The sample is restricted to trademarks that could be classified by matching them to the list of firms' decisions in Sonnenfeld et al. (2022). Pre-sanctions period refers to 2016-21.

Figure A1: Russia's imports: Transaction-level data, Russia's aggregate statistics and mirror aggregate statistics

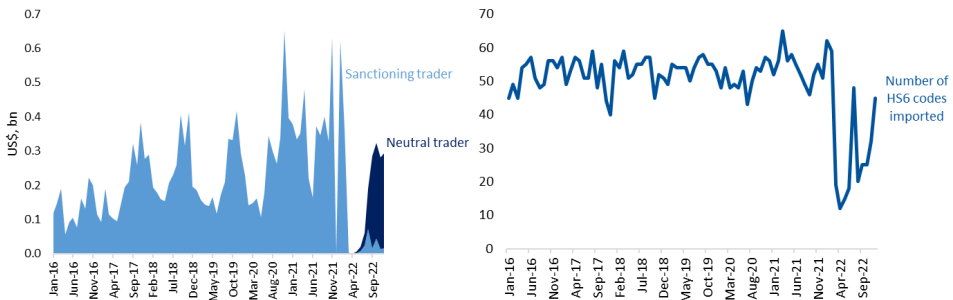Source: Authors' calculations based on Russia customs data and UN Comtrade.
Note: Aggregate imports as reported in the transaction-level dataset and UN Comtrade. Mirror data refers to exports to Russia as reported by trading partners excluding the members of the Eurasian Economic Union. Transaction-level data are aggregated bottom-up from customs dataset.

Figure A2: Imports of equipment and machinery under a major Japanese trademark from sanctioning and neutral exporting traders
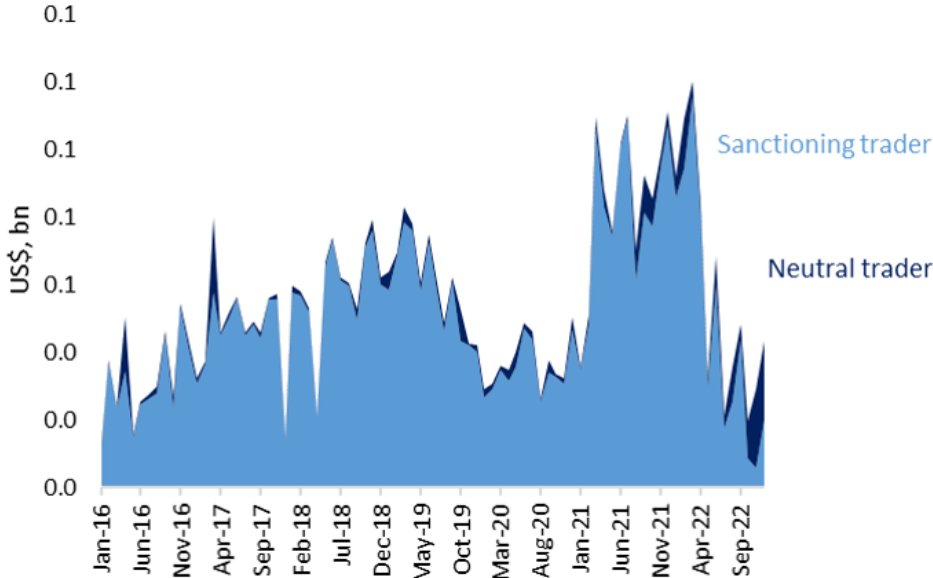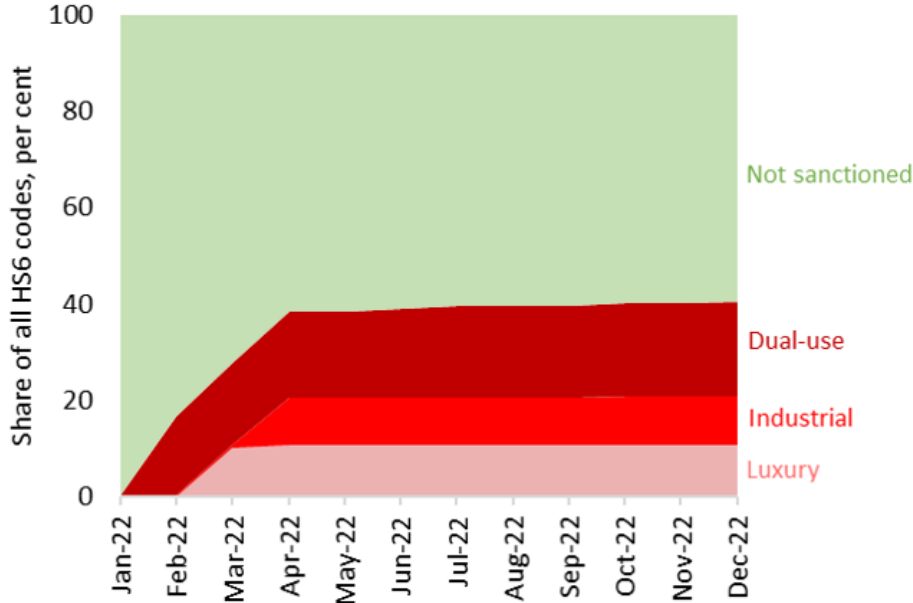

Source: Authors' calculations based on customs data.
Note: Data are aggregated by month. Sanctioning economies are listed in the Annex, all other economies are deemed neutral.

Figure A3: Imports of high-end electronics under a major US trademark from sanctioning and neutral exporting traders
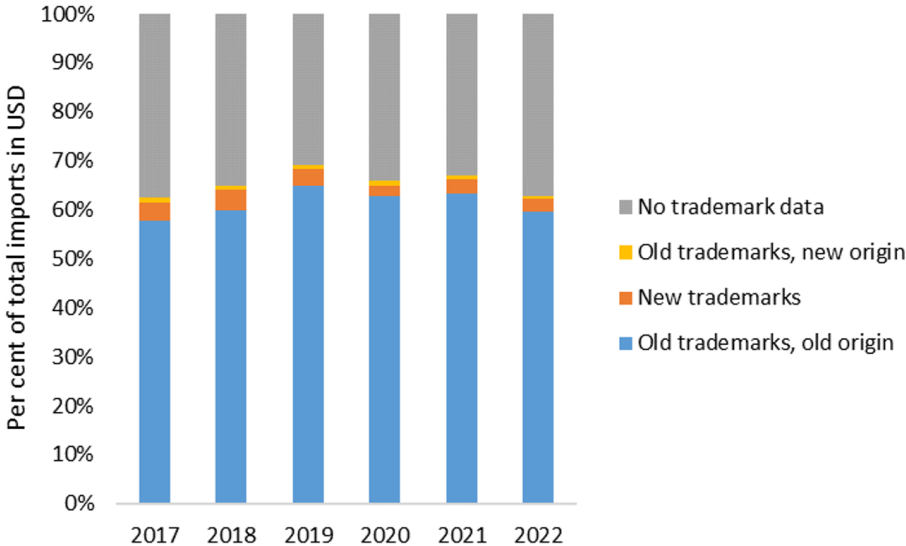

Source: Authors' calculations based on customs data.
Note: Sanctioning economies are listed in the Annex, all other economies are deemed neutral. The right panel shows the total number of different HS6 product lines with at least one product under this brand imported in a given month.

Figure A4: Number of sanctioned product groups

Source: EU and authors' calculations.
Note: HS6 product group is marked as sanctioned from the month following the adoption of the corresponding package.

Figure A5: Imports by trademark

Source: Authors' calculations based on customs data.
Note: The figure shows the shares of imports in each year that are accounted for by (i) previously imported trademarks coming from previously recorded countries of origin; (ii) previously imported trademarks listing a country of origin not recorded in earlier import transactions for that trademarks; (iii) trademarks that were not imported in earlier years; and (iv) transactions where trademark data are not applicable.

**Figure A6: Concentration of import values across importing firms, by firms'
announced decision to serve the Russian market**
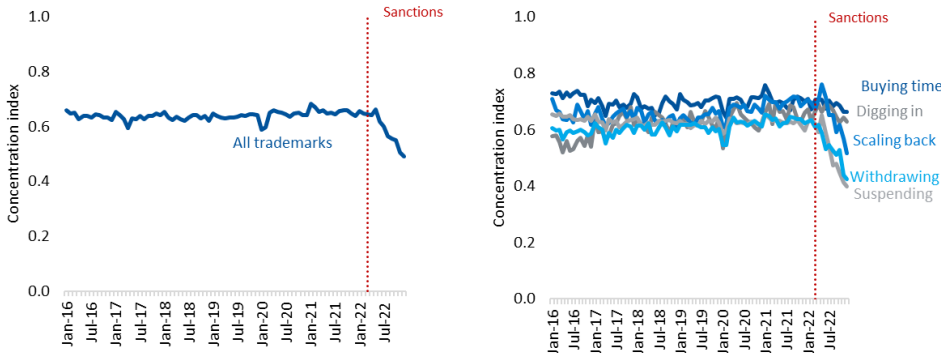
Source: Authors' calculations based on customs data.

Note: The figure shows Hirschman-Herfindahl index (HHI) of concentration of imports across individual
importers. HHIs are calculated for each major Western trademark in each month. Average values are
shown for each type of trademark: withdrawing from the Russian market, suspending operations and so
on, based on classification in Sonnenfeld et al. (2022).

Table A1: Sanctioning economies

European Economic Area

Austria	Belgium	Bulgaria
Croatia	Cyprus	Czech R.
Denmark	Estonia	Finland
France	Germany	Greece
Hungary	Iceland	Ireland
Italy	Latvia	Liechtenstein
Lithuania	Luxembourg	Malta
Netherlands	Norway	Poland
Portugal	Romania	Slovak R.
Slovenia	Spain	Sweden

Other

Albania	Australia	Canada
Japan	Monaco	Montenegro
New Zealand	North Macedonia	Singapore
South Korea	Switzerland	Taipei China
Ukraine	United Kingdom	United States

Source: Authors.

Note: All other economies are classified as neutral in the analysis.

Table A2: Trademarks with the highest import volumes

Western trademarks

Boeing	Airbus	Kia
Apple	Samsung	Mercedes-Benz
Hyundai	Toyota	BMW
Volkswagen	HP	Bosch

Neutral trademarks

Huawei	Lenovo	Redmi
Xiaomi	Honor	Land Rover
Chery	Ekopet	Dexp
Realme	T.Taccardi	Miratorg

Source: Authors.

Note: Western trademarks are identified as those where exporters (traders) in sanctioning jurisdictions accounted for more than half of Russia's imports in 2016-21. Trademarks are sorted by cumulative volume of imports in 2016-21. Top 12 Western and neutral trademarks by volume listed.

Table A3: Sanctioned products, by HS section, product type, and sanction type

N	HS section	Part-sanctioned	Other (same HS4 as sanctioned)	Other (no sanctioned within HS4)
			Number of HS6 product lines	
	By HS section			
I	Animal products	2	2	367
II	Vegetable products	10	29	269
III	Animal and vegetable oils	0	0	48
IV	Prepared food, beverages and tobacco	29	23	165
V	Mineral products	48	28	73
VI	Chemicals	379	363	124
VII	Plastics and rubber	105	83	21
VIII	Leather and fur skins	21	0	48
IX	Wood and articles of wood	16	35	70
X	Wood pulp and paper	62	43	35
XI	Textiles and textile articles	308	234	252
XII	Footwear, headgear, umbrellas, etc.	33	2	12
XIII	Articles of stone and glass	71	45	23
XIV	Precious or semi-precious stones, jewellery	45	1	7
XV	Base metals and articles of base metal	232	159	170
XVI	Machinery and electrical equipment	494	204	79
XVII	Vehicles, aircraft, vessels	120	17	6
XVIII	Optical, precision, medical and other instruments	136	40	31
XIX	Arms and ammunition	20	0	0
XX	Miscellaneous manufacturing	44	36	42
XXI	Works of art	7	0	0
	Total	2182	1344	1842
	By product type			
	Capital	409	185	103
	Intermediate	1230	1039	964
	Consumption	534	120	775
	Generic	732	445	465
	Specific	875	740	318
	Non-durable	66	57	626
	Durable	468	63	149
	Non-differentiated	591	592	939
	Differentiated	1582	752	904
	By sanction type			
	Luxury goods	570		
	Industrial/transport capacity	549		
	Dual-use and military technology	1063		

Source: Authors' calculations.

Note: Number of HS6 product lines where EU sanctions apply at least partially as of December 2022. Differentiated products as defined in Rauch (1999), other classifications are based on Broad Economic Categories classification version 5.

Table A4: Descriptive statistics

Variables	Trader type sample					Individual trader country sample				
	Mean	Median	St. dev.	Min	Max	Mean	Median	St. dev.	Min	Max
Value, log	9.09	9.28	3.05	-4.61	22.28	7.91	7.89	2.94	-4.61	21.83
Quantity, log	5.65	5.62	4.02	-13.82	25.75	4.27	3.94	3.80	-13.82	25.74
Unit value, log	3.44	3.04	2.68	-16.07	22.86	3.65	3.38	2.48	-16.20	24.94

Source: Authors' calculations based on customs data.

Note: Unit of observation are monthly imports. Where quantity is not available, net weight is used. Unit value is the ratio of value and quantity.

Table A5: Trade under sanctions, by country of origin, trading country and new vs old routes

Routing	Sanctioning trader			Neutral trader Old route			Neutral trader New route		
	Trade	Routes	Firms	Trade	Routes	Firms	Trade	Routes	Firms
Sanctioning origin	86.5	67.1	83.8	7.8	11.7	28.0	5.7	21.1	23.1
Neutral origin and Western trademark	52.1	66.4	46.3	42.5	18.8	67.8	5.4	14.8	14.3
Neutral origin and Neutral trademark	14.5	45.1	16.4	83.7	39.9	92.5	1.8	15.0	8.6

Source: Authors' calculations.

Note: A route is a combination of product, country of origin and trading country. New routes are those not observed in the data before March 2022. The sample is restricted to March-December 2022. The table shows shares of trade (for each subsample indicated in a row) accounted for by sanctioning traders versus neutral traders on old routes versus neutral traders on new routes. Rows add up to 100% for trade volumes and route count but may exceed 100% for importing firms as firms may work with multiple exporters on multiple routes.