Decision to leave:
Economic sanctions and intermediated trade*

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Abstract

This paper documents a substantial change in the composition, routing and unit values of Russia's imports in the aftermath of comprehensive trade sanctions imposed on Russia. The analysis is based on transaction-level records of Russia's imports from economies outside the Eurasian Economic Union (EEU) which include data on trademarks. The data shows a sharp drop in imports of goods under "Western" trademarks following the introduction of sanctions in March 2022. A significant share of those imports, previously sold by traders in sanctioning economies, were "re-routed" via intermediaries in neutral economies. Much of this trade involved new routes – combinations of products, trademarks and exporting countries never observed before. This intermediated trade increased significantly more rapidly for industrial-capacity goods under international sanctions and dual-use technology offsetting around one fifth of the reduction in the direct trade in those goods under Western trademarks. Switching to neutral trademarks within the same product offset a further 23-40 percent of the reduction in imports of those goods under Western trademarks. The unit values of goods under Western trademarks saw higher increases, of up to 35 percentage points, compared with similar goods under neutral trademarks. Both the shares of intermediaries in trade and mark-ups were significantly higher for firms with more restrictive self-declared attitudes to serving the Russian market.

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

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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, 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 2023, including details of product, trademark, the country of origin and exporting trader.

The paper documents the scale of switching from imports of goods under trademarks belonging to exporters in sanctioning economies ("Western" trademarks) to imports of the same products under neutral trademarks (for example, switching from importing Japanese cars to importing Chinese cars). The paper also documents the extent of intermediated trade in goods under Western trademarks via third countries used to circumvent sanctions, the speed with which such trades were established and the associated increases in unit values of goods under Western trademarks at the point of import.

Crucially, the analysis focuses on trademarks rather than countries of origin given that a large share of imported goods under Western trademarks are manufactured in China and other neutral economies. Intermediated trade thus often 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 extent of technology switching following the imposition of sanctions and the additional costs incurred by importers.

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 partially or fully subject to the EU sanctions

(EU being Russia's main trading partner before the invasion). We focus on imports of goods under trademarks owned by companies in sanctioning economies, regardless of whether they originate in sanctioning economies or neutral ones, as well as jurisdictions of exporting traders. For example, popular Western-brand smartphones may be designed in California (US) and manufactured in China. As in the above example, under normal circumstance Western-branded goods were sold to Russia by distributors in what became sanctioning jurisdictions while under sanctions they may be sold by a trader in a neutral economy (for instance, Hong Kong SAR, Serbia or the UAE).

These detailed data enables us to distinguish between (i) direct trade in goods under Western trademarks between sanctioning economies and Russia; (ii) intermediated trade in Western-branded goods (via an exporting trader in a neutral jurisdiction); (iii) trade in neutral trademarks. We show that intermediated trade, virtually absent before sanctions, rose rapidly, and significantly more so for industrial-capacity goods under international sanctions and dual-use technology.

In the regression analysis, we follow a difference-in-difference or triple-differencing approach comparing (i) imports under Western and neutral trademarks (ii) the pre- to the post-sanction period; (iii) various types of sanctioned goods to non-sanctioned goods. We use comprehensive sets of fixed effects (for example, product-month fixed effects to account for any fluctuations in demand and product-trademark fixed effects to take into account specific consumer tastes). Standard errors are clustered on products. Our outcome variables include the value of imports or an indicator variable capturing non-zero flows of a given product under a given trademark in a given month. We further use hyperbolic sine transformation and Poisson Pseudo Maximum Likelihood (PPML) to account for the effects on the intensive and extensive margins of trade. We also look at imports in quantity terms, their unit values, the share of trade done by intermediaries for a given trademark and the market concentration among Russian importers of a particular product and trademark. An event-study analysis shows no differential trends in the imports of Western-branded and neutral-trademark 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 of Western trademarks dropped by around 70 percent. At the same time, intermediated trade in goods under Western trademarks, routed via a trading company in neutral countries increased substantially. Almost a quarter of imports of Western-branded goods under sanctions involved routes (combinations of trademarks, products and exporting countries) not seen in the data before the imposition of sanctions.

By 2023, intermediated trade in industrial and dual-use goods under Western trademarks amounted to roughly one fifth of the reduction in direct exports of those goods to Russia. For an equivalent of 20-40 percent of the reduction in imports of Western trademarks, we observe technology switching towards industrial and dual-use goods under neutral trademarks. To the extent that this represents a constrained choice, this technological change may suppress productivity growth in the longer term.

Imports of Western-branded goods after sanctions became relatively more expensive (compared with unit value trends observed for neutral trademarks for the same product and the same month), with additional increases averaging around 25 percent. These increases apply to roughly 35 percent of Russia's imports under sanctions providing a ballpark estimate of the costs inflicted by trade sanctions. Unit values increased relatively more in the case of dual-use technology.

Event studies show that the share of neutral traders in imports of Western trademarks started increasing from the second month after the imposition of sanctions. It kept steadily increasing before stabilizing from mid-2023 at levels close to 40 percent. A similar trend is observed for unit value premium for Western-branded goods.

We also provide the first evidence on the role of the so-called "private sanctions". In particular, the declared attitudes of Western trademark owners 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 scaling back their operations, based on records in the database compiled by Sonnenfeld et al. (2022). On the other hand, the share of neutral intermediaries in imports increased progressively more for trademarks 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. If anything, markets for importing Western-branded goods became less concentrated under sanctions, and concentration fell to a greater extent for "withdrawing" trademarks.

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 sold by traders in neutral jurisdictions.[1]

By using comprehensive transaction-level data on imports of the sanctioned economy we document, in a difference-in-difference 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.

[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.

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.

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 TableA1 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

Our analysis draws on transaction-level dataset of import transactions going through Russia's customs. For instance, 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). 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), trademark (where applicable), 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). 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 products 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].

[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*

Products 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 products 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 products 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 products increased slightly (see Annex Figure A4). Annex Table A3 summarizes application of sanctions by HS section.

2.4 Western and neutral trademarks

The distinction between "Western" and "neutral" trademarks is derived 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 and Lenovo (both electronics from China).

We 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 recent year. 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 (goods with no trademark recorded), 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 unified. 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 trademarks where their owners announced full withdrawal from the Russian 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)). For a further 172 trademarks, their owners suspended almost all operations in Russia without permanently existing / divesting (examples include Boeing, Hyundai and Apple). Another 52 are classed as scaling back – suspending a significant portion but not all of their business in Russia (for example Skoda, General Electric and Linde). We group these together as "scaling back" trademarks. The last group comprises trademarks where owners were buying time (a total of 113 trademarks) – pausing new investments / minor operations in Russia but largely continuing substantive business (examples include Bosch and Philips) or were deemed to be digging in, that is, largely doing business-as-usual (a total of 32 trademarks including Liebherr and Mitsubishi). 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). We expand this list with a further 151 neutral trademarks that are in top-1000 in Russia's imports and are manually verified as neutral (examples include Chery, Great Wall and Sitrak).

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 only 2.2 percent of trade, which gives us reasonable confidence in the accuracy of the empirical way of classifying trademarks.

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

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

earlier years. Many goods will naturally not have trademarks, from generic pharmaceuticals to agricultural commodities.

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).

Having classified trademarks, we distinguish between three mutually exclusive types of trade: Direct trade in Western trademarks, exports of Western trademarks by traders in neutral jurisdictions (intermediated trade) and trade in neutral trademarks.

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.

Or 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 this brand 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. (2024) 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 (an increase in imports of alternative products, for instance, Huawei smart phones). Goods manufactured in neutral economies accounted for 28 percent of imports under Western trademarks in the dataset.

2.5 First look at the data: Broad patterns

Prior to Russia's invasion of Ukraine in February 2022, Western trademarks accounted for around half of Russia's imports (and more than 60 percent of imports of industrial and dual-use goods) while the rest were accounted for by neutral trademarks, including goods with no trademark record (see Figures 1 and 2). After February 2022, shipments of goods under Western trademarks from sanctioning economies dropped sharply. In March-December 2023 such imports of industrial goods were nine times lower than in the same period of 2021 (see Table 1). After initially dropping, imports of industrial capacity goods under neutral trademarks picked up rapidly. In addition, sales of Western trademarks via neutral traders picked up from month to month. Previously negligible, they overtook direct sales of Western-branded industrial goods in the second half of 2022.

Trade diversion (increase in imports of neutral trademarks) compensated for an additional 23 percent of lost direct trade with the West in the case of dual-use goods and 39 percent in the case of industrial goods (comparing March-December 2021 with March-December 2023). Taken together, intermediated trade and technological switching compensated for about 60 percent of lost direct trade with the West when it comes to industrial goods under sanctions.

Direct imports of luxury goods from sanctioning economies also plunged. These imports were to some (lesser) extent substituted through intermediated trade with no increase in imports of neutral trademarks – in part reflecting lower ability of China and other emerging markets to supply luxury goods under their own brands. For non-sanctioned goods under Western trademarks, the drop in direct exports was also observed by was less pronounced. The set of intermediary economies spanned vast geographies and ranges of per capita income, with the largest volumes traded via China, Turkiye, Hong Kong SAR, the UAE and Serbia.

Overall, the share of Western trademarks declined from around 50 percent of Russia's imports in March-December 2021 to around 35 percent in the same period of 2023.

3 Empirical specifications

3.1 Difference-in-difference analysis

We start by systematically examining imports for all trademarks where trade exceeds US$ 10 million. These 13,545 trademark records cover 88 percent of Russia's imports. Inclusion of smaller trades does not fundamentally change results but increases incidence of misspelled trademarks and weakens the power of empirical identification of Western versus neutral trademarks. Around 3,900 trademark records included in this analysis are identified as neutral.

For each trademark r we look at the logarithm of imports (Imp) in each month t for each product p (at the HS6 level). The difference-in-difference specification distinguishes between neutral and Western trademarks 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 ($Post-sanctions$, which takes value of one from March 2022) and a dummy variable for Western trademarks ($Western$).

$$Ln(Imp)_{prt} = \beta PostSanctions_t * Western_r + \alpha_{pr} + \alpha_{pt} + \epsilon_{prt} \quad (1)$$

The specification includes product-trademark (α_{pr}) fixed effects (capturing specificities of demand for particular goods). In our single-importer specification, they also capture factors affecting the trading relationship between a given producer of branded goods, such as distance to headquarters and production facilities, linguistic proximity, historical links or common border and allow for a differential impact of these factors across products. Product-month (α_{pt}) fixed effects account for fluctuations in demand for a given product in Russia as well as any movements in international prices of a particular product. These specifications contrast the change in imports of Western-branded goods after the imposition of sanctions with changes in imports of the same products traded under neutral trademarks, over the same time period.

3.2 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 trademark and 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 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. We also run PPML estimations on the untransformed values of trade (see Silva and Tenreyro (2006)).

3.3 Constructing unit values and market concentration measures

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 products. 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 products where units are available and on weight for other products. 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.

For each trademark, product and time period we also record the share of trade accounted for by exporting traders in neutral jurisdictions. We also look at the concentration of the import market. On the importer side, each importing firm is identified by its unique id number. We can thus calculate a standard measure of market concentration of imports among importers (Hirschman-Herfindahl index of market concentration, HHI). In addition, we look at the market share of the top importing firm, as before the sanctions many branded goods tended to have a single importing distributor. To make sure that the calculations of market concentration measures and unit values are meaningful and robust, we focus on a subsample of trademark-products with at least 100 separate import transactions in the post-sanctions

period. These combinations of products and trademarks account for two thirds of trade in the sample.

4 Results

4.1 Difference-in-difference analysis: Intermediated trade

After the introduction of sanctions, trade in Western trademarks more than halved relative to trade in neutral trademarks and such trades became 11 percentage points less likely to be observed (Table 2). Inverse hyperbolic sine and PPML estimates point to large drops when intensive and extensive margins of trade in Western trademarks are combined. All these effects are statistically significant at the 1 percent level.

The share of neutral traders in total sales of Western trademarks increased by extra 21 percentage points and at least some imports from neutral jurisdictions became 27 percentage points more likely to be observed for a given combination of product and trademark in the case of Western trademarks under sanctions (Table 3).

This reflects a rapid rise of new trade routes – combinations of products, trademarks and trading countries not observed previously. Those routes accounted for 23 percent of imports of Western trademarks by value during March 2022-December 2023 and were used by 69 percent of importing firms (see Annex Table 4). Trade under neutral trademarks also increasingly sought new routes, although the associated shares of new routes in total trade were smaller.

Unit values of goods imported under Western trademarks increased by almost 20 percent after the imposition of sanctions relative to what could be otherwise expected (and relative to the average unit value for a given product imported in Russia in a given month, Table 3, Column 3).

The increases in the share of neutral intermediaries and unit values coincided with reduced concentration in import markets for Western trademarks as many newly established importer firms entered the business of importing Western-branded goods, often via intermediaries, under sanctions (see Figure 3). Historically, a single or dominant importing distributor per trademark-product was the norm, in particular for Western trademarks. After the sanctions, the measures of market concentration, whether HHI index or the market share of top importer, dropped significantly for Western trademarks with little change observed, on average, for neutral trademarks. These trends can also be traced in the difference-in-difference regression framework, with significant differential drops in the measures of import market concentration for Western trademarks under sanctions (Table 3, Columns 4 and 5).

4.2 Trade in sanctioned goods

Next, we look at trends in trade in sub-samples of sanctioned goods of various types as well as non-sanctioned goods (see Table 5). In these specifications, differential drops in trade under Western trademarks were smaller for non-sanctioned goods and largest for industrial goods under sanctions. The share of neutral traders in total trade increased substantially more in the case of dual-use and industrial goods (with coefficients of around 0.3 versus around 0.1-0.2 for luxury goods and non-sanctioned goods). Increases in unit values for Western trademarks were more similar across product types. 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.

4.3 Event studies

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 particular, we estimate specifications similar to those used in difference-in-difference analysis, except now including interaction terms between each month and the Western trademark dummy while using January 2022 as the base period. The results are presented in Figure 4.

$$Ln(Imp)_{prt} = \sum_t \beta_T Month_t * Western_r + \alpha_{pr} + \alpha_{pt} + \epsilon_{prt} \tag{2}$$

While monthly trade is volatile and standard errors are larger, a number of distinctive patterns emerge from this analysis. Event studies show no significant differential pre-trends in terms of the variables of interest between Western and neutral trademarks. Since April 2022 (the second month after sanctions), the share of neutral traders exporting Western trademarks started increasing steadily from month to month, before stabilizing at levels close to extra 40 percentage points by the second half of 2023. Similarly, unit values of Western-branded goods exhibited differential increases that kept rising between May 2022 and mid-2023 and stabilized at levels of premium around 25 percentage points.

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 exports and any intermediated trade.

In a difference-in-difference framework, we restrict the sample to the top 1,000 trademarks and split Western trademarks into a categorical variable distinguishing between withdrawing trademarks, those scaling back and those buying time (see Equation 3). As before, the specifications control for product-trademark fixed effects (taking into account particularities of trade for any given trademark) and product-month fixed effects picking up trends in imports of certain products that are common across all producers.

$$Ln(Imp)_{prt} = \beta PostSanctions_t * TrademarkType_r + \alpha_{pr} + \alpha_{pt} + \epsilon_{prt} \tag{3}$$

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 trademarks (see Table 8). All three types of Western trademarks had similarly high shares of goods originating

in sanctioning economies (if anything, the share was higher for trademarks where owners were buying time than for those where owners announced withdrawal). The results of the analysis are presented in Table 6.

Relative to neutral trademarks, imports under Western trademarks declined most for withdrawing trademark owners and least for trademark owners buying time. The differences are statistically significant at the 1 percent level and hold for various estimation methods. On the extensive margin of trade, the probability of observing non-zero trade for a given product and trademark declined by extra 24 percentage points for withdrawing trademarks relative to neutral trademarks, compared with differential effects of 21 and 15 percentage points for the scaling back and buying time trademark groups, respectively (Column 2).

The share of neutral traders increased by an extra 44 percentage points for imports of withdrawing trademarks while the corresponding differential increases are estimated at 21 and 32 percentage points for the buying time and scaling back trademarks, respectively (see Table 7). These increases are mirrored in additional probabilities of observing exporters from neutral jurisdictions present (Column 2). As the estimated increases in the share of neutral traders come on top of the increases observed for neutral trademarks, intermediated trade in Western trademarks overtook direct Western exports (Figure 6). And while the share of the Russian market corresponding to withdrawing trademarks collapsed following the imposition of sanctions, it partially recovered owing to intermediated trade.

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 (6 where the scales for direct trade with the West (upper left panel) and intermediated trade (upper right panel) are aligned).

The differential premia in terms of in unit values appear to be similarly increasing in the degree of restrictiveness of "private sanctions", from 6 percent in the case of buying time trademarks to 34 percent for withdrawing trademarks. The differences between these estimates are in turn statistically significant at the 1 percent level (Column 3).

As before, we track market concentration of imports for each trademark in each month across Russian importers (proxied by Hirschman-Herfindahl index of market concentration, HHI). The results presented in Figure 7 show that market concentration of Russia's imports declined more strongly in the case of withdrawing trademarks and least strongly in the case of trademarks buying time (that may have been more inclined to continue working with official distributors). These differential increases can also be seen in Table 7, Columns 4 and 5. In particular, the market share of the top importer is estimated to have declined by extra 7 percentage points in the case of withdrawing trademarks and 6 percentage points in the case of scaling back trademarks while the difference between the market share dynamics for neutral trademarks and those buying time is small and not statistically significant at the 10 percent level.

To the extent that 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, the fact that unit value premia align with firms' "private sanctions" may be indicative of trademark owners, on average, having some (albeit imperfect) knowledge of the nature of intermediated trade.

4.5 Discussion

Taken together, the estimates shed some light on two key objectives of a comprehensive trade sanctions regime. In the medium term, trade sanctions have much more limited impact on overall imports than in the very short term. A year after the introduction of trade sanctions, trade diversion and intermediated trade together compensated for at least half of the loss of direct trade in industrial and dual-use goods between the sanctioning and sanctioned economies (the compensating rates may be higher taking into account trade via the Eurasian Economic Union, see Chupilkin et al. (2023b)). New routes involved in such intermediated trade are highly diverse and were up and running in a matter of months after the introduction of trade sanctions.

When it comes to restricting access to technology, direct Western trade in industrial-capacity and dual-use goods contracted by close to four fifth. At least 20 percent of that drop (more than 15 percent 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).

Another 20 to 40 percent (more than 20 percent 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. These are conservative estimates as the 2021 imports, used as a baseline in the analysis, may have been boosted by post-Covid recovery in trade relative to the trend.

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 Western trademarks is associated with an increase in unit values at the point of imports of 20 to 25 percent.

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 buyers in the sanctioned economies (of perhaps up to an extra 40 percentage points compared with goods under trademarks with permissive attitude to serving the Russian market). 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.

4.6 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. If we exclude data on generics (where trademark is not identified), the results (for trade under neutral trademarks) remain similar. The results for unit values and the share of imports from traders in neutral jurisdictions are also similar for the larger sample (without restrictions on the number of individual import records). These samples underpin the reported version of event studies.

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 2023, while the composition and routing of trade flows changed dramatically.

Detailed analysis of patterns of trade for individual trademarks suggests that both intermediated trade – imports of goods under Western trademarks through neutral intermediaries – and technological switching towards industrial and dual-use goods under neutral trademarks played a significant role in replacing direct imports of Western-branded products. Sanctions appear to have inflicted additional cost on imports of Western products, perhaps equivalent to a tariff of 20-25 percent.

Detailed analysis of trade in major Western trademarks shows that involvement of intermediaries and unit values at the point of import align strongly with companies' self-declared attitudes to serving the Russian market, with more restrictive attitudes corresponding to greater increases in unit values and a higher share of trade conducted via intermediaries. This pattern appears to be consistent with some knowledge of intermediated trade, even if imperfect, on the part of major Western exporters.

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.

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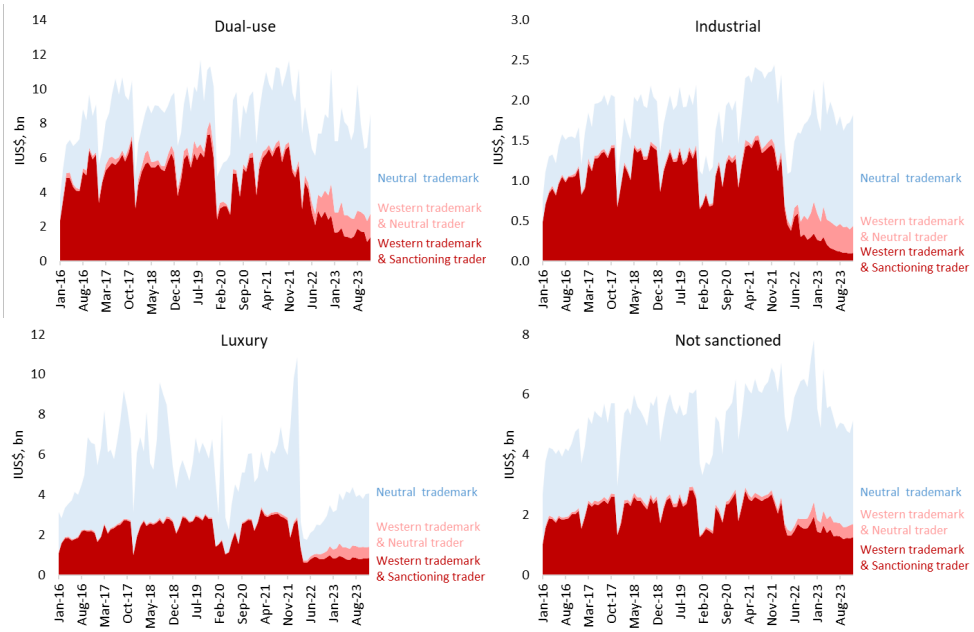
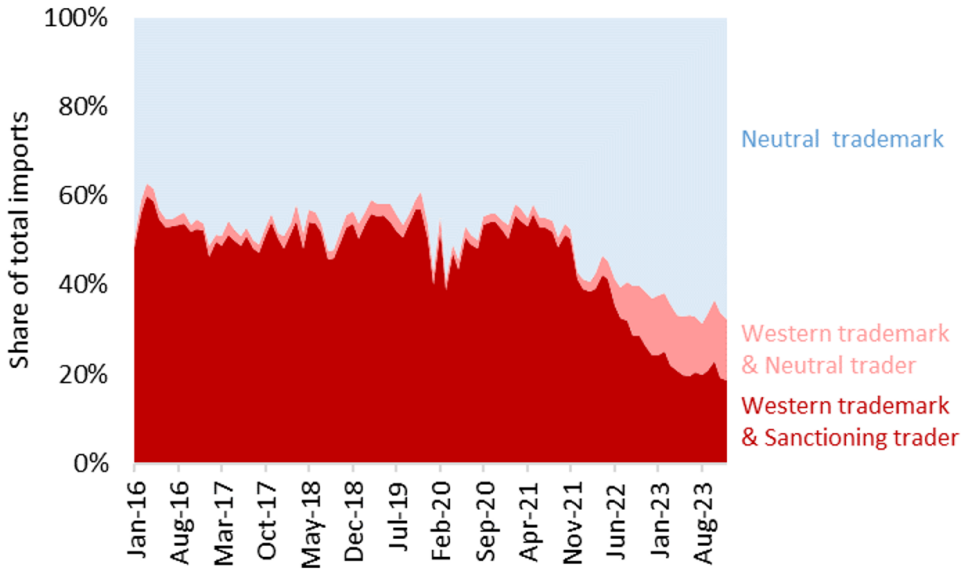
Figure 1: Russia's monthly imports by type of trademark and trader



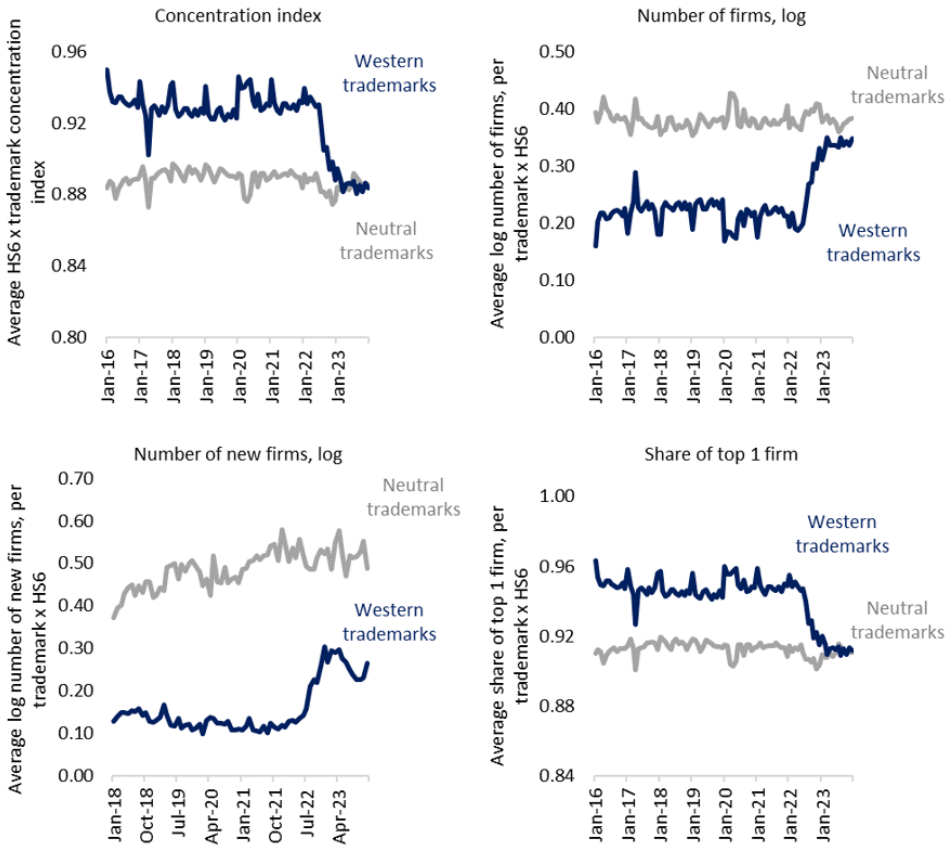
Source: Authors' calculations.
Note: Monthly volumes of trade in nominal US$. Sanctioning economies are listed in the Annex, all other economies are deemed neutral. Neutral trademarks are those registered to companies in neutral jurisdictions; traders refer to exporting companies and their jurisdictions.

Figure 2: Share of Russia's monthly imports by type of trademark and trader



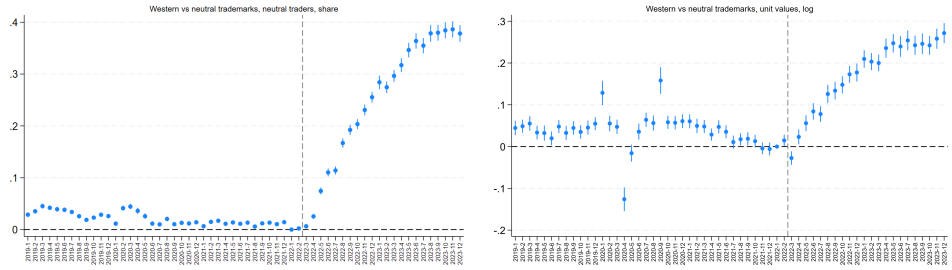
Source: Authors' calculations.
Note: Sanctioning economies are listed in the Annex, all other economies are deemed neutral. Neutral trademarks are those registered to companies in neutral jurisdictions; traders refer to exporting companies and their jurisdictions. Shares of trade add up to 100 percent in each month.

Figure 3: Market concentration



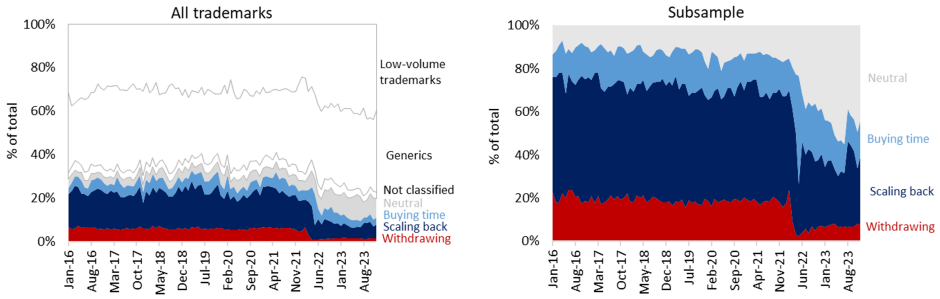
Source: Authors' calculations.
Note: Hirschman-Herfindahl index of concentration of imports across importing firms. Calculated for each trademark and product; simple average across trademark-product observations in each month.

Figure 4: Event study



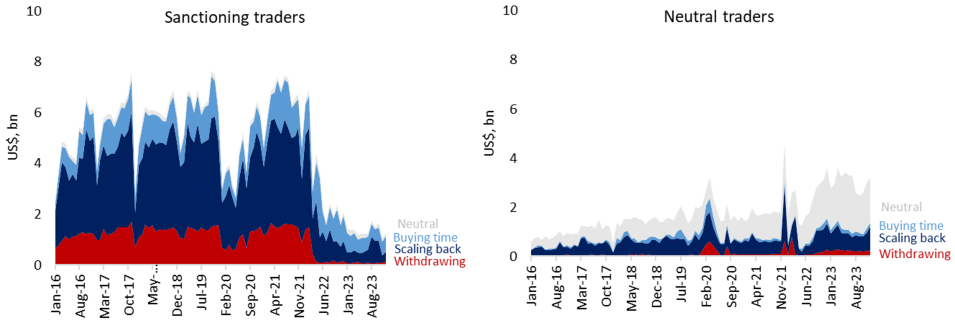
Source: Authors' calculations.
Note: Standard errors are clustered on products. All regressions include product-month and product-trademark fixed effects. Coefficients on the interaction terms between month dummies and a dummy variable for Western trademarks, with January 2022 set to be the base period. The dependent variables are the share of trade accounted for by traders in neutral jurisdictions, probability of observing a trade via a neutral jurisdiction for a given product, trademark and month, the logarithm of the unit value at the point of imports.

Figure 5: Russia's monthly imports, by type of trademark



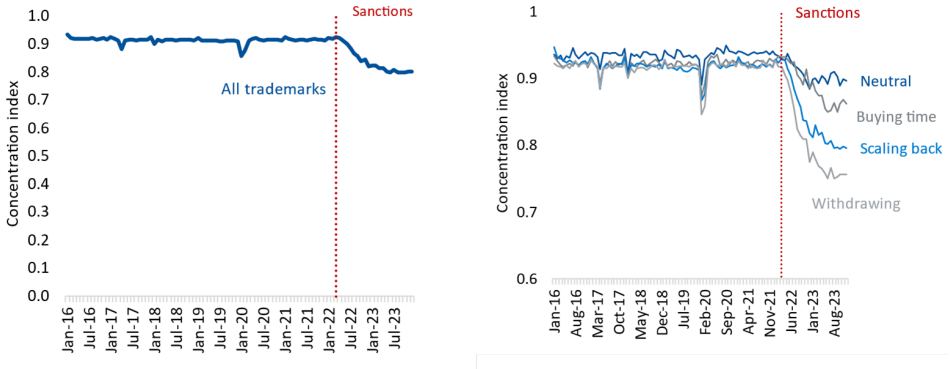
Source: Authors' calculations.
Note: Sample is restricted to imports where the attitude of the trademark owner to serving the Russian market is defined and the top 1,000 trademarks by volume. Generics refer to imports with no trademark data. Not classified refers to trademarks in top-1,000 that are likely to be Western and attitude to serving the Russian market is not defined. Low-volume trademarks refer to trademarks outside the top 1,000. Shares add up to 100 percent in each time period.

Figure 6: Russia's monthly imports from sanctioning and neutral traders, by type of trademark



Source: Authors' calculations.
Note: Sample is restricted to imports where the attitude of the trademark owner to serving the Russian market is defined and the top 1,000 trademarks by volume.

Figure 7: Market concentration, by type of trademark



Source: Authors' calculations.
Note: Sample is restricted to imports where the attitude of the trademark owner to serving the Russian market is defined and the top 1,000 trademarks by volume. Hirschman-Herfindahl index of concentration of imports across importing firms. Hirschman-Herfindahl index of concentration of imports across importing firms. Calculated for each trademark, product; simple average across trademark-product observations in each month.

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

	(1)	(2)	(3)	(4)
		March-December, US$ bn		
	2021	2023	Difference: (2) - (1)	Substitution, %
Dual-use goods				
Western trademarks, direct	62.2	15.3	-46.9	
Western trademarks, intermediated	2.7	12.0	9.3	19.8
Neutral trademarks	41.1	51.9	10.8	22.9
Industrial goods				
Western trademarks, direct	14.2	1.5	-12.8	
Western trademarks, intermediated	0.6	3.3	2.6	20.7
Neutral trademarks	8.5	13.5	5.0	39.1
Luxury goods				
Western trademarks, direct	28.7	8.5	-20.2	
Western trademarks, intermediated	0.9	5.7	4.8	23.5
Neutral trademarks	32.9	26.0	-6.9	
Non-sanctioned goods				
Western trademarks, direct	25.6	13.4	-12.2	
Western trademarks, intermediated	1.3	4.3	3.0	24.9
Neutral trademarks	36.7	35.1	-1.6	
Industrial and Dual-use goods				
Western trademarks, direct	76.5	16.8	-59.7	
Western trademarks, intermediated	3.3	15.2	11.9	20.0
Neutral trademarks	49.6	65.4	15.8	26.4
Total				
Western trademarks, direct	130.7	38.6	-92.1	
Western trademarks, intermediated	5.5	25.3	19.7	21.4
Neutral trademarks	119.2	126.4	7.3	7.9

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 imports of Western trademarks. Intermediated trade in Western trademarks involves exporting traders is in a neutral jurisdiction.

Table 2: Imports of Western versus neutral trademarks: Difference-in-difference analysis

	(1)	(2)	(3)	(4)
Dep. variable	Trade, log	0-1	Trade, hyp	Trade, ppml
Post-sanctions x Western trademark	-0.539***	-0.106***	-0.903***	-1.195***
	(0.0185)	(0.00175)	(0.0160)	(0.0806)
Observations	10,608,343	72,207,072	72,207,072	71,181,539
R^2	0.783	0.439	0.522	

Source: Authors' calculations.

Note: Standard errors are clustered at the product level. *, **, *** denote statistical significance at the 10%, 5% and 1% levels, respectively. All regressions include product-month and product-trademark fixed effects. Column (3) is estimated using inverse hyperbolic sine transformation; Column (4) is estimated by PPML.

Table 3: Western versus neutral trademarks: Market characteristics and unit values

Dep. Variable	(1) Neutral traders, share	(2) Neutral traders, 0-1	(3) Unit value, log	(4) Concentration index	(5) Market share of top 1 firm
Post-sanctions x Western trademark	0.206***	0.273***	0.189***	-0.0117***	-0.00875***
	(0.00934)	(0.00802)	(0.0127)	(0.00300)	(0.00243)
Observations	1,465,170	1,465,170	1,465,071	1,465,170	1,465,170
R^2	0.824	0.735	0.920	0.677	0.658

Source: Authors' calculations.

Note: Standard errors are clustered at the product level. *, **, *** denote statistical significance at the 10%, 5% and 1% levels, respectively. All regressions include product-month and product-trademark fixed effects. The sample is restricted to trademark-product observations with more than 100 transactions in the post-sanctions period. Concentration index is HHI index of market concentration among importers of a given trademark and product. Neutral traders are exporters in neutral jurisdictions.

Table 4: Share of total trade on new routes, Mar 2022-Dec 2023, %

	(1) Trade volume	(2) Number of routes	(3) Number of importing firms
All trademarks	17.6	51.4	43.5
Neutral trademarks	14.6	39.6	29.9
Western trademarks	23.1	57.0	69.2
In subsample of top-1,000 trademarks			
Neutral trademarks	10.0	63.1	53.0
Buying time	8.0	59.2	62.3
Scaling back	32.6	67.9	67.8
Withdrawing	471.	69.4	67.1

Source: Authors' calculations.

Note: Routes are combinations of product, trademark and jurisdiction of exporting trader. New routes are those not observed before March 2022.

Table 5: Trade in Western versus neutral trademarks, by type of product

Subsample	(1) All	(2) Dual-use	(3) Industrial	(4) Luxury	(5) Non-sanctioned
			Dependent variable: Volume of trade (PPML)		
Post-sanctions x Western trademark	-1.195***	-1.017***	-1.696***	-1.619***	-0.921***
	(0.0806)	(0.0820)	(0.103)	(0.277)	(0.0803)
Observations	71,181,539	28,099,669	8,072,034	10,838,532	24,171,304
			Dependent variable: Share of neutral traders		
Post-sanctions x Western trademark	0.219**	0.289***	0.312***	0.126***	0.167***
	(0.00552)	(0.00741)	(0.0107)	(0.0109)	(0.00782)
Observations	10,608,343	4,123,343	1,227,666	2,088,631	3,168,703
R-squared	0.817	0.793	0.817	0.816	0.847
			Dependent variable: Unit value, log		
Post-sanctions x Western trademark	0.137***	0.175***	0.126***	0.0494***	0.158***
	(0.00696)	(0.0116)	(0.0174)	(0.0153)	(0.00730)
Observations	10,593,254	4,116,068	1,225,513	2,087,437	3,164,236
R-squared	0.890	0.861	0.899	0.906	0.901

Source: Authors' calculations.

Note: Standard errors are clustered at the product level. *, **, *** denote statistical significance at the 10%, 5% and 1% levels, respectively. All regressions include product-month and product-trademark fixed effects. Neutral traders are exporters in neutral jurisdictions.

Table 6: Private sanctions: Difference-in-difference analysis

Dependent var.	(1) Trade, log	(2) Trade, 0-1	(3) Trade, hyperbolic	(4) Trade, PPML
Post-sanctions x Buying time	-0.702***	-0.148***	-1.290***	-1.202***
	(0.0491)	(0.00322)	(0.0336)	(0.232)
Post-sanctions x Scaling back	-1.342***	-0.211***	-1.876***	-1.774***
	(0.0441)	(0.00383)	(0.0411)	(0.251)
Post-sanctions x Withdrawing	-2.027***	-0.235***	-2.282***	-2.158***
	(0.0457)	(0.00407)	(0.0463)	(0.218)
Observations	2,501,611	9,941,856	9,941,856	9,310,957
R-squared	0.791	0.552	0.647	

Source: Authors' calculations.

Note: Standard errors are clustered at the product level. *, **, *** denote statistical significance at the 10%, 5% and 1% levels, respectively. All regressions include product-month and product-trademark fixed effects. The sample is restricted to all imports of top 1,000 trademarks where attitudes to serving the Russian market has been identified. The base category are neutral trademarks. Column (3) is estimated using inverse hyperbolic sine transformation; Column (4) is estimated by PPML.

Table 7: Private sanctions: Market structure and unit values

Dependent variable	(1) Neutral traders, share	(2) Neutral traders, 0-1	(3) Unit value, log	(4) Concentration index	(5) Market share of top 1 firm
Post-sanctions x Buying time	0.209***	0.164***	0.0597**	-0.00136	-0.00575
	(0.0131)	(0.0130)	(0.0263)	(0.00734)	(0.00604)
Post-sanctions x Scaling back	0.320***	0.302***	0.188***	-0.0721***	-0.0601***
	(0.00941)	(0.00850)	(0.0258)	(0.00659)	(0.00532)
Post-sanctions x Withdrawing	0.444***	0.347***	0.337***	-0.0878***	-0.0731***
	(0.0108)	(0.0104)	(0.0365)	(0.00818)	(0.00649)
Observations	532,439	532,515	527,609	532,515	532,515
R-squared	0.815	0.663	0.900	0.621	0.589

Source: Authors' calculations.

Note: Standard errors are clustered at the product level. *, **, *** denote statistical significance at the 10%, 5% and 1% levels, respectively. All regressions include product-month and product-trademark fixed effects. The sample is restricted to 1,000 trademarks where attitudes to serving the Russian market has been identified and to trademark-product observations with more than 100 transactions in the post-sanctions period. The base category are neutral trademarks. Concentration index is HHI index of market concentration among importers of a given trademark and product. Neutral traders are exporters in neutral jurisdictions.

Table 8: Share of total trade, by type of trademark, %

	(1) Sanctioned dual-use and industrial products (pre-sanctions)	(2) Luxury goods (pre-sanctions)	(3) Goods originating in sanctioning economies (pre-sanctions)
Neutral trademarks	55.4	30.0	12.7
Buying time trademarks	67.8	11.4	83.4
Scaling back trademarks	68.4	24.4	71.0
Withdrawing trademarks	46.2	42.9	65.7

Source: Authors' calculations.

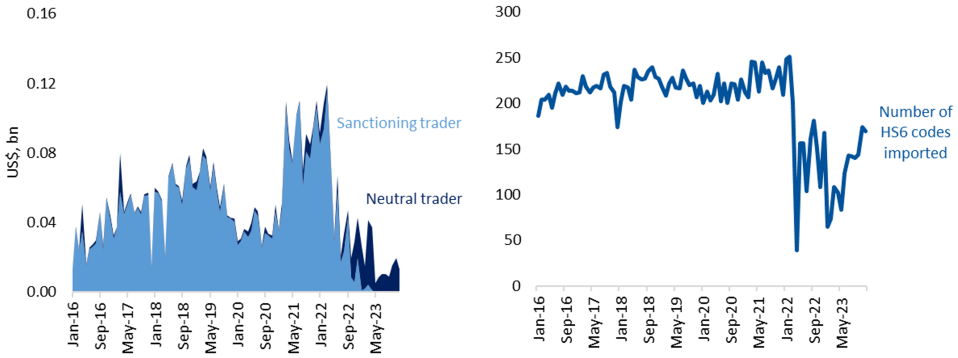
Note: The sample is restricted to trademarks that could be classified by matching them to the list of firms' decisions in Sonnenfeld et al. (2022). Pre-sanctions period refers to 2016-21.

Annex tables and figures

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

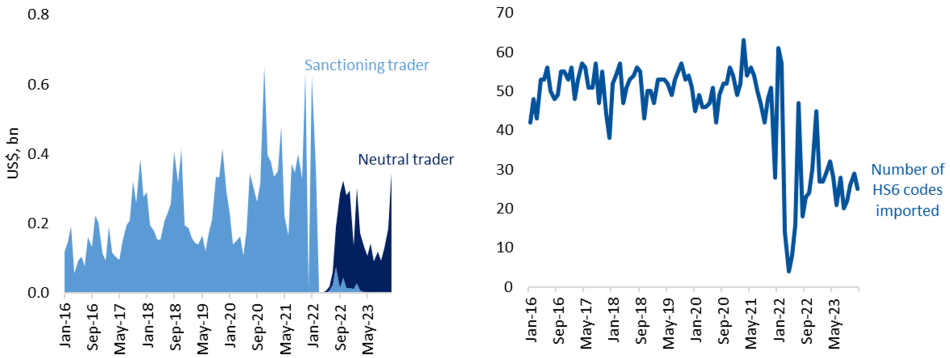
Source: Authors' calculations based on Russia customs data and UN Comtrade.
Note: Aggregate imports as reported in the transaction-level dataset and UN Comtrade. Mirror data refers to exports to Russia as reported by trading partners excluding the members of the Eurasian Economic Union. Transaction-level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



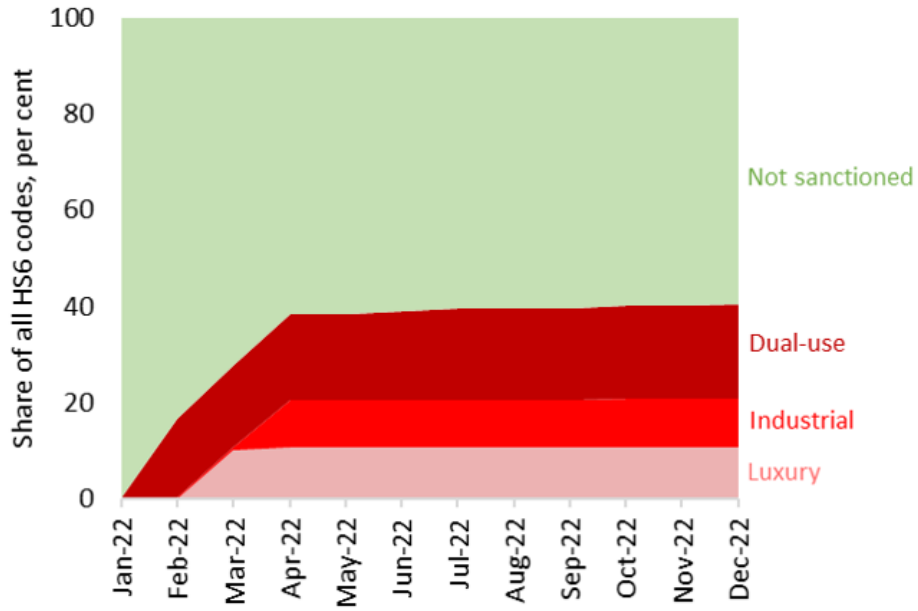
Source: Authors' calculations based on customs data.
Note: Data are aggregated by month. Sanctioning economies are listed in the Annex, all other economies are deemed neutral.

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



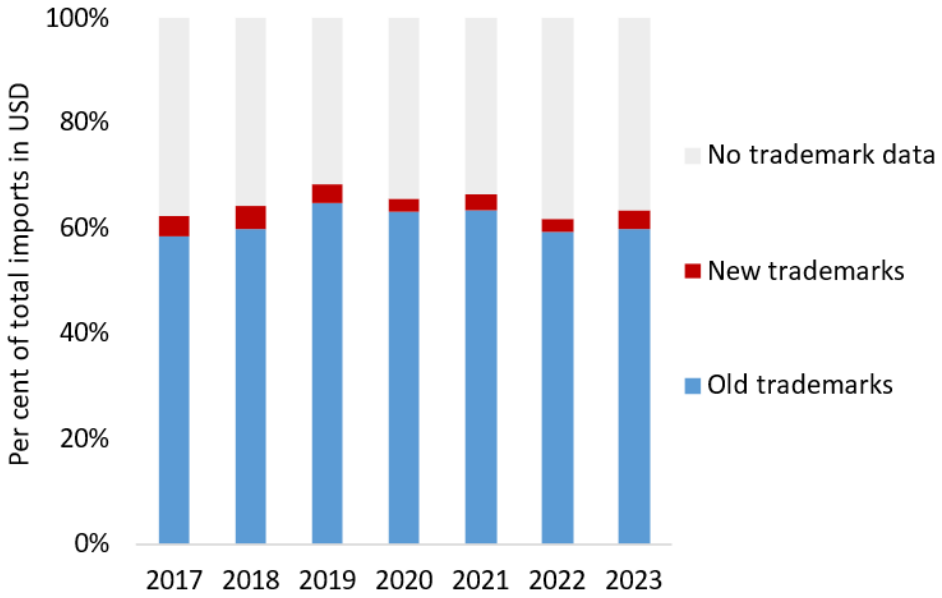
Source: Authors' calculations based on customs data.
Note: Sanctioning economies are listed in the Annex, all other economies are deemed neutral. The right panel shows the total number of different HS6 product lines with at least one product under this brand imported in a given month.

Figure A4: Number of sanctioned products



Source: EU and authors' calculations.
Note: HS6 product 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; (ii) trademarks that were not imported in earlier years; and (iii) transactions where trademark data are not available or applicable.

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 and sanction type

N	*HS section*	Number of HS6 product lines	
		Part-sanctioned	Other (combined)
	By HS section		
I	Animal products	2	369
II	Vegetable products	10	298
III	Animal and vegetable oils	0	48
IV	Prepared food, beverages and tobacco	29	188
V	Mineral products	48	101
VI	Chemicals	379	487
VII	Plastics and rubber	105	104
VIII	Leather and fur skins	21	48
IX	Wood and articles of wood	16	105
X	Wood pulp and paper	62	78
XI	Textiles and textile articles	308	486
XII	Footwear, headgear, umbrellas, etc.	33	14
XIII	Articles of stone and glass	71	68
XIV	Precious or semi-precious stones, jewellery	45	8
XV	Base metals and articles of base metal	232	329
XVI	Machinery and electrical equipment	494	283
XVII	Vehicles, aircraft, vessels	120	23
XVIII	Optical, precision, medical and other instruments	136	71
XIX	Arms and ammunition	20	0
XX	Miscellaneous manufacturing	44	78
XXI	Works of art	7	0
	Total	2182	3186
	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	Broad sample					Narrow sample				
	Mean	Median	St. Dev.	Min	Max	Mean	Median	St. Dev.	Min	Max
Value, log	7.95	7.93	3.01	-4.61	22.58	10.48	10.72	2.71	-4.61	22.58
Value, 0-1	0.15	0.00	0.36	0.00	1.00	0.80	1.00	0.40	0.00	1.00
Value, hyperbolic	1.31	0.00	3.31	0.00	23.28	8.90	10.48	5.11	0.00	23.28
Quantity, log	4.34	4.04	3.81	-13.82	25.75	7.35	7.35	3.48	-13.82	25.35
Unit value, log	3.62	3.39	2.38	-16.02	24.35	3.13	2.86	2.30	-14.64	20.83
Neutral traders, share	0.26	0.00	0.43	0.00	1.00	0.37	0.00	0.45	0.00	1.00
Neutral traders, 0-1	0.30	0.00	0.46	0.00	1.00	0.51	1.00	0.50	0.00	1.00
Concentration index	0.92	1.00	0.19	0.00	1.00	0.74	0.92	0.31	0.00	1.00
Market share of top 1 firm	0.94	1.00	0.16	0.02	1.00	0.79	0.96	0.26	0.02	1.00

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. Narrow sample is restricted to trademark x HS6 units where more than 100 transactions are observed post-sanctions .