

Reducing trade with Russia: Sanctions vs. firms' voluntary suspension of activities*

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Abstract

The invasion of Ukraine in February 2022 led to unprecedented and large sanctions against Russia. Parallel to this process, many multinational firms voluntarily decided to suspend their activities in Russia. Using Spanish firm-level data, this paper quantifies the impact of trade sanctions and the voluntary decision of firms to suspend activities on exports and imports with Russia. We find that the voluntary decision of firms to suspend activities in Russia contributed to the reduction in exports and imports by 19% and 23%, respectively, while sanctions contributed by 11% and 32%, respectively. The results show that the combination of sanctions and the voluntary decision of firms to suspend activities caused a much greater reduction in trade with Russia than what sanctions alone would have achieved.

JEL: F10, F14

Keywords: Russia, sanctions, voluntary suspension of activities, reputation, Russian invasion of Ukraine, firm-level exports and imports, Spain.

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1 Introduction

The Russian invasion of Ukraine in February 2022 led many countries to impose large and unprecedented trade sanctions against Russia. On the export side, the main objective of sanctions was to reduce Russia’s access to technologies and goods that could enhance its military and industrial capacity. On the import side, the aim was to reduce Russia’s foreign revenue so that it had less resources to fund its war effort. The scope of affected products and the stringency of sanctions justifies the interest in quantifying the impact of sanctions on trade flows with Russia.¹ This interest is further explained by the fact that previous sanctions against Russia, motivated by the annexation of Crimea in 2014, had a relatively small impact on Russian trade and heterogeneous effects on sanctioning countries (Syropoulos et al., 2023).

Few days after the Russian invasion of Ukraine, some multinational firms announced that they would suspend their activities in Russia. The main motivation behind this decision was the reputational damage firms could suffer if they maintained economic ties with Russia (Balyuk and Fedyk, 2023). That is, firms feared that they would lose sales in other markets, investors, or talent if they continued to operate in Russia.² According to the list developed by Yale’s School of Management Chief Executive Leadership Institute (Yale CELI list), by December 2023, 1,028 companies had decided to permanently or temporarily suspend their activities in Russia.³ These firm-level decisions can also lead to a reduction in trade with Russia. For example, multinational firms may stop exporting goods that were previously distributed by their subsidiaries in Russia or provide intermediate inputs to their factories in Russia. They may also decide to stop importing intermediate inputs or final goods from Russia. Since multinationals account for a large share of a country’s trade, their decision to suspend activities in Russia is likely to have a sizable detrimental effect on trade.

Using Spanish firm-level transaction data, this paper quantifies the effect of EU trade sanctions and the voluntary decision of firms to suspend activities on trade with Russia. First, we use the Yale CELI and Leave-Russia lists to identify companies that decided to withdraw or suspend activities in Russia after the invasion of Ukraine.⁴ Second, we identify products, at the 8-digit Combined Nomenclature level (CN8), that were affected by a European Union (EU) trade sanction against Russia after the invasion of Ukraine.

¹For example, at the end of 2023, 2,795 export and 3,151 import products out of 9,758 were affected by European Union (EU) sanctions against Russia. They represented 40% and 50% of the average annual pre-invasion (2019-2021) EU exports and imports from Russia, respectively.

²See “The Viral List That Turned a Yale Professor Into an Enemy of the Russian State” by Robb Mandelbaum, bloomberg.com, 6 December 2022 at <https://www.bloomberg.com/news/articles/2022-12-06/list-of-companies-doing-business-in-russia-made-by-yale-professor?embedded-checkout=true>.

³The list can be accessed at <https://www.yalerussianbusinessretreat.com/>.

⁴The latter list can be accessed at <https://leave-russia.org/>.

Third, we identify trade transactions in unsanctioned and sanctioned products from firms that voluntarily suspended activities in Russia and from those that did not, before and after the invasion of Ukraine. Finally, we use a difference-in-differences methodology to estimate the impact of trade sanctions and firms' voluntary decision to suspend activities on Spanish exports and imports from Russia.

Although some governments, such as the US, expected Russia to invade Ukraine,⁵ it seems safe to assume that Spanish firms not related to the military industry could not anticipate the products that would be affected by EU sanctions after a potential invasion.⁶ Furthermore, the fact that Spanish firms incurred large economic costs due to their voluntary decision to suspend activities in Russia suggests that they were not anticipating a suspension decision before the Russian invasion of Ukraine.⁷ These facts allow us to consider the Russian invasion of Ukraine as a quasi-natural experiment and to interpret our estimates as causal.

Our econometric estimates conclude that Spanish firms' exports to Russia of products affected by trade sanctions decreased by 57% after the invasion of Ukraine, relative to unsanctioned products. Sanctions on firearms, jet fuel, maritime, military, and products that could improve Russia's industrial capacity had a significant negative impact on exports. However, sanctions on aviation, dual-use, luxury, and oil refining goods did not reduce exports of these manufactures. As expected, exports to Russia from firms that voluntarily suspended activities in Russia almost disappeared after the invasion of Ukraine. In the case of unsanctioned products, exports from firms that voluntarily suspended activities decreased by 98% compared to firms that did not. In the case of sanctioned products, exports decreased by 99%. This latter result indicates that sanctions had a minimal contribution to the reduction of exports when firms voluntarily suspended activities in Russia.

Imports of sanctioned products from Russia decreased by 82% after the invasion of Ukraine, compared to unsanctioned products. Sanctions on coal, crude oil, products which generate significant revenues for Russia, and steel had a significant negative effect on imports. The export ban imposed by Russia on some products also had a negative effect on imports. However, sanctions on jewelry had no significant impact on imports. Imports of unsanctioned products from firms that voluntarily suspended activities in

⁵For example, see "Biden Predicts Putin Will Order Ukraine Invasion, but "Will Regret Having Done It"" by David E. Sanger, *nytimes.com*, 19 January 2022 at <https://www.nytimes.com/2022/01/19/us/politics/biden-putin-russia-ukraine.html>. However, other governments, such as those of France and Germany, and the President of Ukraine, did not expect Russia to invade Ukraine (Shuster, 2024).

⁶For example, EU sanctions affected products as diverse as dormant narcissi bulbs, plain woven fabrics of cotton, or seats for motor vehicles.

⁷For example, see "La guerra en Ucrania acaba con más de 2.000 millones de negocio para empresas españolas" by Javier García Roper, *cincodias.elpais.com*, 22 February 2023 at <https://cincodias.elpais.com/companias/2023-02-22/la-guerra-en-ucrania-acaba-con-mas-de-2000-millones-de-negocio-para-empresas-espanolas.html>.

Russia decreased by 95% after the invasion of Ukraine, compared to those of firms that did not. Imports decreased by 100% for firms that voluntarily suspended activities and imported sanctioned products from Russia. As was the case for exports, sanctions had a small contribution to the reduction in imports from firms that voluntarily suspended activities in Russia.

A primary contribution of the paper is to show that the combination of sanctions and the voluntary decision of firms to suspend activities caused a much greater reduction in trade with Russia than what sanctions alone would have achieved. The combination of voluntary suspension of activities and sanctions led to a reduction of 30% in exports, compared to a reduction of 11% if only sanctions had been imposed. In the case of imports, the combination of voluntary suspension and sanctions led to a 53% reduction in trade, compared to a reduction of 32% if only sanctions had been imposed. This finding highlights that the voluntary decision of firms, in most cases motivated by reputational pressure, can substantially enhance the economic harm of a conflict in the sanctioned country and therefore increase the likelihood that the target country will stop the actions that motivated the dispute (Drezner, 2023). Furthermore, this higher economic pain can discourage other countries from taking actions that can lead to a conflict.⁸ It also points out that conflicts can cause firms to voluntarily suspend activities in the country with which the dispute arises, generating economic losses to the sanctioning country that can be as large as those created by sanctions.

We also explore the entry and exit of Spanish firms from Russia after the invasion of Ukraine. We find that sanctions and voluntary suspension of activities had a negative effect on the probability that a firm starts exporting to Russia and a positive effect on exiting the Russian market. Sanctions also significantly reduced the probability of starting to import from Russia and increased the probability of stopping importing from Russia. We show that our baseline results are robust to the use of an alternative sample and to the estimation of a triple-difference regression. We also document that the impact of sanctions was similar on voluntary suspension and non-suspension firms in previous sanction episodes in which firms did not voluntarily suspend activities.

Finally, we find evidence that Spanish firms that did not voluntarily suspend their activities in Russia rerouted their exports to Russia through neighboring countries to circumvent sanctions. The increase in exports to neighboring countries by firms that did not voluntarily suspend activities represented a substantial fraction of the direct reduction in exports of sanctioned products from these firms to Russia: 43%. We also observe some evidence consistent with import rerouting. However, this increase in imports from neighboring countries seems to be explained by trade diversion rather than trade rerouting. We find no evidence consistent with rerouting for firms that voluntarily suspended activities

⁸Daniel Drezner in Klein (2024)

in Russia. This result highlights that the reduction of trade with a target country is less likely to be thwarted by rerouting if it is based on firms' voluntarily suspension decisions than on sanctions.

Our paper makes three contributions to the literature. First, we contribute to the literature on the impact of sanctions. The large increase in the use of sanctions as foreign policy instruments has led scholars to explore the economic impact of sanctions on sanctioning and sanctioned countries (Felbermayr et al., 2021; Drezner, 2023; Morgan et al., 2023), and to examine how firms respond to them (Meyer et al., 2023). In particular, our paper speaks to the literature that analyzes the impact of EU sanctions against Russia on firm-level trade. Previous studies have focused on the sanctions that the EU imposed on Russia in the aftermath of the annexation of Crimea. Using French firm-level data, Crozet and Hinz (2020) concluded that the 2014 EU sanctions against Russia had no significant effect on exports of well-known brands. However, they had a strong negative effect on products that relied on trade finance instruments. In a later paper, Crozet et al. (2021) found that the 2014 EU sanctions against Russia reduced the probability that French firms exported to that country. Using Swedish firm-level data, Gullstrand (2020) found that Russia's retaliatory measures against EU products after the 2014 EU sanctions had a strong negative effect on Swedish exports to Russia on intensive and extensive margins. Looking from Russia's angle and using the same sanction episode, Miromanova (2023) concluded that Russian firms reduced the imports of embargoed products on intensive and extensive margins. Ahn and Ludema (2020) showed that Russian firms targeted by sanctions lost operating revenue, asset value, and employees relative to non-targeted firms. However, focusing only on Russia-based sanctioned firms, Nigmatulina (2023) found that sanctioned firms performed better than unsanctioned ones. Finally, using Dutch firm-level data, Kohl et al. (2023) showed that EU export restrictions on oil refining products and arms led to a reduction in the exports of these products to Russia by Dutch firms after the annexation of Crimea. They also found that Russia's retaliatory measures had a strong negative effect on Dutch exports to that country. We contribute to this literature by estimating the impact of the trade sanctions imposed by the EU on Russia after the invasion of Ukraine. This episode is interesting because the range of products and the value of trade affected by sanctions were much larger than in previous conflicts. Furthermore, in contrast to previous firm-level studies that focused on a single trade flow, we analyze the impact of trade sanctions on a country's exports and imports. We show that sanctions had a strong negative effect on Spanish firm-level exports and imports from Russia.

Second, we add to the literature that analyzes whether firms use intermediary countries to circumvent trade sanctions. Chupilkin et al. (2023) found that the increase in EU and UK exports to countries neighboring Russia after the invasion of Ukraine was

30% higher for sanctioned products than for unsanctioned ones. However, the increase in sanctioned exports to countries neighboring Russia only represented 5% of the direct reduction in the exports of sanctioned products to Russia. [Borin et al. \(2023\)](#) raise this fraction to 10%. In contrast to these studies, we use firm-level data and find that the increase in exports from firms that did not suspend activities in Russia to countries neighboring Russia represented a substantial fraction of the direct decrease in exports from these firms of sanctioned products to Russia after the invasion of Ukraine: 43%. We do not find evidence consistent with trade rerouting for firms that voluntarily suspended activities in Russia. This result indicates that a reduction of trade with the sanctioned country based on a firm's voluntary decision to suspend activities is less likely to be undermined by rerouting strategies than one based on sanctions.

Third, we contribute to the corporate social responsibility literature. Motivated by the seminal work of [Bowen \(2013\)](#), many scholars have argued that firms have a social responsibility toward different stakeholders, such as customers, suppliers, shareholders, or community members, that goes beyond the maximization of profits. These stakeholders can pressure firms to meet their demands, and firms can face reputational damage if they do not ([Eesley and Lenox, 2006](#)). There is literature showing that reputational damage can explain firms' trade decisions. For example, [Koenig and Poncet \(2022\)](#) concluded that French firms that had outsourced their production to manufacturers located in the Rana Plaza building, which collapsed in April 2013, shifted their imports to producers closer to France in geographical and regulatory terms. [Korovkin and Makarin \(2023\)](#) presented anecdotal and indirect evidence supporting the hypothesis that reputational pressure led Ukrainian firms to reduce trade with Russia after the annexation of Crimea. [Balyuk and Fedyk \(2023\)](#) concluded that reputational pressure was the main explanation for the withdrawal of US companies from Russia after the invasion of Ukraine. We show that the voluntary decision of firms to suspend activities in Russia after the invasion of Ukraine had a strong negative effect on trade.

The remainder of the paper is organized as follows. The next section explains how we combine information on firms that voluntarily decided to suspend activities in Russia, EU trade sanctions, and Spanish firm-level data to build our data set. It also describes the evolution of Spanish trade flows with Russia by sanction and voluntary suspension categories. This analysis provides initial evidence on the impact of sanctions and voluntary suspension of activities on Spanish trade flows with Russia after the invasion of Ukraine. Section 3 introduces the difference-in-differences regressions and reports estimates of the impact of sanctions and voluntary suspension of activities on Spanish exports and imports from Russia. This section also examines how sanctions and voluntary suspension affect firms' decision to enter or exit the Russian market. The section ends with a robustness analysis. Section 4 explores whether firms rerouted their trade with Russia

through neighboring countries to circumvent sanctions or smooth out the negative effects of voluntary suspension. The last section concludes.

2 Data and stylized facts

Our data set combines three pieces of information. First, we use the Yale CELI and KSE Institute’s Leave-Russia lists to identify the Spanish firms that voluntarily decided to stop their activities in Russia. We consider that a firm voluntarily decided to curtail operations in Russia if it is included in the Yale CELI list with the “Withdrawal” or “Suspension” status or in the KSE’s Institute’s Leave-Russia list with the “Exited” or “Leave” status. As explained in [Sonnenfeld et al. \(2022\)](#), withdrawal is defined as “making a clean break/permanent exit from Russia or and/or leaving behind no operational footprint” and suspension as “temporarily suspending all or almost all Russian operations without permanently exiting or divesting”.⁹ If there was a discrepancy between the two lists on the suspension status of a firm, following a prudence criterion, we defined that the firm continued its operations in Russia. We should note that the Yale CELI and Leave-Russia lists include firms that had production or distribution-oriented affiliates in Russia. That is, they do not include firms that only performed export or import operations with Russia.

We argue that the Yale CELI and KSE Leave-Russia lists provide a fairly good identification of firms that voluntarily suspended activities in Russia. To begin with, they correctly assigned a suspension status to firms that stated in a press release that an ethical concern was driving their decision to suspend activities in Russia. Furthermore, as shown later, many firms that voluntarily suspended activities according to these lists did so a few weeks after the invasion of Ukraine, when the full extent of EU trade sanctions against Russia and the evolution of the conflict was unknown. In addition, as explained below, in the case of exporters, most of the firms that voluntarily suspended activities in Russia exported unsanctioned products. There was also heterogeneity in the suspension decision between firms operating in the same industry. Finally, as shown below, our econometric estimates indicate that the negative impact of a suspension of activities on trade was similar for sanctioned and unsanctioned products.

Second, we use the timeline on EU restrictive measures against Russia over Ukraine developed by the EU Council to trace the trade sanctions imposed by the EU against Russia since the invasion of Ukraine in February 2022.¹⁰ Table A.1 in the appendix

⁹As explained in [Mylovanov et al. \(2023\)](#), the KSE Institute’s Leave-Russia list defines Exited as “companies that sold their business/assets or its part of the business to a local partner/terminated relations and left the market. Also, for companies that are being liquidated, this status is being assigned.” Leave is defined as “companies that have published on the company’s official website (or their release has appeared in a foreign publication such as FT, NYT, etc.) that are completely shutting down in Russia or companies that have officially announced that they are temporarily reducing operations in Russia.

¹⁰This timeline can be accessed at <https://www.consilium.europa.eu/en/policies/sanctions/>

reports the date when each trade sanction package was introduced, the affected trade flow (exports or imports), and the products targeted by the trade sanction. The EU imposed 12 rounds of sanctions against Russia between February 2022 and December 2023. Export bans or restrictions were imposed on aviation, dual use, firearms, luxury, maritime navigation, military, and oil refining goods, and on products that could enhance Russia's industrial capacity. Products affected by import bans and restrictions were, among others, coal, crude oil and petroleum products, gold, iron and steel, and jewelry. Using information published in different editions of the EU Official Journal and the list of dual-use goods available at the EU Communication and Information Resource Center for Administrations, Businesses, and Citizens (CIRCABC)¹¹, we built a data set of products affected by a trade sanction, identifying the product's CN8 code, the sanction regime (e.g., luxury goods), the affected trade flow (exports or imports), and the date the sanction entered into force. In March 2022, Russia imposed an export ban on different products.¹² We consider these bans as an additional sanction category for Spanish imports from Russia.

Third, quarterly data on the universe of Spanish firms' export and import transactions in goods were obtained from the Customs and Excise Department of the Spanish Tax Agency (AEAT-Customs). Each record reports the value (in euros) of exports or imports for each firm, by CN8 product, country of destination or origin, year, and quarter. Our data set includes all Spanish firms that traded at least one quarter with Russia during the period 2019q1-2023q4. Following the procedure explained in [de Lucio et al. \(2018\)](#), we identified by name 64% and 41% Spanish firms that exported and imported from Russia during that period, respectively: 2,778 exporters and 998 importers. These firms represented 91% and 93% of Spanish exports and imports from Russia during the pre-invasion period (2019-2021), respectively. Among them, we identified 63 companies that voluntarily suspended activities in Russia after the invasion of Ukraine: 27 firms exported and imported from Russia, 18 only exported to Russia, and 18 only imported from Russia. These firms had their headquarters in Spain or belonged to foreign companies that voluntarily suspended activities in Russia. We also identified 69 companies operating in Spain that stayed in Russia according to the Yale CELI or Leave-Russia lists: 16 firms exported and imported from Russia, 38 only exported to Russia and 15 only imported from Russia. Among the remaining 3,357 firms that are not included in the Yale CELI or Leave-Russia lists, 244 were two-way traders, 2,435 only exporters, and

[restrictive-measures-against-russia-over-ukraine/history-restrictive-measures-against-russia-over-ukraine/](https://circabc.europa.eu/ui/group/0e5f18c2-4b2f-42e9-aed4-dfe50ae1263b/library/c3d06bd7-6ef0-4771-bbd7-f92b976ae9a0).

¹¹This list, which is updated every year, can be accessed at <https://circabc.europa.eu/ui/group/0e5f18c2-4b2f-42e9-aed4-dfe50ae1263b/library/c3d06bd7-6ef0-4771-bbd7-f92b976ae9a0>.

¹²The Russian government decision can be accessed at <http://government.ru/en/docs/44762/>. We were unable to find a list that specifies the CN8 products affected by the Russian export ban. Therefore, we created a list based on the description of the products included in the Russian government decision.

678 only importers. As explained below, these firms were smaller than those that voluntarily suspended activities in Russia, and most of them exported intermediate inputs or industrial goods. As explained by [Korovkin and Makarin \(2023\)](#), these two characteristics reduce the probability that a firm will be subject to reputational pressure. Therefore, we assume that these firms did not voluntarily cease their export or import operations with Russia after the invasion of Ukraine. In any case, we test the robustness of our results to excluding these firms from the sample.

Table [A.2](#) in the appendix shows that the firms that voluntarily suspended activities in Russia were much larger in terms of export and import value, number of traded products, and number of destinations/origins than the rest of the Spanish traders with Russia before the invasion of Ukraine. This result is explained by the fact that the firms that voluntarily suspended activities in Russia had distribution or production affiliates in that country. As shown in [Helpman et al. \(2004\)](#), firms that invest in foreign markets are more productive and larger than those that only trade. Importers who voluntarily suspended activities in Russia were larger than exporters who suspended activities in Russia, especially when looking at trade flows with Russia. This is explained by the presence of oil and gas importers, which have larger trade flows than other traders.

The average annual Spanish exports and imports from Russia during the pre-invasion period (2019-2021) were equal to 1,631 and 3,749 million euros, respectively (0.6% of total Spanish exports and 1.3% of total Spanish imports). During the pre-invasion period, Russia occupied the 26th and 17th positions in the ranking of Spanish export and import partners, respectively.¹³ Table [A.3](#) shows that machinery, motor vehicles, and tanning extracts were the most exported sanctioned products from Spain to Russia during the pre-invasion period, while mineral fuel was the most imported sanctioned product.

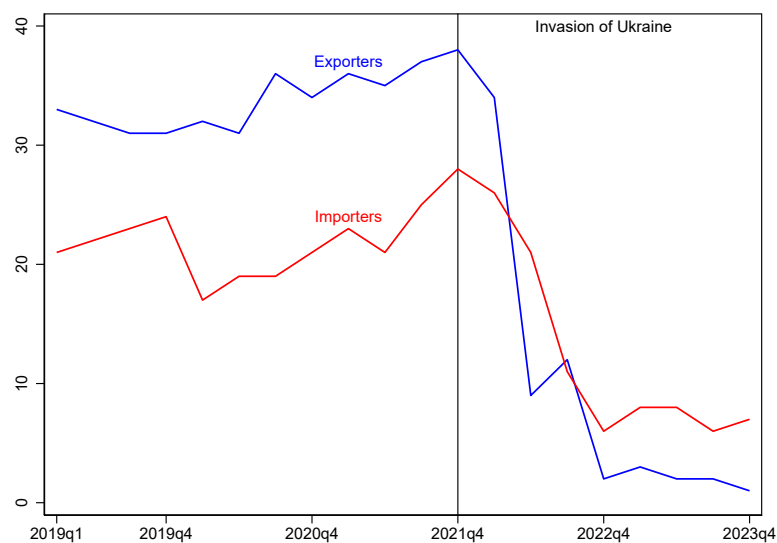
Figure [1](#) shows the evolution of the number of Spanish firms that were trading with Russia in each year-quarter. Panel A shows the evolution of firms that voluntarily decided to suspend activities in Russia. As expected, there is a marked reduction in the number of exporters after the invasion of Ukraine. The largest drop occurred in the second quarter of 2022. This decrease highlights that most firms that voluntarily decided to suspend their activities in Russia terminated their exports a few months after the invasion. At the end of 2023, there was only one firm that was still exporting to Russia. The number of importers begins to decline the quarter after the invasion and continues decreasing during the third and fourth quarters of 2022. However, there is no decrease in the number of importers in 2023. At the end of this year, seven firms that voluntarily decided to suspend operations with Russia were importing from Russia.

Panel B shows the evolution of exporters and importers of firms that did not volun-

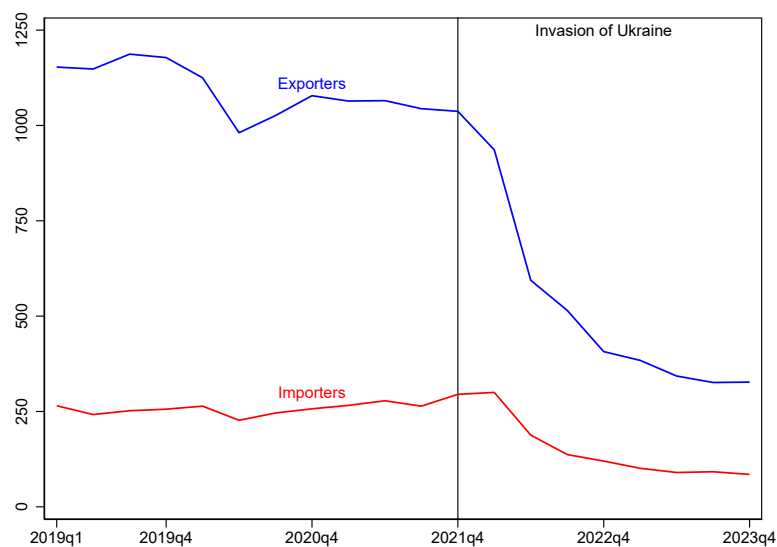
¹³The 12th and 9th positions in the ranking of Spanish extra-EU export and imports partners, respectively.

Figure 1: Number of Spanish exporters and importers from Russia, 2019q1-2023q4

A. Firms that voluntarily suspended activities in Russia



B. Firms that did not voluntarily suspend activities in Russia



Source: authors' own elaboration using data from AEAT-Customs.

tarily suspend activities in Russia. There was a slight downward trend in the number of exporters before the invasion. This downward trend was magnified after the invasion, particularly in the second quarter of 2022, when the number of exporters decreased by 37%. The downward trend continued, although with a lower intensity, until the last quarter of 2023. Overall, the invasion of Ukraine decreased the number of exporters by 68%. In contrast, there was a slight upward trend in the number of importers before the invasion. This number continued to rise in the quarter when the invasion occurred (2022q1) and

then decreased. The relative decline in the number of importers after invasion, 72%, is similar to that of exporters. These figures highlight that many firms stopped exporting and importing from Russia involuntarily after the invasion of Ukraine.

Panel A of Figure 2 shows the evolution of quarterly Spanish exports to Russia by firm-product groups between 2019 and 2023. The first group (green area; Only Suspension) is exports of products unaffected by sanctions from firms that voluntarily suspended activities in Russia after the invasion of Ukraine. The second group (orange area; Sanction and Suspension) is exports of products affected by sanctions from firms that voluntarily suspended activities in Russia after the invasion of Ukraine. The third group (blue area; Only Sanction) is exports of products affected by trade sanctions from firms that did not voluntarily suspend activities in Russia. The fourth group (red area; No Sanction and No Suspension) is exports of products unaffected by sanctions from firms that did not voluntarily suspend activities in Russia.

During the pre-invasion period (2019q1-2021q4), on average, annual exports from firms that voluntarily suspended activities in Russia after the invasion of Ukraine represented 27% of total exports to Russia. Twenty-one percentage points corresponded to products unaffected by sanctions and six percentage points to products affected by them. Therefore, more than three-quarters of the exports of firms that voluntarily suspended activities in Russia after the invasion of Ukraine were unaffected by sanctions. Sanctioned products exported by firms that did not voluntarily suspend activities represented 21% of total Spanish exports to Russia in the pre-invasion period. Finally, exports of products unaffected by sanctions and exported by firms that did not voluntarily suspend activities in Russia represented 52% of total Spanish exports to Russia during the pre-invasion period.

After reaching a maximum in 2021q2, total exports from Spain to Russia declined during the last two quarters of 2021 and throughout the invasion period. Exports decreased by 42% between the post-invasion period (2022q1-2023q4) and a pre-invasion period of the same duration (2020q1-2021q4). As expected, there is a large decrease in exports from firms that voluntarily suspended activities in Russia after the invasion of Ukraine. These exports disappeared almost completely in the last quarter of 2023. There is also a large reduction in the export of sanctioned products from firms that did not voluntarily suspend activities in Russia. Between the pre-invasion and the above-defined post-invasion period, exports of these goods decreased by 53%. There is also a decrease in exports of unsanctioned goods from firms that did not voluntarily suspend activities in Russia. This decrease can be explained by the negative effect on exports of sanctions that were not targeted at specific products, such as financial sanctions. Furthermore, the conflict itself could have increased the risk of trading with Russia, leading to a reduction in exports to this country. In any case, the decrease in exports in this last group was

Figure 2: Quarterly Spanish trade with Russia by firm-product groups, 2019q1-2023q4 (million euros)



Source: authors' own elaboration using data from AEAT-Customs.

less pronounced than in the previous groups: 14%. This latter result suggests that both trade sanctions and the voluntary decision of firms to suspend activities in Russia had a particularly negative effect on Spanish exports to Russia after the invasion of Ukraine.

Panel B of Figure 2 shows the evolution of Spanish imports from Russia. The graph shows a sharp increase in imports between the last quarter of 2020 and the last quarter of 2021. This increase is explained by the rise in the price of oil, a product that represented

almost two-thirds of Spanish imports from Russia in the pre-invasion period (see Table A.3 in the appendix). Imports from firms that voluntarily suspended activities in Russia represented 56% of all Spanish imports from Russia in the pre-invasion period, of which 5 percentage points corresponded to unsanctioned products (green area) and 51 percentage points to sanctioned products (orange area). Therefore, in the case of imports, most of the products traded by firms that voluntarily suspended activities were affected by sanctions. Imports of sanctioned products from firms that did not voluntarily suspend activities in Russia represented 20% of Spanish imports during the pre-invasion period (blue area). Finally, imports of unsanctioned products from firms that did not voluntarily suspend activities in Russia represented 24% of total Spanish imports from Russia during the pre-invasion period.

Between the pre-invasion (2020q1-2021q4) and the post-invasion periods (2022q1-2023q4) defined above, imports decreased by 17%. Imports from firms that voluntarily suspended activities (green and orange areas) and imports of sanctioned products from firms that did not voluntarily suspend activities in Russia (blue area) almost disappeared by the last quarter of 2023. In contrast, imports of unsanctioned products from firms that did not voluntarily suspend activities in Russia *increased* by 100% between the pre-invasion and post-invasion periods. This increase is explained by imports of liquefied natural gas, a product that represented half of all Spanish imports from Russia in the post-invasion period and whose average price increased after the invasion of Ukraine, especially during 2022.

Import trends also suggest that trade sanctions and the voluntary decision of firms to suspend activities in Russia had a negative impact on Spanish trade with Russia. To confirm visual perception, the next section uses econometric techniques to estimate the impact of sanctions and firms' voluntary decision to suspend activities on Spanish firms' trade with Russia after the invasion of Ukraine.

3 Trade impact of sanctions and the voluntary decision of firms to suspend activities in Russia

This section is divided into three parts. First, we explain the difference-in-differences strategy used to identify the impact of sanctions and voluntary suspension of activities on Spanish trade with Russia after the invasion of Ukraine. Second, we present the baseline estimations of the impact of sanctions and firms' voluntary decision to suspend activities in Russia on the Spanish trade with Russia. Finally, we analyze the robustness of our estimates.

3.1 Methodology

We use the following specification to estimate the effect of EU trade sanctions and the voluntary decision of firms to suspend activities on the trade flows of Spanish firms with Russia:

$$y_{fkt} = \exp \left[\alpha(OnlySuspension_{fk} \times Post_{ft}) + \beta(SanctionAndSuspension_{fk} \times Post_{fkt}) + \delta(OnlySanction_{fk} \times Post_{kt}) + \gamma_{fk} + \gamma_t \right] \times \epsilon_{fkt} \quad (1)$$

where y_{fkt} is the value of firm f trade flow (exports or imports) of product k with Russia in time t . Time is defined at the year-quarter level (e.g., 2022q1). In line with Figure 2, Equation (1) captures the three alternative treatments a trade relationship can experience after the Russian invasion of Ukraine. First, $OnlySuspension_{fk}$ is an indicator variable that turns one if the trade flow involves a product unaffected by sanctions, which is traded by a firm that voluntarily suspends activities in Russia after the invasion of Ukraine. $Post_{ft}$ turns 1 if the trade flow occurs in the year-quarter when firm f announces the suspension of activities in Russia or later.¹⁴ Second, $SanctionAndSuspension_{fk}$ is an indicator variable that turns one if the trade flow involves a product affected by sanctions, which is traded by a firm that voluntarily suspends activities in Russia after the invasion of Ukraine. $Post_{fkt}$ turns 1 if the trade flow occurs in the year-quarter when the firm announces the suspension of activities in Russia and the sanction is imposed, or later. Third, $OnlySanction_{fk}$ is an indicator variable that turns one if the trade flow involves a product affected by sanctions, which is traded by a firm that does not voluntarily suspend activities in Russia after the invasion of Ukraine. $Post_{kt}$ turns 1 if the trade flow occurs in the year-quarter when the sanction is imposed or later. Trade flows that do not experience any treatment, denoted as No sanctions and no suspension in Figure 2, constitute the excluded category.

Equation (1) includes two fixed effects. γ_{fk} is a firm \times product fixed effect that absorbs all time-invariant factors that can affect firm f exports or imports of product k from Russia. Since this fixed effect includes the product dimension, it absorbs the impact of the trade sanctions that the EU imposed against Russia and the counter-sanctions that Russia introduced against the EU after the annexation of Crimea in 2014, and which remained in force during our analysis period. γ_t is a time fixed effect, which captures all time-variant factors, such as the Covid-19 pandemic, the euro-ruble exchange rate, or Russia's GDP, that affect trade flows between Spain and Russia. ϵ_{fkt} is the disturbance term.

¹⁴We obtain this date from the Russia-Leave list.

Equation (1) uses a difference-in-differences strategy to identify the effect of each treatment on Spanish firms' exports to Russia. α captures whether the difference in exports of unsanctioned product k between a firm that voluntarily suspended activities in Russia and another that did not (first difference) changed between the post-invasion and the pre-invasion period (second difference). β captures whether the difference between exports of sanctioned product k from firm f that voluntarily suspended activities and unsanctioned product k' from firm f' that did not voluntarily suspend activities (first difference) changed between the post-invasion and the pre-invasion period (second difference). δ captures whether the difference between exports of sanctioned product k and unsanctioned product k' by a firm that did not voluntarily suspend activities in Russia (first difference) changed between the post-invasion and the pre-invasion period (second difference). The interpretation of these coefficients is similar if the analyzed trade flow is imports.

A potential concern with the Only Sanction $_{fk}$ coefficient is that it is estimated analyzing only the trade flows of firms that did not voluntarily suspend activities in Russia after the invasion of Ukraine. It can be argued that this coefficient may not properly capture the effect that sanctions would have had on firms that voluntarily suspended activities had this choice not been available to firms. For example, while a firm that did not voluntarily suspend activities could use schemes to make the identification of sanctioned products more difficult to customs authorities, a firm that voluntarily suspended activities would have been more diligent in complying with sanctions. In this scenario, the Only Sanction $_{fk}$ coefficient would underestimate the negative effect of sanctions on trade. To address this concern, in the robustness subsection, we explore whether the impact of sanctions was similar on suspension and non-suspension firms in an episode in which firms did not voluntarily suspend activities in Russia: the Annexation of Crimea in 2014. We show that the impact of sanctions on trade was similar in both types of firms.

The difference-in-differences methodology is based on the assumption that the control group provides a good approximation of what would have occurred to the treated group if the EU had not imposed sanctions on Russia and firms had not voluntarily suspended activities in Russia. This assumption seems reasonable if the treated and control groups followed similar trends before the invasion. Panels A and B of Figure 2 suggest that the treated and control groups followed similar trends before the Russian invasion of Ukraine. Furthermore, as explained later, the quarterly pre-invasion coefficients confirm the parallel trends' assumption.

Equation (1) allows us to estimate the *average* effect of a trade sanction, a firm's decision to suspend activities in Russia, or the combination of these treatments on trade. To explore whether the impact of these treatments changes over the period in which they

are in force, we estimate a specification that includes interaction terms for each quarter included in the sample period (2019q1-2023q4):

$$y_{fkt} = \exp\left[\sum_t \alpha_t(\text{OnlySuspension}_{fk} \times D_t) + \sum_t \beta_t(\text{SanctionAndSuspension}_{fk} \times D_t) + \sum_t \delta_t(\text{OnlySanction}_{fk} \times D_t) + \gamma_{fk} + \gamma_t\right] \times \epsilon_{fkt} \quad (2)$$

where D_t is an indicator variable that turns one if the analyzed year-quarter is t . We select 2021q4, the quarter just before the Russian invasion of Ukraine, as the excluded category.

Since we use high-frequency trade data, there are many observations in which the value of the trade flow is zero. Furthermore, due to firms' voluntary or involuntary decisions to suspend operations in Russia after the invasion, the number of zero trade flows increases in the last year-quarters of our data set. To incorporate zero-valued trade flows into our empirical analysis, we estimate Equations (1) and (2) using a Poisson pseudo-maximum likelihood estimator (Santos-Silva and Tenreyro, 2010).¹⁵ We cluster standard errors at the firm and product level.

3.2 Econometric Results

Table 1 reports the results of the econometric analysis on the impact of EU sanctions and the voluntary suspension of firms' activities on Spanish trade with Russia. Columns 1 and 2 report the estimates when the dependent variable is the value of exports and imports, respectively. Columns 3 and 4, denoted as entry, report the estimates of the probability of starting to export and import from Russia, respectively. Finally, columns 5 and 6, denoted as exit, report the estimates of the probability of stopping exporting and importing from Russia, respectively.

Column 1 of Table 1 shows that the $\text{OnlySanction}_{fk} \times \text{Post}_{kt}$ coefficient (Only Sanction for short) is negative and statistically significant, indicating that trade sanctions had a negative effect on Spanish firm-level exports to Russia after the invasion of Ukraine. Specifically, exports of products affected by sanctions decreased by 57% $[(1-\exp(-0.852))]$ relative to products unaffected by sanctions after the invasion of Ukraine.¹⁶ As expected,

¹⁵We use Stata's `ppmlhdfc` command (Correia et al., 2020).

¹⁶Sanctions were introduced at different moments throughout the post-invasion period. Therefore, the Only Sanction coefficient is an average of the effect of sanctions in each quarter, with weights based on the share of sanctions in each quarter (Goodman-Bacon, 2021; Athey and Imbens, 2022). To address the staggered imposition of sanctions, as shown below, we estimate quarter-specific sanction coefficients (Figure 3) and sanction-specific coefficients (Table 3).

Table 1: Impact of sanctions and voluntary suspension on Spanish firms' trade with Russia

| | Value | | Entry | | Exit | |
|--|--------------------------------|--------------------------------|--------------------------------|--------------------------------|-------------------------------|-------------------------------|
| | (1) Exports | (2) Imports | (3) Exports | (4) Imports | (5) Exports | (6) Imports |
| Only Sanction $_{fk} \times \text{Post}_{kt}$ | -0.852 ^b (0.338) | -1.727 ^a (0.562) | -0.045 ^a (0.007) | -0.036 ^a (0.013) | 0.209 ^a (0.030) | 0.170 ^a (0.044) |
| Only Suspension $_{fk} \times \text{Post}_{ft}$ | -3.942 ^a (0.532) | -2.937 ^a (0.197) | -0.120 ^a (0.017) | -0.014 (0.019) | 0.458 ^a (0.047) | 0.202 ^b (0.088) |
| Sanction and Suspension $_{fk} \times \text{Post}_{fkt}$ | -4.278 ^a (0.792) | -7.467 ^a (1.105) | -0.075 ^a (0.017) | -0.058 ^a (0.021) | 0.448 ^a (0.067) | 0.453 ^a (0.060) |
| Observations | 233700 | 41260 | 174170 | 32749 | 42958 | 5424 |
| Pseudo-R2 | 0.747 | 0.864 | | | | |
| Adjusted R2 | | | 0.081 | 0.042 | 0.323 | 0.259 |

Note: In columns 1 and 2 the dependent variable is the value of exports and imports, respectively. In column 3 (4) the dependent variable turns one if firm f did not export (import) product k at time $t - 1$ and exported (imported) product k at time t . In column 5 (6) the dependent variable turns one if firm f exported (imported) product k at time $t - 1$ and did not export (import) product k at time t . All estimations include firm \times product and time fixed effects. Standard errors clustered at the firm and product level are in parentheses. a, b, and c: statistically significant at 1%, 5%, and 10%, respectively.

the Only Suspension $_{fk} \times \text{Post}_{ft}$ coefficient (Only Suspension for short) is also negative and statistically significant, indicating that a firm's voluntary decision to suspend activities in Russia led to a reduction in exports of unsanctioned products to this country after the invasion of Ukraine. According to our estimation, exports from a firm that voluntarily suspended activities in Russia decreased by 98% [$1 - \exp(-3.942)$] compared to firms that did not voluntarily suspend activities in Russia after the invasion of Ukraine.¹⁷ Finally, the Sanction and Suspension $_{fk} \times \text{Post}_{fkt}$ coefficient (Sanction and Suspension for short) is also negative and statistically significant. A test on the equality of coefficients does not reject the hypothesis that the Only Suspension coefficient is equal to the Sanction and Suspension coefficient. This result indicates that the effect of suspending activities had similar effects on sanctioned and unsanctioned products.

Column 2 of Table 1 presents the estimates when the value of imports is the dependent variable. The Only Sanction coefficient is negative and statistically significant, indicating that EU sanctions decreased Spanish imports from Russia after the invasion of Ukraine. Specifically, imports of products affected by sanctions decreased by 82% [$1 - \exp(-1.727)$] compared to unsanctioned products after the invasion of Ukraine. The Only

¹⁷Why the suspension of activities does not lead to a 100% reduction in exports? First, the decision to suspend activities may occur in the middle of a quarter. Therefore, firms may export in a quarter despite taking the decision to suspend activities in that quarter. Second, some firms might have needed some time to end their activities in Russia. For example, due to obligations related to contracts signed before the invasion, firms had to supply their Russian customers after the invasion. Therefore, we can observe export operations by firms that suspended activities in later stages of the invasion period.

Suspension coefficient is negative and statistically significant, indicating that firms that voluntarily suspended activities in Russia reduced imports of unsanctioned products from that country after the invasion of Ukraine. Specifically, imports from firms that voluntarily suspended activities in Russia decreased by 95% [$1 - \exp(-2.937)$] compared to other importers of unsanctioned products after the invasion of Ukraine. The point estimate for Sanction and Suspension is higher than the one for Only Sanction.¹⁸ Specifically, firms that voluntarily suspended activities and imported sanctioned products decreased their imports compared to firms that did not voluntarily suspend activities and imported unsanctioned products by 100%. In any case, sanctions only increase by 5 percentage points the negative effect of suspension on imports.

In columns 3 to 6 we analyze whether EU sanctions against Russia and firms' voluntary decision to suspend activities in that country had an impact on the Spanish firms' entry or exit from the Russian market. We use an equation similar to (1), where now the dependent variable is an indicator variable that turns one if a firm begins exporting a product to Russia (entry) or if a firm stops exporting to Russia (exit). We define that a firm begins to export to Russia if it does not export product k at time $t - 1$ and exports product k at time t . We define that a firm stops exporting to Russia if it exports product k at time $t - 1$ and does not export product k at time t . The same definitions apply to imports. We estimate a linear probability model.

Column 3 of Table 1 shows that sanctions reduced the probability of starting exporting to Russia by 4.5 percentage points after the invasion of Ukraine. Voluntary suspension of activities decreased the probability of starting to export by 12 percentage points. Paradoxically, the reduction in the probability of entering the Russian market by firms that voluntarily suspended activities and exported sanctioned products was smaller than for firms that voluntarily suspended activities and exported unsanctioned products. Sanctions reduced the probability of starting to import from Russia by 3.6 percentage points (column 4). The voluntary decision of firms to suspend activities had no significant effect on the probability of starting importing from Russia. In contrast, sanctions, combined with the voluntary decision to suspend activities in Russia, reduced the probability of starting importing from Russia by 5.8 percentage points.

Sanctions increased the probability of stopping exporting to Russia by 20.9 percentage points, while voluntary suspension of activities increased the probability of exit by 45.8 percentage points (column 5). The combined effect of sanctions and suspension is similar to that of Only Suspension. Sanctions increased the probability of stopping imports from Russia by 17 percentage points. Only Suspension increased the probability of stopping imports from Russia by 20.2 percentage points. The combined effect of sanctions and suspension raises the probability of stopping imports from Russia to 45.3 percentage points.

¹⁸The hypothesis on the equality of coefficients is rejected at the 1% significance level.

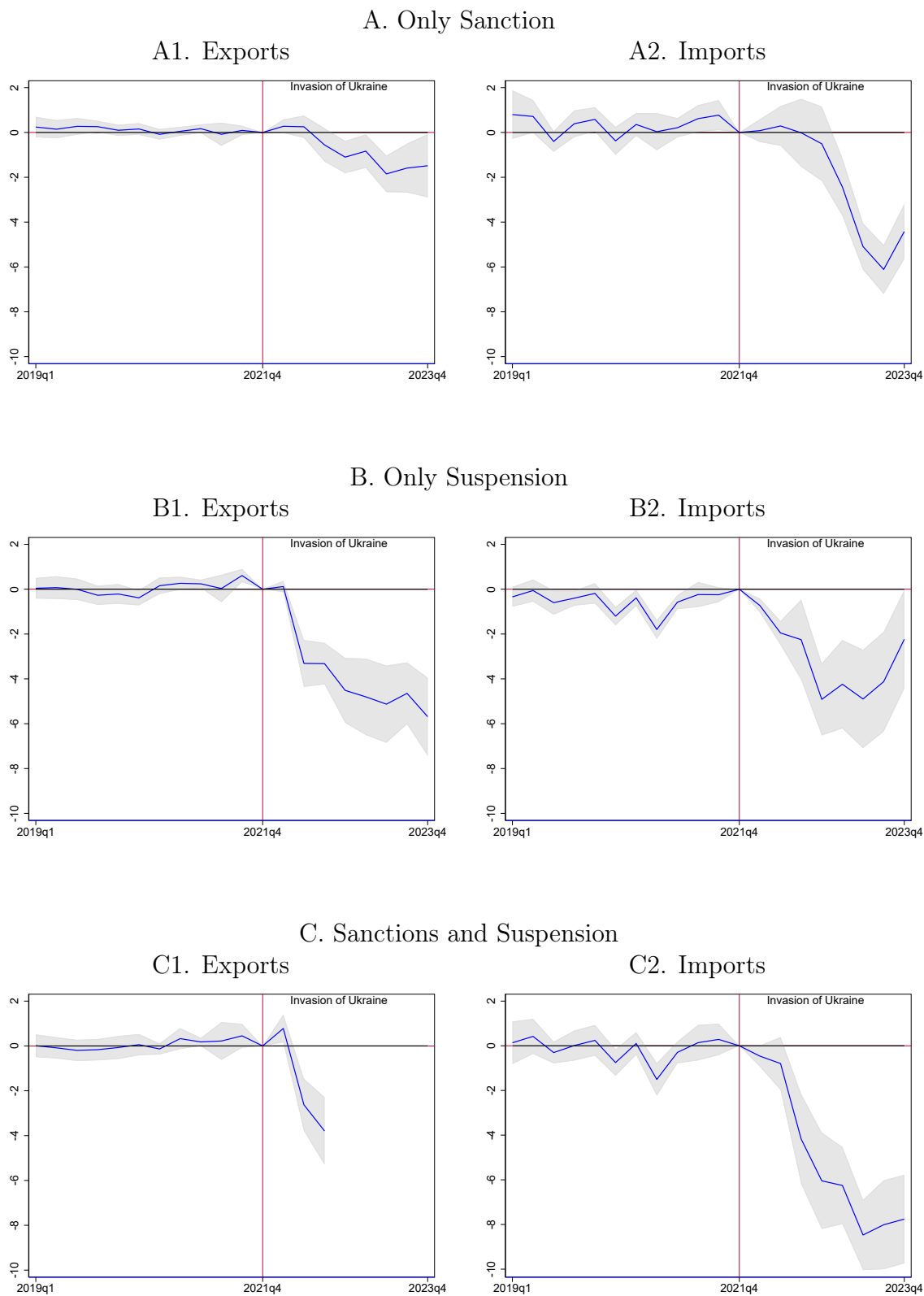
In summary, we find that sanctions and voluntary suspension of activities had a strong negative effect on Spanish firms' trade with Russia after the invasion of Ukraine. Regarding exports, the impact of voluntary suspension of activities on the reduction of trade was not augmented by the existence of sanctions. However, with respect to imports, import bans augmented, although barely, the detrimental effect that the voluntary suspension of activities had on trade.

Panels A, B, and C of Figure 3 show the evolution of the quarterly Only Sanction, Only Suspension, and Sanction and Suspension coefficients estimated with Equation (2) for the value of Spanish exports and imports, respectively. In addition to the point estimate, we draw the 90% confidence interval for each coefficient. The reference quarter is 2021q4. Analyses for entry and exit are reported in Figures A.1 and A.2 in the appendix. We observe no pretrend in the pre-invasion quarterly coefficients in any panel, which validates the difference-in-differences identification strategy followed in our study. In line with the estimates reported in columns 1 and 2 of Table 1, in all panels, the quarterly coefficients become negative after the invasion of Ukraine. Furthermore, the quarterly coefficients become more negative as we progress in the post-invasion period, except for the last quarters.¹⁹

We use the coefficients reported in columns 1 and 2 of Table 1, and the set of non-reported fixed effects, to quantify the contribution of sanctions and voluntary suspension of activities to the decrease in trade with Russia after the invasion of Ukraine. These calculations are presented in Table 2. We predict the average amount of quarterly exports in the post-invasion period if the EU had not imposed product-specific sanctions and firms had not voluntarily suspended activities in Russia (Scenario (1): No sanction and no suspension): 332 million euros. It is worth noting that this figure already captures the effect that non-trade sanctions (e.g., financial sanctions), the deterioration of the economic environment in Russia, and the higher risk of operating with Russia had on Spanish exports to Russia after the invasion of Ukraine. Then, we predict the quarterly exports in the post-invasion period if the EU had imposed trade sanctions but firms did not voluntarily suspend activities. For this calculation, the Only Suspension coefficient turns zero and the Sanction and Substitution coefficient takes the value of the Only Sanction coefficient estimated in column 1 of Table 1. The value of exports in the Only sanction scenario decreases to 297 million euros. We calculate the difference between the prediction for the No sanction and no suspension scenario and the one for the Only sanction scenario: 332 million euros-297 million euros=35 million euros. Dividing the latter figure by the prediction for the No sanction and no suspension scenario, we see that sanctions reduced the predicted post-invasion No sanction and no suspension exports by 11% (35/332; col-

¹⁹Note that in Panel C1 we cannot estimate the Sanction and Suspension coefficients from 2022q4 onward because there were no exports in this category.

Figure 3: Quarterly coefficients on the impact of sanctions and the suspension of activities on Spanish exports and imports from Russia, 2019q1-2023q4



Note: The figures report the point estimate and the 90% confidence interval of the quarter coefficients estimated in Equation (2). The excluded category is 2021q4.

Table 2: Contribution of sanctions and voluntary suspension to the decrease in the Spanish trade with Russia after the invasion of Ukraine (average quarterly; million euros)

| A. Exports | | | |
|-----------------------------------|---------------|---|------------------------------------|
| Scenario | Post-invasion | Difference to No sanction and no suspension | % of No sanction and no suspension |
| (1) No sanction or suspension | 332 | | |
| (2) Only sanction | 297 | 35 | 11 |
| (3) Sanction and suspension | 234 | 98 | 30 |
| B. Imports | | | |
| Scenario | Post-invasion | Difference to No sanction and no suspension | % of No sanction and no suspension |
| (1) No sanction and no suspension | 1,768 | | |
| (2) Only sanction | 1,196 | 572 | 32 |
| (3) Sanction and suspension | 826 | 942 | 53 |

Source: We use Equation (1) as estimated in columns 1 and 2 of Table 1 to predict the value of quarterly exports (imports) in three different scenarios: (1) No sanctions and no suspension [benchmark]; (2) Only sanction; and (3) Sanction and suspension.

umn 4). Next, we predict the value of exports when sanctions are imposed and firms voluntarily suspend activities in Russia. In this new scenario, denoted Sanctions and suspension, the value of exports decreases to 234 million euros. Applying the procedure described above, we find that sanctions and suspension reduced benchmark exports by 30% ($98/332$). If we subtract the impact of sanctions from this latter percentage, we find that the voluntary suspension of activities contributed by 19 percentage points to the reduction of exports. That is, the combination of trade sanctions and the voluntary suspension of activities generated a negative effect on exports which was almost three times larger than that achieved only by trade sanctions.

Panel B of Table 2 shows that if the EU had not imposed any product-specific sanctions and firms had not voluntarily suspended activities in Russia after the invasion (No sanction and no suspension scenario), the predicted value of quarterly imports would have been 1,768 million euros. In the Only sanction scenario, quarterly exports would have decreased to 1,196 million euros. Therefore, sanctions would have reduced the amount of imports by 572 million euros, which represents a 32% decrease relative to the benchmark import value ($572/1,768$). If sanctions had been imposed and firms had voluntarily suspended activities, imports would have decreased to 826 million (Sanction and suspension scenario). Therefore, sanctions and voluntary suspension of activities would have reduced the amount of imports in 942 million euros, which represents a 53% decrease relative to the benchmark scenario ($942/1,768$). If we subtract the impact of sanctions from this latter percentage, we find that the voluntary suspension of activities contributed by 21

percentage points to the reduction of imports. That is, the combination of trade sanctions and the voluntary suspension of activities generated a negative effect on imports which was almost 65% larger than that achieved only by trade sanctions.

Finally, we analyze the impact of each sanction category on the Spanish trade with Russia. We substitute the Only Sanction $_{fk}$ variable in Equation 1 by a set of variables which includes all categories of export and import sanctions (see Table A.1 in the appendix). Columns 1 to 3 of Table 3 report the results of export-related sanctions and columns 4 to 6 the import-related ones. The regressions also include the Only Suspension, and the Sanction and Suspension variables, although their coefficients are not reported in the table. The coefficients for maritime and military products, and for goods that can enhance Russia’s industrial capacity are negative and statistically significant in column 1. Exports of maritime and military goods almost disappeared after the invasion, while they decreased by 82% for industrial goods [$1-\exp(-1.723)$].²⁰ Sanctions did not have a significant effect on Spanish exports of luxury goods and oil refining equipment. In the case of luxury goods, the export ban was only imposed if a unit price threshold was exceeded, so sanctions became not binding for many products. In the case of oil refining, some varieties within a sanctioned 8-digit product line could be exempted from sanctions. This could explain the statistically insignificant coefficient estimated for this sanction category. Surprisingly, we find that despite sanctions, exports of aviation and dual-use goods increased after the invasion. With regard to aviation, the unexpected result is explained by the delivery of a helicopter in the first quarter of 2022, which was shipped before the invasion of Ukraine.²¹ In the case of dual-use goods, exports after the invasion of Ukraine were concentrated in two products: polyethers and iron and steel tubes and pipes. It is likely that the EU did not restrict the exports of these products because it considered that the varieties shipped from Spain could not be used in the Russian military industry.

Sanctions on industrial and military goods had a significant negative effect on the probability of entering the Russian market. Sanctions had no significant effect on the probability of starting to export aviation, luxury, maritime, and oil refining goods. Paradoxically, sanctions on dual-use goods increased the probability of entering the Russian market after the invasion of Ukraine. Sanctions significantly increased the probability of stopping exporting aviation, industrial, maritime, military, and oil refining goods to Russia after the invasion of Ukraine and significantly reduced the probability for dual use goods.

²⁰There are two sanction categories, jet fuel and firearms, whose coefficient could not be estimated, because there were no exports of these goods after the invasion. In any case, we can conclude that sanctions on jet fuel and firearms were fully effective, as they eliminated exports of these products.

²¹We confirm this fact analyzing the product-level monthly data from AEAT-Customs, available at <https://sede.agenciatributaria.gob.es/Sede/estadisticas/estadisticas-comercio-exterior.html>.

Table 3: Impact of export-related and import-related sanctions on Spanish firms trade with Russia

| | Exports | | | Imports | | |
|--|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|-------------------------------|
| | (1) Value | (2) Entry | (3) Exit | (4) Value | (5) Entry | (6) Exit |
| Dual use _k × Post _{tk} | 1.455 ^a (0.561) | 0.190 ^a (0.032) | -0.123 ^a (0.041) | | | |
| Oil refining _k × Post _{tk} | -0.803 (0.744) | -0.001 (0.014) | 0.112 ^c (0.065) | | | |
| Aviation _k × Post _{tk} | 0.877 ^a (0.168) | 0.005 (0.033) | 0.232 ^a (0.034) | | | |
| Military _k × Post _{tk} | -6.041 ^a (0.656) | -0.017 ^c (0.010) | 0.289 ^a (0.062) | | | |
| Maritime _k × Post _{tk} | -2.834 ^a (0.714) | 0.021 (0.036) | 0.150 ^a (0.027) | | | |
| Luxury _k × Post _{tk} | 0.297 (0.201) | -0.017 (0.013) | -0.001 (0.053) | | | |
| Industrial _k × Post _{tk} | -1.723 ^a (0.282) | -0.059 ^a (0.007) | 0.312 ^a (0.024) | | | |
| Russia's export ban _k × Post _t | | | | -2.096 ^a (0.568) | 0.005 (0.030) | 0.242 ^b (0.109) |
| Coal _k × Post _{tk} | | | | -0.582 ^c (0.345) | -0.127 ^b (0.050) | 0.033 (0.067) |
| Crude oil _k × Post _{tk} | | | | -3.558 ^a (0.698) | -0.069 ^a (0.025) | 0.358 ^a (0.064) |
| Jewelry _k × Post _{tk} | | | | -0.060 (0.296) | 0.110 ^a (0.009) | |
| Revenue _k × Post _{tk} | | | | -1.997 ^a (0.330) | -0.046 ^a (0.011) | 0.212 ^a (0.052) |
| Steel _k × Post _{tk} | | | | -5.375 ^a (0.876) | -0.053 ^a (0.017) | 0.721 ^a (0.062) |
| Observations | 221609 | 163050 | 42404 | 39814 | 31677 | 5298 |
| Pseudo-R2 | 0.748 | | | 0.870 | | |
| Adjusted R2 | | 0.088 | 0.314 | | 0.046 | 0.259 |

Note: In columns 1 and 4 the dependent variable is the value of exports and imports, respectively. In column 2 (5) the dependent variable turns one if firm f did not export (import) product k at time $t - 1$ and exported (imported) product k at time t . In column 3 (6) the dependent variable turns one if firm f exported (imported) product k at time $t - 1$ and did not export (import) product k at time t . All estimations include the Only Suspension and the Sanction and Suspension variables, and firm × product and time fixed effects. Standard errors clustered at the firm and product level are in parentheses. a, b, and c: statistically significant at 1%, 5%, and 10%, respectively.

Sanctions had a significant negative effect on the import of crude oil and petroleum products (crude oil, for short), the main product imported by Spain from Russia before the invasion of Ukraine. In fact, crude oil imports were zero since the second quarter of 2023, when the import ban was fully implemented.²² There was also a significant decrease in imports of coal, goods that generated significant revenue for Russia (e.g., caviar) and steel. Russia’s export ban also had a negative impact on imports. Sanctions had no significant impact on jewelry import.²³ Sanctions had a significant negative effect on import entry for all affected products, except jewelry and products affected by a Russian export ban. Sanctions increased the probability of stopping imports of crude oil, products which generate significant revenues for Russia, and steel. Russia’s export ban also significantly increased the probability of stopping importing from Russia. Sanctions had no effect on the probability of stopping the import of coal.²⁴

3.3 Robustness

This subsection tests the robustness of our estimates. First, we have assumed that all firms not included in the Yale-CELI and Leave-Russia lists did not voluntarily suspend activities in Russia. We tested the robustness of our results to removing these firms from the sample and keeping only the multinationals that are included in the Yale-CELI and Leave-Russia lists. The limitation of the new sample is that the number of observations is severely reduced, especially in the case of imports. Table A.4 in the appendix reports the results. We find that Only Sanction has no effect on the value of exports. This unexpected result can be explained by the fact that most of the sanctioned products exported by firms that decided to stay in Russia were luxury goods. As explained above, the export ban on luxury goods was only imposed if a unit price threshold was exceeded, so sanctions became not binding for many products. The Only Suspension coefficient is negative and statistically significant, and its point estimate is similar to that of Sanction and Suspension. The point estimates of these two latter coefficients are quantitatively and qualitatively similar to those reported in the baseline analysis (Table 1).

Regarding imports, the Only Sanction coefficient is negative but statistically insignificant. The large standard error of this coefficient appears to be related to the small sample of firms that decided to stay in Russia and imported sanctioned products before the invasion. The Only suspension and the Sanction and Suspension coefficients are negative and statistically significant. Their point estimates are lower than those reported

²²The ban on crude oil imports entered into force on December 5, 2022, and the ban on petroleum products on February 5, 2023.

²³Our dataset only records two jewelry import operations, one before the invasion and another after the invasion. In both operations, the imported value was very small. Gold is excluded because no firm in our sample imported gold from Russia during the post-invasion period.

²⁴The coefficient for jewelry could not be estimated.

in the baseline analysis. Only Sanction, Only Suspension, and Sanction and Suspension have a negative effect on export entry, but no effect on import entry. Finally, we find that Only suspension and Sanction and Suspension increase the probability of stopping exporting to Russia after the invasion of Ukraine. Paradoxically, Only sanction reduces the probability of stopping importing from Russia. Only suspension has no effect, and Sanction and Suspension has a significant positive effect.

Second, the baseline estimation assumes that the decrease in trade in sanctioned products after the invasion of Ukraine is only explained by sanctions. Similarly, it assumes that the decrease in trade from firms that voluntarily suspended activities in Russia was fully explained by that decision. However, if the invasion of Ukraine coincided with a global decrease in demand for sanctioned products or with poor performance from firms that voluntarily decided to suspend activities in Russia, the Only Sanction, the Only Suspension, and the Sanction and Suspension coefficients would also capture these effects. To rule out this possibility, we enlarge our sample with a control set of countries and estimate a triple-difference regression:

$$\begin{aligned}
y_{fkd,t} = & \exp[(\alpha(\text{OnlySuspension}_{fk} \times \text{Post}_{ft} \times \text{Russia}_d) + \\
& \beta(\text{SanctionsAndSuspension}_{fk} \times \text{Post}_{fkt} \times \text{Russia}_d) \\
& \delta(\text{OnlySanction}_{fk} \times \text{Post}_{kt} \times \text{Russia}_d) + \gamma_{fkt} + \gamma_{fkd})] * \epsilon_{fkd,t}
\end{aligned} \tag{3}$$

Now, the dependent variable, $y_{fkd,t}$, is the value of exports of product k from firm f to destination d at time t . The interaction terms include a new indicator variable, Russia_d , which takes the value of one if exports are destined to Russia. The new equation includes two new fixed effects. γ_{fkt} captures all the effects that affect the value of exports of a given product, by a given firm, at a particular time. γ_{fkd} captures all the time-invariant factors that affect exports of a particular product by a given firm in a given market. $\epsilon_{fkd,t}$ is the disturbance term. A similar interpretation applies to imports.

The α coefficient now captures a triple difference. The first compares the exports of unsanctioned product k to Russia from a firm that voluntarily decided to suspend its activities in Russia and the exports of product k from a firm that did not. The second compares the value of exports for the same firms and product but to a control destination. The third compares the difference between the previous two comparisons before and after the invasion of Ukraine. The same interpretation applies to imports. Regarding the β coefficient, the first difference compares the exports of sanctioned product k to Russia from a firm that voluntarily decided to suspend its activities in Russia and the exports of unsanctioned product k' from a firm that did not voluntarily suspend activities. The second compares the value of exports for the same firms and products but to a control

destination. The third compares the difference between the previous two comparisons before and after the invasion of Ukraine. The same interpretation applies to imports. Finally, regarding δ , the first difference compares the exports of a firm that did not voluntarily suspend activities of a sanctioned product and an unsanctioned product to Russia. The second compares the exports of the same firm and products to a control country. The third compares the difference between the previous two comparisons before and after the invasion of Ukraine. Note that the estimation of these coefficients is more demanding than that in the baseline estimation, since it requires a firm to export the same product(s) to more than one destination at two different moments.

Since a very large number of zero-valued observations compromises our computational capacity, we collapse Spanish firms' trade with all non-Russian countries into a rest-of-the-world partner. Table A.5 in the appendix presents the results. Only Sanction, Only Suspension, and Sanction and Suspension have a large negative impact on the value of exports and imports after the invasion of Ukraine. Note that now the combined impact of Sanction and Suspension on exports is larger than that of Only Suspension (column 1). Comparing the point estimates reported in columns 1 and 2 with those reported in the same columns of the baseline table (Table 1), we observe an increase in the (absolute) value for all coefficients. Only Suspension has no longer a significant effect on the probability of starting to export to Russia. The remaining entry and exit coefficients are qualitatively similar to those reported in Table 1.

Third, we explore whether the Only Sanction coefficient underestimates the impact that sanctions would have had on firms that voluntarily suspended activities had this option not been available to firms. To address this concern, we estimate the impact of sanctions in an episode in which Spanish firms did not voluntarily suspend activities: the Annexation of Crimea. In July 2014 the EU imposed export restrictions to Russia on dual-use goods and technologies intended for military use, prior authorization for the export of technologies related to oil exploration and production, and an export and import ban of items included in the EU common military list. In August 2014, Russia took retaliatory measures, banning the import of some EU food products. We built a sample including firms that exported to Russia before the Annexation of Crimea and before the invasion of Ukraine: 41 out of 45 firms that voluntarily suspended activities after the invasion of Ukraine also exported to Russia before the Annexation of Crimea, and 1,923 out of 2,737 firms that did not voluntarily suspend activities before the invasion of Ukraine also exported to Russia before the Annexation of Crimea. Firms that voluntarily suspended activities after the invasion of Ukraine were only affected by sanctions in the export of dual-use goods and technologies after the Annexation of Crimea. To test whether the impact of these sanctions was similar on voluntary suspension and non-suspension firms,

we estimate the following regression:

$$y_{fkt} = \exp[\beta_1(DualUse_k \times Post_t) + \beta_2(DualUse_k \times Post_t \times Suspension_f) + \beta_3(DualUse_k \times Suspension_f) + \beta_4(Post_t \times Suspension_f) + \gamma_k + \gamma_t + \gamma_f] * \epsilon_{ktf} \quad (4)$$

where y_{fkt} is Spanish firm f product k exports to Russia in year-quarter t . $DualUse_k$ is an indicator variable that takes the value of one if product k was included in the list of dual-use goods and technologies. $Post_t$ is an indicator variable that takes the value of one if the year quarter is 2014q3 or later. $Suspension_f$ is an indicator variable that takes the value of one if firm f voluntarily suspended activities after the invasion of Ukraine.

Our key coefficients are β_1 and β_2 . The first captures the impact of sanctions on dual-use goods exports to Russia after the Annexation of Crimea from firms that did not voluntarily suspend activities after the invasion of Ukraine. β_2 captures whether the impact of sanctions on exports from firms that voluntarily suspended activities was significantly different from those that did not. The remaining double interactions, β_3 and β_4 , absorb the impact on exports generated by differences in the dual-use goods exported by suspension and non-suspension firms and in the overall export performance after the Annexation of Crimea between suspension and non-suspension firms, respectively. Our sample covers the 2012q1-2016q4 period. We excluded from the sample the products that were not included in the dual-use list and which were affected by the EU arms embargo, or restrictions on oil refining goods, or Russia's retaliation.

Table A.6 in the appendix presents the estimates. Sanctions on dual-use goods had an insignificant effect on exports from firms that did not suspend activities after the invasion of Ukraine. The effect of sanctions on dual-use goods exports was also insignificant for firms that voluntarily suspended activities after the invasion of Ukraine.²⁵ Therefore, we conclude that the impact of sanctions was similar on both suspension and non-suspension firms. We find no differences in the impact of sanctions on export entry and exit between non-suspension and suspension firms. These results suggest that the Only Sanction coefficient reported in the baseline analysis provides a good estimation on the impact of sanctions on firms that voluntarily suspended activities had this option not been available for firms.

4 Did firms reroute trade with Russia via neighboring countries?

This section examines the phenomenon of trade rerouting, that is, whether firms used third countries close to Russia to circumvent sanctions or alleged voluntary suspension

²⁵Our estimates are in line with Kohl et al. (2023), who also found that sanctions on dual-use goods had no significant effect on Dutch exports to Russia after the Annexation of Crimea.

of activities and carried on trading with Russia. Using product-level data, [Chupilkin et al. \(2023\)](#) observed a simultaneous drop in exports of sanctioned products from the EU to Russia and an increase in exports of sanctioned goods to Armenia, Kazakhstan, and the Kyrgyz Republic (CCA3). These three countries are members of the Eurasian Customs Union alongside Belarus and Russia. Therefore, exports and imports from these economies could potentially be shipped from Russia with minimum checks. We investigate whether Spanish firms increased trade flows in sanctioned products, compared to unsanctioned ones, with CCA3 after the invasion of Ukraine. We also explore whether firms that voluntarily suspended activities in Russia increased trade flows with CCA3, compared to firms that did not voluntarily suspend activities in Russia, after the invasion of Ukraine.

We estimate Equation (1), substituting Spanish firms' trade flows with Russia by those with CCA3. It is important to note that the sample only includes Spanish firms that traded with Russia between 2019q1 and 2023q4. Panel A of Table 4 presents the results for CCA3. The Only Sanction coefficient in column 1 is positive and statistically significant, indicating that Spanish firms that did not voluntarily suspend activities in Russia increased their exports of sanctioned products, compared to unsanctioned products, to CCA3 after the invasion of Ukraine. Specifically, exports of sanctioned products to CCA3 multiplied by almost two [$\exp(0.684)-1$]. This result is consistent with the conjecture that Spanish exporters used CCA3 to circumvent EU sanctions against Russia. The increase in 149 million euros in the exports of sanctioned products to CCA3 after the invasion of Ukraine covered 43% of the decrease in the exports of these products to Russia by firms that did not voluntarily suspend activities.²⁶ This percentage is much higher than the 5% fraction estimated by [Chupilkin et al. \(2023\)](#) using product-level data.

The Only suspension coefficient in column 1 of Table 4 is positive, but statistically insignificant. It indicates that Spanish firms that voluntarily suspended their activities in Russia and exported unsanctioned products did not significantly increase their exports to CCA3 after the invasion of Ukraine. Firms that voluntarily suspended activities in Russia and exported sanctioned products insignificantly reduced their exports to CCA3. This result is also inconsistent with rerouting.

The Only Sanction coefficient for the value of imports is positive and statistically significant. According to this coefficient, imports of sanctioned products by firms that did not voluntarily suspend activities from CCA3 multiplied by four relative to unsanctioned products after the invasion of Ukraine [$\exp(1.638)-1$]. However, this result does not necessarily imply that Spanish importers rerouted their sanctioned Russian imports through intermediaries. Crude oil was the most important sanctioned product that Spain

²⁶The increase in exports was concentrated in Kazakhstan and products that can improve Russia's industrial capacity.

Table 4: Rerouting trade with Russia

| Panel A (CCA3: Armenia, Kazakhstan and the Kyrgyz Republic) | | | | | | |
|---|-------------------------------|-------------------------------|--------------------------------|--------------------------------|-------------------------------|------------------|
| | Value | | Entry | | Exit | |
| | (1) Exports | (2) Imports | (3) Exports | (4) Imports | (5) Exports | (6) Imports |
| Only Sanction $_{fk} \times \text{Post}_{kt}$ | 0.684 ^b (0.296) | 1.638 ^a (0.497) | 0.019 ^a (0.007) | 0.008 (0.012) | -0.036 (0.035) | 0.029 (0.030) |
| Only Suspension $_{fk} \times \text{Post}_{ft}$ | 0.689 (0.490) | 0.622 ^b (0.315) | -0.002 (0.014) | -0.042 ^a (0.014) | 0.105 ^b (0.050) | 0.012 (0.014) |
| Sanction and Suspension $_{fk} \times \text{Post}_{fkt}$ | -0.434 (0.277) | 1.254 ^b (0.500) | -0.029 ^a (0.009) | -0.031 ^b (0.015) | 0.116 (0.089) | 0.006 (0.008) |
| Observations | 77420 | 2540 | 122475 | 6827 | 27866 | 1048 |
| Pseudo-R2 | 0.726 | 0.939 | | | | |
| Adjusted R2 | | | 0.242 | 0.413 | 0.475 | 0.678 |

| Panel B (CCA3+Azerbaijan+Georgia+Turkey) | | | | | | |
|--|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| | Value | | Entry | | Exit | |
| | (1) Exports | (2) Imports | (3) Exports | (4) Imports | (5) Exports | (6) Imports |
| Only Sanction $_{fk} \times \text{Post}_{kt}$ | 0.173 (0.109) | 0.280 ^c (0.168) | 0.009 ^c (0.006) | 0.021 ^b (0.010) | -0.016 (0.025) | 0.057 ^a (0.018) |
| Only Suspension $_{fk} \times \text{Post}_{ft}$ | 0.184 ^b (0.083) | 0.009 (0.178) | 0.049 ^a (0.017) | 0.015 (0.016) | 0.123 ^b (0.055) | 0.036 (0.046) |
| Sanction and Suspension $_{fk} \times \text{Post}_{fkt}$ | 0.041 (0.279) | 0.215 (0.198) | 0.026 (0.019) | 0.006 (0.017) | 0.230 ^b (0.104) | 0.054 (0.040) |
| Observations | 290660 | 98660 | 317113 | 108793 | 37805 | 3548 |
| Pseudo-R2 | 0.848 | 0.913 | | | | |
| Adjusted R2 | | | 0.384 | 0.448 | 0.639 | 0.703 |

Note: In column 1 and 2 the dependent variable is the value of exports and imports, respectively. In column 3 (4) the dependent variable turns one if firm f did not export (import) product k at time $t - 1$ and exported (imported) product k at time t . In column 5 (6) the dependent variable turns one if firm f exported (imported) product k at time $t - 1$ and did not export (import) product k at time t . All estimations include firm \times product and time fixed effects. Standard errors clustered at the firm and product level are in parentheses. a, b, and c: statistically significant at 1%, 5%, and 10%, respectively.

imported from Russia. After the invasion of Ukraine, Spanish firms replaced Russian oil with Kazakh oil. Hence, the positive Only Suspension coefficient in column 2 could be explained by a diversion of imports rather than rerouting. The same conclusion applies to the positive Sanction and Suspension coefficient. Only Suspension is positive and statistically significant, indicating that firms that voluntarily suspended operations in Russia increased their imports of unsanctioned products from CCA3 after the invasion of Ukraine relative to firms that did not voluntarily suspended activities in Russia. This result is consistent with a reroute argument. However, taking into account the small increase in imports from CCA3 in unsanctioned products (27 million euros), the positive

coefficient may also be related to other reasons.

Export entry into CCA3 increased for firms that did not voluntarily suspend activities in Russia and exported sanctioned products. It did not increase for the remaining categories of firm-products. We find no results consistent with rerouting for import entry, and for export and import exit. In summary, our results indicate that there was substantial rerouting for firms that exported sanctioned products to Russia and did not voluntarily suspend activities in that country. The positive estimates for imports could be explained by trade diversion rather than trade rerouting. These results indicate that the reduction of trade with a target country is less likely to be thwarted by rerouting if it is based on firms' voluntarily suspension decisions than on sanctions.

As a robustness check, Panel B of Table 4 expands the number of potential trade intermediaries with Azerbaijan and Georgia, two former Soviet republics not members of the EU that share a land border with Russia; and Turkey, a neighboring country which did not impose sanctions on Russia and has preferential access to the EU market. For example, [Borin et al. \(2023\)](#) found that Turkey was the most important intermediary for EU exports of sanctioned products to Russia in 2022. Our results show that there was no significant increase in exports to potential intermediaries of sanctioned products after the invasion of Ukraine. However, we find that firms that voluntarily suspended activities in Russia and traded unsanctioned products increased their exports to CCA3plus countries. Specifically, exports from these firms increased by 20% compared to firms that did not voluntarily suspend activities in Russia [$\exp(0.184)-1$]. This surprising result is consistent with rerouting. However, the insignificant Sanction and Suspension coefficient puts a caveat on the reroute argument. The Only Sanction coefficient for imports is positive and statistically significant. The point estimate of this coefficient is much lower (in absolute terms) than the one estimated for CCA3. This result points out that rerouting of imports in CCA3plus countries was much lower than in CCA3 countries. In fact, if we remove the CCA3 countries from the sample, the Only Sanction coefficient is no longer statistically significant. Therefore, the Only Sanction coefficient for imports reported in Panel B of Table 4 is an attenuated result of the potential diversion of crude oil imports discussed above.

Firms that voluntarily suspended activities in Russia and imported unsanctioned or sanctioned products did not significantly change their imports from the countries included in Panel B. There is an increase in the probability of starting to export to neighboring countries after the invasion of Ukraine for firms that exported sanctioned products but did not voluntarily suspend activities in Russia, and for firms that voluntarily suspended activities in Russia and exported unsanctioned products. Finally, we do not find that firms significantly reduced their probability of stopping exporting or importing from CCA3plus countries. This result is inconsistent with a reroute argument. In summary, the analyses

with the enlarged sample confirm that there was only rerouting of exports to circumvent sanctions using CCA3.

5 Conclusion

In the last two decades, there has been an increase in the use of trade sanctions to punish partners' misbehavior. In the same period, due to the expansion of social networks, multinational companies have become more exposed to the rapid and global spread of any criticism of their actions. The Russian invasion of Ukraine in February 2022 is an example in which these trends coincide. First, the invasion of Ukraine led many countries to impose trade sanctions against Russia. Second, many multinational firms, fearing that maintaining their activities in Russia could affect their reputation in the EU, the United States, and other developed countries, voluntarily suspended their activities in Russia after the invasion of Ukraine. The goal of this paper has been to quantify the contribution of these actions to reduce trade with Russia.

Using a representative sample of Spanish firms, we find that sanctions had a strong negative effect on trade with Russia. As expected, the paper also finds that firms that voluntarily suspended activities in Russia reduced their exports and imports from Russia after the invasion of Ukraine. We find that the contribution of voluntary suspension of activities to the reduction of exports to Russia was almost twice that of sanctions. For imports, the contribution of voluntary suspension of activities was two-thirds of the contribution of sanctions.

These findings highlight that the voluntary decision of firms, in most cases motivated by reputational pressure, can be a powerful complement to sanctions in reducing the amount of trade with a target country. The higher economic costs of the conflict in the sanctioned country can increase the probability that it will stop the actions that motivated the dispute. Furthermore, this higher economic pain can discourage other countries from taking actions that can lead to a conflict. It also points out that conflicts can cause firms to voluntarily suspend activities in the country with which the dispute arises, generating economic losses to the sanctioning country that can be larger than those created by sanctions.

References

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

- Athey, S. and Imbens, G. W. (2022). Design-based analysis in Difference-In-Differences settings with staggered adoption. *Journal of Econometrics*, 226(1):62–79.
- Balyuk, T. and Fedyk, A. (2023). Divesting under pressure: U.S. firms’ exit in response to Russia’s war against Ukraine. *Journal of Comparative Economics*, In press.
- Borin, A., Cappadona, G., Conteduca, F. P., Hilgenstock, B., Itskhoki, O., Mancini, M., Mironov, M., and Ribakova, E. (2023). The impact of EU sanctions on Russian imports. *VoxEU.org*, 29 May.
- Bowen, H. R. (2013). *Social responsibilities of the businessman*. University of Iowa Press.
- Chupilkin, M., Javorcik, B., and Plekhanov, A. (2023). The Eurasian Roundabout: Trade Flows Into Russia Through the Caucasus and Central Asia. *EBRD Working Paper No. 276*.
- Correia, S., Guimarães, P., and Zylkin, T. (2020). Fast Poisson estimation with high-dimensional fixed effects. *The Stata Journal*, 20(1):95–115.
- Crozet, M. and Hinz, J. (2020). Friendly fire: the trade impact of the Russia sanctions and counter-sanctions. *Economic Policy*, 35(101):97–146.
- Crozet, M., Hinz, J., Stammann, A., and Wanner, J. (2021). Worth the pain? Firms’ exporting behaviour to countries under sanctions. *European Economic Review*, 134:103683.
- de Lucio, J., Mínguez, R., Minondo, A., and Requena, F. (2018). The variation of export prices across and within firms. *Review of World Economics*, 154(2):327–346.
- Drezner, D. W. (2023). Global economic sanctions. *Annual Review of Political Science*. *Forthcoming*.
- Easley, C. and Lenox, M. J. (2006). Firm responses to secondary stakeholder action. *Strategic Management Journal*, 27(8):765–781.
- Felbermayr, G., Morgan, T. C., Syropoulos, C., and Yotov, Y. V. (2021). Understanding economic sanctions: Interdisciplinary perspectives on theory and evidence. *European Economic Review*, 135:103720.
- Goodman-Bacon, A. (2021). Difference-in-differences with variation in treatment timing. *Journal of Econometrics*, 225(2):254–277.
- Gullstrand, J. (2020). What goes around comes around: The effects of sanctions on Swedish firms in the wake of the Ukraine crisis. *The World Economy*, 43(9):2315–2342.

- Helpman, E., Melitz, M. J., and Yeaple, S. R. (2004). Export versus FDI with heterogeneous firms. *American Economic Review*, 94(1):300–316.
- Klein, M. H. (2024). Economic Sanctions as a Foreign Policy Tool. Conversation with Daniel Drezner. *EconoFact Chats*, 19 May 2024, Available at <https://econofact.org/podcast/economic-sanctions-as-a-foreign-policy-tool>.
- Koenig, P. and Poncet, S. (2022). The effects of the Rana Plaza collapse on the sourcing choices of French importers. *Journal of International Economics*, 137:103576.
- Kohl, T., van den Berg, M., and Franssen, L. (2023). Going Dutch? Firm exports and FDI in the wake of the 2014 EU-Russia sanctions. *Review of International Economics*, In press.
- Korovkin, V. and Makarin, A. (2023). Conflict and Intergroup Trade: Evidence from the 2014 Russia-Ukraine Crisis. *American Economic Review*, 113(1):34–70.
- Meyer, K. E., Fang, T., Panibratov, A. Y., Peng, M. W., and Gaur, A. (2023). International business under sanctions. *Journal of World Business*, 58(2):101426.
- Miromanova, A. (2023). Quantifying the trade-reducing effect of embargoes: Firm-level evidence from Russia. *Canadian Journal of Economics/Revue canadienne d'économique*, 56(3):1121–1160.
- Morgan, T. C., Syropoulos, C., and Yotov, Y. V. (2023). Economic sanctions: Evolution, consequences, and challenges. *Journal of Economic Perspectives*, 37(1):3–29.
- Mylovanov, T., Shapoval, N., Onopriienko, A., and Hrybanovskyi, O. (2023). How to Identify Foreign Business in Russia and What are the Key Issues of Creating and Keeping a Full List of the Largest Foreign Companies in Russia. *SSRN Working Paper 4407284*, Available at <https://ssrn.com/abstract=4407284>.
- Nigmatulina, D. (2023). Sanctions and Misallocation. How Sanctioned Firms Won and Russia Lost. *Unpublished paper*. Available at https://www.dropbox.com/s/5f15nmir4bkuzwx/JMP_Nigmatulina_Misallocation_and_State_Ownership.pdf?e=1&dl=0.
- Santos-Silva, J. and Tenreyro, S. (2010). Further simulation evidence on the performance of the Poisson pseudo-maximum likelihood estimator. *Economics Letters*, 112(2):220 – 222.
- Shuster, S. (2024). *The Showman. Inside the Invasion that Shook the World and Made a Leader of Volodymyr Zelenski*. HarperCollins.

Sonnenfeld, J., Tian, S., Zaslavsky, S., Bhansali, Y., and Vakil, R. (2022). It pays for companies to leave Russia. *SSRN Working Paper 4112885*, Available at <https://ssrn.com/abstract=4112885>.

Syropoulos, C., Felbermayr, G., Kirilakha, A., Yalcin, E., and Yotov, Y. V. (2023). The global sanctions data base—Release 3: COVID-19, Russia, and multilateral sanctions. *Review of International Economics*, In press.

Table A.1: Timeline of European Union’s trade sanctions against Russia after the invasion of Ukraine

| Date | Products affected |
|---------------|---|
| 25 Feb, 2022 | (i) Export ban on specific goods and technologies in oil refining; (ii) export ban on goods and technology suitable for use in the aviation or space industry; (iii) export ban on goods and technology which could contribute to Russia’s military and technological enhancement or the development of the defense and security sector; (iv) dual-use goods and technology. |
| 9 Mar, 2022 | Export ban on maritime navigation goods and technology. |
| 15 Mar, 2022 | (i) Export ban on luxury goods; (ii) import restrictions on iron and steel goods. |
| 8 April, 2022 | (i) Export ban on jet fuel and fuel additives; (ii) export ban on goods which could contribute to the enhancement of Russian industrial capacities; (iii) import ban on coal and other solid fossil fuels from August 2022 onward; (iv) import ban on goods which generate significant revenues for Russia. |
| 3 Jun, 2022 | (i) Import ban of crude oil and petroleum products, with limited exceptions (phase out will take 6 months for crude oil to 8 months for other refined petroleum products); (ii) New products included in the import ban on goods which generate significant revenues for Russia. |
| 21 Jul, 2022 | Ban on imports of gold and jewelry. |
| 6 Oct, 2022 | (i) New products included in the export ban on goods and technology that could contribute to the military and technological enhancement; (ii) New products included in the export ban on goods and technology suitable for use in the aviation or space industry; (iii) import ban on steel products; (iv) New products included in the import ban on goods which generate significant revenues for Russia. |
| 16 Dec, 2022 | (i) New products included in the export ban on goods and technology which could contribute to military and technological enhancement; (ii) New products included in the export ban on goods and technology suitable for use in the aviation or space industry; (iii) New products included in the export ban on goods which could contribute to the enhancement of Russian industrial capacities; (iv) New products included in the import ban on steel products. |
| 25 Feb, 2023 | (i) New products included in the export ban on goods and technology which could contribute to the military and technological enhancement; (ii) New products included in the export ban on goods and technology suitable for use in the aviation or space industry; (iii) New products included in the export ban on goods which could contribute to the enhancement of Russian industrial capacities; (iv) New products included in the import ban on goods which generate significant revenues for Russia. |
| 23 Jun, 2023 | (i) New products included in the export ban on goods and technology which could contribute to the military and technological enhancement; (ii) export ban on firearms and their parts; (iii) New products included in the export ban on luxury goods; (iv) New products included in the export ban on goods which could contribute to the enhancement of Russian industrial capacities. |
| 18 Dec 2023 | (i) Import ban on diamonds; (ii) New products included in the import ban on goods which generate significant revenues for Russia; (iii) import ban on liquefied propane. |

Source: authors’ own elaboration.

Table A.2: Voluntary suspension firms vs. non-suspension firms, 2019-2021 (annual averages)

| Variable | Exports | | Imports | |
|---------------------------|------------|----------------|------------|----------------|
| | Suspension | Non-suspension | Suspension | Non-suspension |
| Number of traders | 45 | 2,733 | 45 | 953 |
| <i>With all countries</i> | | | | |
| Exports (million euros) | 516 | 9 | 556 | 10 |
| Number of products | 35 | 7 | 48 | 10 |
| Number of countries | 17 | 6 | 10 | 4 |
| <i>With Russia</i> | | | | |
| Exports (million euros) | 11 | 1 | 67 | 3 |
| Number of products | 16 | 2 | 2 | 1 |

Note: Average annual values for the period 2019-2021. Suspension firms are those Spanish firms headquartered in Spain or foreign firms that have subsidiaries in Spain that have an exit or leave status on the Yale CELI and Leave-Russia lists. Source: authors' own elaboration using data from AEAT-Customs.

Table A.3: Top-10 sanctioned HS2 chapters in pre-invasion trade flows (% of total flow. 2019-2021. Annual averages)

| A. Exports | | |
|------------|-------------------------------------|-------|
| HS2 Code | HS2 Chapter Description | Share |
| 84 | Machinery | 6.5 |
| 32 | Tanning extracts | 3.3 |
| 87 | Motor vehicles | 2.8 |
| 40 | Rubber | 2.2 |
| 33 | Oils and resinoids | 2.1 |
| 39 | Plastics | 2 |
| 85 | Electrical and electronic equipment | 1.6 |
| 72 | Iron and steel | 1.1 |
| 48 | Paper and paperboard | 1 |
| 38 | Miscellaneous chemical products | .8 |
| B. Imports | | |
| HS2 Code | HS2 Chapter Description | Share |
| 27 | Mineral fuels | 63.6 |
| 72 | Iron and steel | 1.3 |
| 40 | Rubber | 1.2 |
| 23 | Residues from food industry | 1.1 |
| 31 | Fertilisers | .6 |
| 29 | Organic chemicals | .5 |
| 28 | Inorganic chemicals | .4 |
| 84 | Machinery | .4 |
| 94 | Raw hides and skins | .2 |
| 44 | Wood and articles of wood | .2 |

Note: authors' own elaboration using data from AEAT-Customs.

Table A.4: Robustness. Only firms included in the Yale CELI and Leave-Russia lists

| | Value | | Entry | | Exit | |
|--|--------------------------------|--------------------------------|--------------------------------|-------------------|-------------------------------|--------------------------------|
| | (1) Exports | (2) Imports | (3) Exports | (4) Imports | (5) Exports | (6) Imports |
| Only Sanction $_{fk} \times \text{Post}_{kt}$ | 0.336 (0.289) | -0.345 (0.760) | -0.041 ^b (0.019) | -0.021 (0.030) | 0.043 (0.056) | -0.187 ^c (0.100) |
| Only Suspension $_{fk} \times \text{Post}_{ft}$ | -3.666 ^a (0.575) | -2.378 ^a (0.512) | -0.105 ^a (0.023) | -0.003 (0.034) | 0.307 ^a (0.077) | 0.024 (0.107) |
| Sanction and Suspension $_{fk} \times \text{Post}_{fkt}$ | -4.053 ^a (0.836) | -6.760 ^a (1.152) | -0.064 ^a (0.024) | -0.034 (0.035) | 0.283 ^a (0.093) | 0.210 ^b (0.084) |
| Observations | 47500 | 5380 | 33107 | 4052 | 11257 | 945 |
| Pseudo-R2 | 0.845 | 0.910 | 0.120 | 0.053 | 0.362 | 0.261 |
| Adjusted R2 | | | | | | |

Note: In column 1 and 2 the dependent variable is the value of exports and imports, respectively. In column 3 (4) the dependent variable turns one if firm f did not export (import) product k at time $t - 1$ and exported (imported) product k at time t . In column 5 (6) the dependent variable turns one if firm f exported (imported) product k at time $t - 1$ and did not export (import) product k at time t . All estimations include firm, product, and time fixed effects. Standard errors clustered at the firm and product level are in parentheses. a, b, and c: statistically significant at 1%, 5%, and 10%, respectively.

Table A.5: Robustness. Triple-difference regression

| | Value | | Entry | | Exit | |
|---|--------------------------------|--------------------------------|--------------------------------|--------------------------------|-------------------------------|-------------------------------|
| | (1) Exports | (2) Imports | (3) Exports | (4) Imports | (5) Exports | (6) Imports |
| Only Sanction $_k \times \text{Post}_t^i \times \text{Russia}_d$ | -1.653 ^a (0.421) | -3.725 ^a (0.733) | -0.028 ^a (0.003) | -0.033 ^a (0.003) | 0.402 ^a (0.034) | 0.322 ^a (0.055) |
| Only Suspension $_f \times \text{Post}_{ft} \times \text{Russia}_d$ | -4.418 ^a (0.545) | -3.472 ^a (0.519) | -0.004 (0.007) | -0.013 (0.008) | 0.759 ^a (0.048) | 0.412 ^a (0.068) |
| Sanc and Susp $_{fk} \times \text{Post}_{fkt} \times \text{Russia}_d$ | -6.611 ^a (0.971) | -8.371 ^a (1.089) | -0.027 ^a (0.009) | -0.024 ^a (0.007) | 0.763 ^a (0.093) | 0.582 ^a (0.065) |
| Observations | 290058 | 39964 | 3106364 | 2144966 | 76760 | 6026 |
| Pseudo-R2 | 0.994 | 0.991 | | | | |
| Adjusted R2 | | | 0.096 | 0.119 | 0.334 | 0.156 |

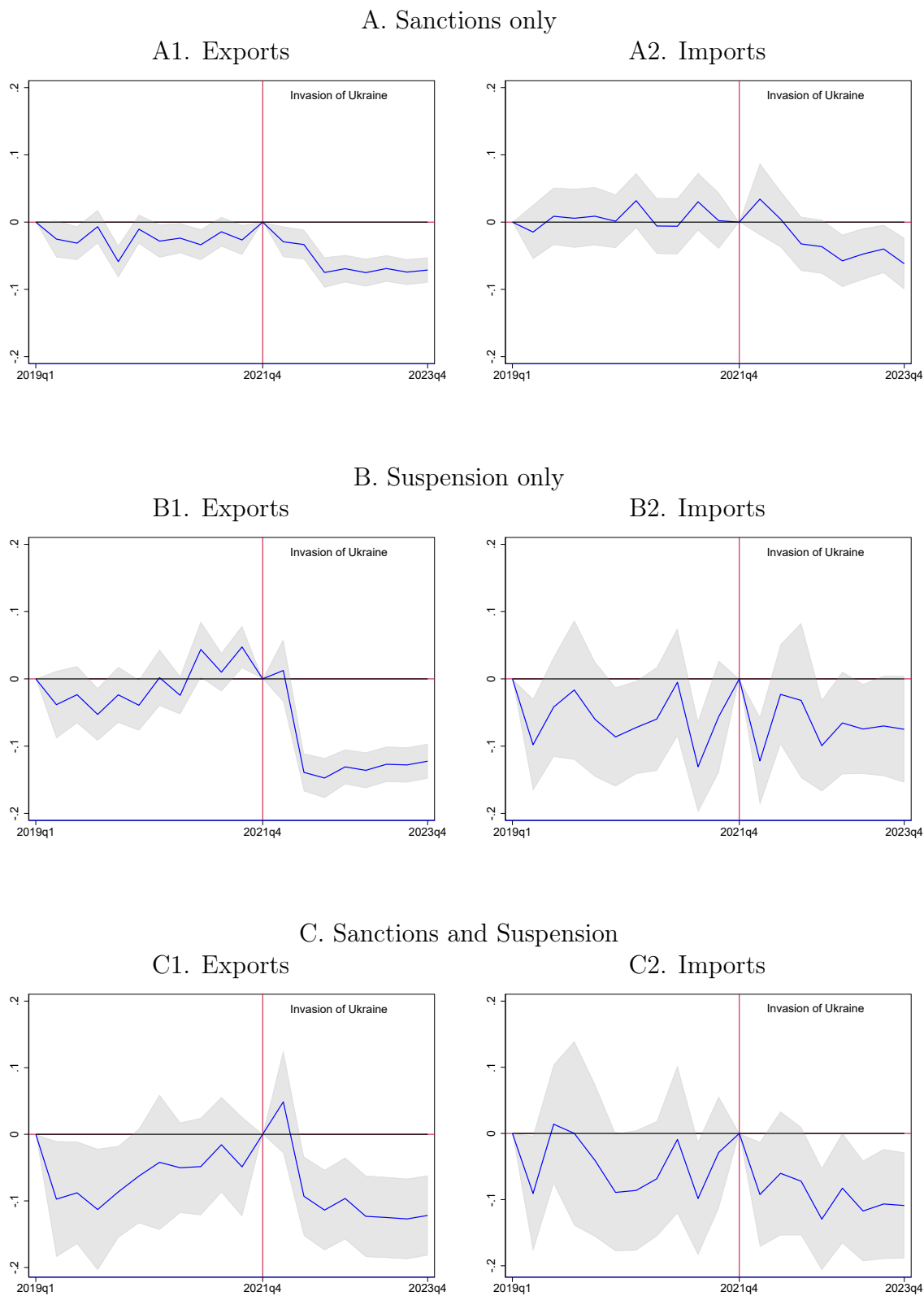
Note: In column 1 and 2 the dependent variable is the value of exports and imports, respectively. In column 3 (4) the dependent variable turns one if firm f did not export (import) product k at time $t - 1$ and exported (imported) product k at time t . In column 5 (6) the dependent variable turns one if firm f exported (imported) product k at time $t - 1$ and did not export (import) product k at time t . All estimations include firm \times product \times time and firm \times product \times destination fixed effects. Standard errors clustered at the firm and product level are in parentheses. a, b, and c: statistically significant at 1%, 5%, and 10%, respectively.

Table A.6: Robustness. Comparing the effect of sanctions on suspension and non-suspension firms in the Crimea Annexation episode

| | (1) | (2) | (3) |
|---|-------------------|-------------------------------|--------------------------------|
| | Value | Entry | Exit |
| Dual use _k × Post _t | 0.206 (0.132) | 0.009 ^c (0.005) | -0.006 (0.017) |
| Dual use _k × Post _t × Suspension _f | -0.215 (0.358) | 0.029 ^c (0.017) | 0.026 (0.034) |
| Dual use _k × Suspension _f | 0.370 (0.366) | -0.016 (0.017) | -0.055 (0.050) |
| Post _t × Suspension _f | -0.285 (0.198) | 0.019 ^a (0.007) | -0.026 ^a (0.010) |
| Observations | 232580 | 166552 | 53556 |
| Pseudo-R2 | 0.702 | | |
| Adjusted R2 | | 0.046 | 0.296 |

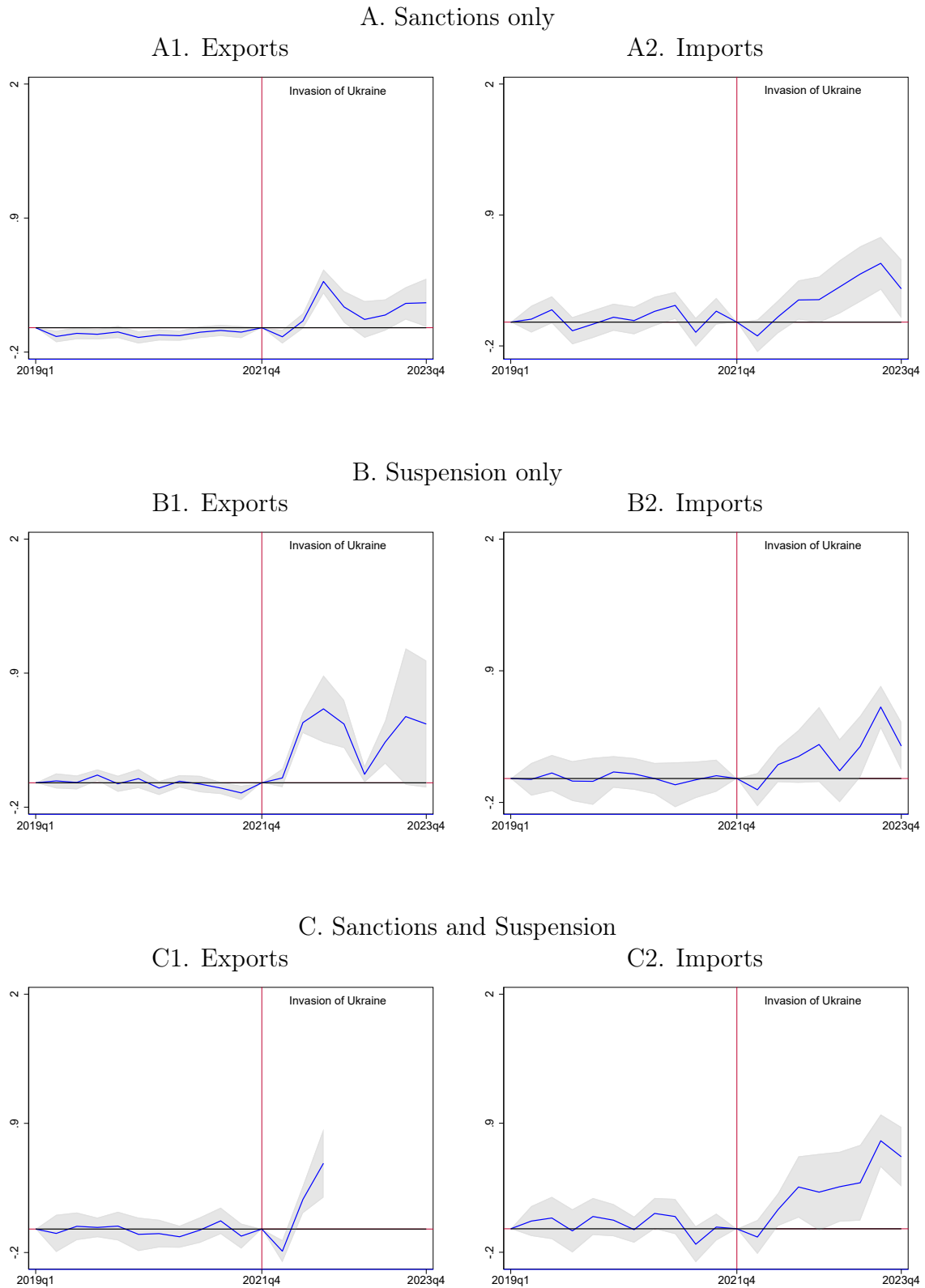
Note: In column 1 the dependent variable is the value of exports. In column 2 the dependent variable turns one if firm f did not export product k at time $t - 1$ and exported product k at time t . In column 3 the dependent variable turns one if firm f exported product k at time $t - 1$ and did not export product k at time t . All estimations include product, time, and firm fixed effects. Standard errors clustered at the product level are in parentheses. a, b, and c: statistically significant at 1%, 5%, and 10%, respectively.

Figure A.1: Quarterly coefficients on the impact of sanctions and the suspension of activities on Spanish firms' entry to Russia, 2019q1-2023q4



Note: The figures report the point estimate and the 90% confidence interval of the quarter coefficients estimated in Equation (2). The excluded category is 2021q4.

Figure A.2: Quarterly coefficients on the impact of sanctions and the suspension of activities on Spanish firms' exit from Russia, 2019q1-2023q4



Note: The figures report the point estimate and the 90% confidence interval of the quarter coefficients estimated in Equation (2). The excluded category is 2021q4.