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Going Dutch? Firm exports and FDI in the wake of the 2014 EU-Russia sanctions

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Abstract

We examine the 2014 European Union economic sanctions on exports to Russia and the Russian retaliatory measures on imports from several Western countries. Using the universe of highly disaggregated international trade and taxation data for firms in the Netherlands, we systematically analyze the impact of these economic sanctions on Dutch firms' exports and foreign direct investment. Our analyses account for the product-specific EU restrictions on arms, equipment used for oil exploration and extraction, and dual-use products suitable for civilian and military use, as well as the Russian import ban on various primary commodities. Our empirical findings highlight the overall negative impact of sanctions on the intensive margin of exports. However, having a foreign affiliate in Russia helps to mitigate the otherwise negative impact of sanctions on the extensive margin of exports. We also show that exporters do not circumvent sanctions by setting up a local affiliate in Russia. In fact, exposure to Russian countersanctions may even force firms to close their Russian affiliates.

KEYWORDS

exports, firms, foreign direct investment, sanctions, sanctions jumping

JEL CLASSIFICATION

F13, F14, F51

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1 | INTRODUCTION

Following the Russian annexation of the Crimea in March 2014, the European Union (EU) imposed economic sanctions—“restrictive measures” in the parlance of the Common Security and Foreign Policy—on the Russian Federation. These sanctions were rapidly upgraded following events of the bombing of Malaysian Airlines’ civilian flight MH17 on July 17, 2014, killing 283 (mostly Dutch) passengers and 15 crew members.¹ Since then, asset freezes, travel bans, financial restrictions, and trade restrictions have been implemented by the EU (Guimelli et al., 2021). Responding to these measures, the Russian Federation imposed retaliatory import bans on various food and agricultural products from the EU in August 2014.²

This study aims to contribute to the growing literature on the costs of restrictive measures borne on the imposing (sending) country, and the firm-level responses to these sanctions (see, e.g., Ahn & Ludema, 2020; Besedeš et al., 2017, 2021; Crozet & Hinz, 2020; Crozet et al., 2021; Gullstrand, 2020; Haidar, 2017). In particular, we address the question how the 2014 EU economic sanctions on Russia, and Russian retaliatory sanctions, impacted Dutch firms’ activities in Russia through both trade and foreign direct investment (FDI). In doing so, we aim to contribute to the literature in three ways.

First, and novel to the literature, is that we quantify the effects of the 2014 sanctions on firm-level trade and FDI. To the best of our knowledge, ours is the first study to simultaneously examine how economic sanctions impact firm-level internationalization patterns through these two channels. Armed with this unique dataset, we investigate if economic sanctions impact pure exporters differently compared to exporters with an affiliate in the target market. Relative to pure exporters, exporters with foreign affiliates may be better able to use their local resources and capabilities to adapt to the export restrictions imposed by economic sanctions. For example, compared to exporters, firms with an affiliate in the target economy may have superior access to the government agencies responsible for drawing up and enforcing sanctions, legal expertise to navigate around sanctions, and political capital in the target economy to secure favorable treatment or exemptions (Guimelli & Onderco, 2021). We also examine the notion of “sanctions jumping,” that is, once exporters are confronted with increased trade costs due to economic sanctions, firms will switch to serving the target market through a local affiliate in the target economy, rather than exports.³

Second, by building a detailed product specific dataset on four different types of sanctions, our research design explicitly accounts for the design of sanction regimes and their heterogeneous economic impacts. We identify four sanctions regimes: three EU export restrictions on (i) so-called “Annex II” equipment for oil exploration and extraction, (ii) arms and military equipment, and (iii) dual-use goods with both civilian and military applications.⁴ We also account (iv) for the detailed, product-level counter-sanctions imposed on Russian imports from the EU. While we are not the first to address this heterogeneity of sanction regimes, ours is the first to systematically cover all relevant sanction regimes in the 2014 EU-Russian sanctions episode. Accounting for all sanction regimes that were implemented in a given sanctions episode is vital in empirical work because failure to do so would lead the empirical researcher to mistakenly assign *de jure* sanctioned products to the control group of non-sanctioned products. In doing so, measurement bias is introduced in the parameter estimate of interest. In order to make progress on this important limitation to empirical research on the economic outcomes of sanctions, we document how product-level sanction data can be readily obtained from relevant legal texts and make our dataset on sanction regimes publicly available for future research.⁵

Finally, we add to the growing but limited literature that uses highly detailed (i.e., firm, product, and country specific) data to shed light on how sanctions affect the internationalization behavior of firms through firm-level exports. While Crozet and Hinz (2020) have done this for Gullstrand (2020) for Sweden, we focus on the Netherlands. The Netherlands is an open economy and is the second largest goods exporter (after Germany), and the sixth largest economy in the EU-28 in terms of GDP; it is an important hub in the European trade network.⁶ Moreover, it is the second largest exporter of agricultural goods (after the United States) in the world.⁷ Yet, little is known about how economic sanctions affect firms in the Netherlands in terms of their cross-border trade, let alone FDI.⁸

Overall, we find a significantly negative effect of most sanction regimes on the intensive margin of exports. This effect is driven by a decrease in quantities traded. The arms embargo, Annex-II restrictions and Russian countersanctions negatively affect exports along both the intensive and the extensive margin, that is, they reduce the average value of sanctioned goods exported, they reduce the probability a Dutch firm will start exporting these sanctioned products, and they increase the probability that firms will stop exporting them. In contrast, dual-use sanctions only affect the extensive margin of trade.

Our analysis of firm-level trade and FDI also enable us to shed light on whether firms with Russian affiliates are somehow affected differently by sanctions compared to exporting firms. We find that compared to exporters, firms with a Russian affiliate do not have an advantage in weathering sanctions along the intensive margin of exports. However, having a Russian affiliate dampens the otherwise negative effect of sanctions on the probability of product market entry. Our results also reveal that sanctions increase the probability of product market exit for exporters as well as for firms with local affiliates. However, having a Russian affiliate helps to mitigate the negative impact of Russian countersanctions, suggesting that FDI provides the firm resources and capabilities to navigate around these sanctions by utilizing local expertise in securing exemptions. Finally, we do not find any evidence that firms engage in “sanctions-jumping” FDI to circumvent export restrictions.

The remainder of this paper is structured as follows. Section 2 provides an overview of the related literature, followed by a presentation of our dataset in Section 3. Sections 4–6 present our methodology and results for the intensive margin of exports, the extensive margin of exports, and FDI dynamics, respectively. Section 7 discusses the main findings and concludes.

2 | LITERATURE

Previous studies on the economic consequences of sanctions on international trade focused on a broad range of sanctions on a variety of countries (senders and targets) for numerous years. Publicly available datasets on sanctions have evolved to give better detail about the scope of the sanctions implemented with information on whether sanction episodes include travel bans, asset freezes, trade restrictions, financial restrictions, and military restrictions (e.g., Felbermayr et al., 2020; Hufbauer et al., 1990; Morgan et al., 2009, 2023; Weber & Schneider, 2020). These endeavors have resulted in a large body of literature to quantify how sanctions-induced increases in trade costs impact on bilateral trade in commodities (see, e.g., Kohl and Klein Reesink (2019) for a detailed overview of the literature, and Larch et al. (2022) for a recent application to the case of trade in energy and mining).

While multi-country, multi-sanction analyses can in principle be informative to learn about average effects, a drawback is that sanctions vary in their purpose and design (Guimelli, 2011),

which calls for additional, contextualized analyses. In this regard, the literature has progressed by delving deeper into the question how the activities of economic agents in target and/or sending states are affected in a specific sanction episode.

With a view of analyzing the cost of sanctions on a target country, Evenett (2002) explores the case of anti-apartheid sanctions on South African trade. Using aggregate bilateral trade data in a gravity model, he finds that the United States' Comprehensive Anti-Apartheid Act was the most effective in reducing South African exports to foreign markets. In contrast, sanctions imposed by the European Community were less effective in curbing South African exports. Beyond the effects on trade, Biglaiser and Lektzian (2011) find that U.S. sanctions reduce U.S. FDI inflows into sanctioned countries. In addition, Neunenkirch and Neumeier (2015) demonstrate that United Nations sanctions reduce targets' aggregated GDP over a period of 10 years by up to 25%.

At a more disaggregate level of analysis, Haidar (2017) uses customs transaction data for 2006–2011 to examine the export behavior of Iranian non-oil exporters in the aftermath of the 2008 sanctions on Iran. He finds that overall Iranian exports increased. While some exports to sanctioning destinations were destroyed, about two-thirds of exports were deflected to non-sanctioning, less expensive destinations at lower prices and higher quantities. While these studies deviate in their level of analysis and context, their results suggest that sanctions inflict a significant economic burden on targeted exporters in terms of lost trade.

More recently, several studies have examined how sanctions impose costs on economic agents in the sending states in the context of the 2014 EU-Russian sanctions. Such costs may be reflected in overall macroeconomic and foreign currency performance (e.g., Dreger et al., 2016), firm performance (Ahn & Ludema, 2020), country-level exports (Moret et al., 2016; Oja, 2015), firm-level exports (Crozet & Hinz, 2020; Gullstrand, 2020), foreign market entry (Crozet et al., 2021), and cross-border financial activity (Besedeš et al., 2017, 2021).

Crozet and Hinz (2020) quantify that Russia lost 7.4% of its predicted 2014–2015 export value as a result of Western sanctions imposed in 2014, while the cost to Western senders was just 0.3% of their total export for the same period. Using firm-product data for French exporters, they find that this result is most pronounced for products that were not subject to Russian counter-sanctions on food and dairy products, which the authors identify as products subject to “friendly fire.” However, the authors ascribe this drop in senders' export performance to the generally poor macroeconomic performance of the Russian economy and the rising political uncertainty following the Russo-Ukrainian War.

In a subsequent study, Crozet et al. (2021) examine the probability of French firms entering into markets that are subject to sanction impositions, in particular Iran and Russia. They find that sanction impositions reduce the probability of firm entry, especially for firms that rely on trade financing, but less so for firms with prior experience in these markets. In addition, the probability of entry does not increase once sanctions are (temporarily) lifted as in the case of Cuba and Myanmar (also see Attia et al., 2020, Kohl, 2021).

In another paper related to ours, Gullstrand (2020) examines the effect of the 2014 Russian sanctions imposed by the EU, and the Russian countersanctions, for Swedish firms over the period 2010–2016. He finds that, while the overall impact of these sanctions on the Swedish economy was small, firms facing the Russian counter-sanctions saw a significant decline in sales and a higher probability of leaving Russia. The negative impact of these sanctions was most pronounced for small firms with weak financial performance, and for larger firms of which the main business activity is exposed to the sanctions.

How sanctions affect economic activity has also been examined beyond the scope of international trade. The impact of financial sanctions on cross-border capital flows has been studied in a

series of papers by Besedeš et al. (2017, 2021). Using disaggregated monthly balance-of-payments data, these authors examine how German financial institutions and non-financial firms respond to various financial restrictions imposed in the past 20 years. They find that financial sanctions decrease German financial institutions' (intensive margin) cross-border capital flows to and (extensive margin) number of transactions in sanctioned markets. They also show that financial sanctions induce non-financial German firms to engage in fewer financial activities (extensive margin) in sanctioned markets. The cost of financial sanctions on the sender is relatively small, and these restrictions do not necessarily have detrimental consequences for trade in goods and services. This only is the case when financial sanctions are complemented with trade restrictions and even then, these effects are sizably smaller compared to how financial restrictions impact cross-border capital flows (Besedeš et al., 2022).

While this study also explores the costs of the 2014 EU-Russian sanctions in a sending state, our approach is distinctive in the following respects. First, and novel to the literature, is our simultaneous analysis of firm-level exports and FDI in the wake of sanctions. Second, we account for a variety of trade sanctions including arms embargos, equipment related to the oil industry, and dual-use products suitable for civilian and military applications and explore how these impact exports along both the intensive and extensive margins of trade. Our analyses also provide details on how these sanctions affect trade in terms of the quantities traded and unit values. Finally, we contribute insights from the underexplored case of firms in the Netherlands, an economically important EU member country. Together, these findings shed light on our understanding of if and how internationally active firms bear the burden of economic sanctions.

3 | DATA

3.1 | Product-level sanction regimes

Ever since Hufbauer et al. (1990), the sanctions literature has seen gradual progress in datasets documenting the countries that are involved in sanctions as senders, targets, and the extent to which these sanctions contain measures to limit—among others—international trade, cross-border mobility of individuals, assets and diplomatic relations (see, e.g., Felbermayr et al., 2020; Morgan et al., 2009). However, an important drawback of these datasets is that they lack detailed sector or product-level data on the precise import or export restrictions that were implemented, which generally limits empirical research on the economic impact of sanctions on trade to the country-level aggregate level.

To overcome this limitation, we (i) focus on two interrelated sanction events revolving around the 2014 Russian invasion of the Crimea and (ii) draw on the legal texts of the EU and Russian Government to accurately identify those products that were subject to the 2014 restrictive measures at the CN8-digit level. Appendix A provides a detailed account of how this information was retrieved from the relevant legal documents, how we used this information to identify the CN8-digit products subject to the sanction regimes introduced below, and how interested researchers can access this dataset for future research. We document four distinct sanction regimes that are relevant for our analysis of international trade of Dutch firms with Russia:

1. An export prohibition on the exports of arms and military equipment to Russia, henceforth referred to as the arms ban. This effectively is an export embargo for all exports of arms and military equipment from EU Member States to Russia. A legal exemption is provided for

transactions stemming from “an obligation arising from a contract or an agreement concluded before August 1, 2014.”⁹

2. An export restriction subject to prior authorization of “certain technologies suited to [arctic, deep sea or shale] oil exploration and production”—henceforth referred to as the Annex-II restrictions. This restriction is not an outright prohibition as is the case of the arms ban, as export is still possible subject to prior authorization from the relevant Member States’ export authority. Prior authorization is “required for the sale, supply, transfer or export [...] to [...] Russia or in any other country, if such equipment or technology is for use in Russia.” Export authorization may be denied if the export authority has “reasonable grounds to determine that the sale, supply, transfer or export” of the product in question is for use in Russia. However, export authorization may be granted for contractual obligations dating from before August 1, 2014.¹⁰
3. An export restriction subject to prior authorization on the exports of dual-use goods and technology, that is, products with both a civilian and military application—henceforth referred to as the dual-use restrictions. As with the restrictions on Annex-II products, prior export authorization must be granted by the competent export authority, which must make a determination on whether the “end-user might be a military end-user or that the goods might have a military end-use.” However, authorization may be granted to exports of obligations arising from contracts and agreements concluded before August 1, 2014.¹¹ Note that to the best of our knowledge, this is the first empirical trade study to assess the impact of dual-use trade restrictions on international trade.
4. The retaliatory Russian import restriction on select agricultural products, raw materials, and foodstuffs originating from Australia, Canada, the EU, Norway, and United States. An exception is made for products destined for the use in baby foods, yet these products cannot be readily identified from CN codes. As such, importers need to obtain prior authorization to legally import these restricted products.¹²

The product-level sanction regimes are subsequently merged with our firm-level trade and investment data, which are described next.

3.2 | Dutch firm-level trade and investment data

Our dataset further consists of the universe of Dutch exports at the firm-product-destination-year level over the period 2010–2020. The backbone of our database is provided by Statistics Netherlands, notably the Registry of Business Demographics and the International Trade in Goods Statistics database. The former contains panel information on every firm located in the Netherlands from which we obtain data on firm characteristics such as their sector (NACE/ISIC), firm size in terms of employment, address information, age, and labor productivity. An adjacent database, the Inward Foreign Affiliates Statistics (IFATS), is used to identify whether the ultimate controlling institution of the firm is located within the Netherlands or abroad. We augment this dataset with matched data from firm’s annual tax records combined with the Outward Foreign Affiliates Statistic (OFATS), from which we derive whether and where they have foreign affiliates. These FDI data also cover the period 2010–2020.

The International Trade in Goods Statistics database contains information on all firm-level exports and imports by firms registered in the Netherlands and accounts for approximately 80% of all Dutch exports. These flows are registered at the CN 8-digit and destination level. Extra-EU

trade is recorded by the Customs Authority and has full detail in terms of destination country and products traded. Intra-EU trade is recorded by the Dutch Tax Authority. Only firms with total annual intra-EU import and/or exports exceeding 1.2 million (threshold in 2016) are required to specify their trade transactions by product-destination through an additional questionnaire from Statistics Netherlands. Below this threshold, firms only report the total import and export value of intra-EU trade. Since we have no product and only limited intra-EU country information on these observations, firms that fall below this threshold are excluded from our sample.

The full sample covers 18.8 million observations, composed of roughly 48,000 individual firms, 10,500 CN8 products, 24 destinations, and 11 years (2010–2020). We observe a total of 10,954 individual firms who export at least once to Russia, and 3810 firms who have a foreign affiliate in Russia in at least one of these years. 1323 firms did both at least once during the sample period. Table B1 in Appendix B presents additional descriptive statistics.

3.3 | Stylized facts

Drawing on the combination of our detailed product-level sanction and firm-level data, we uncover five stylized facts. First, a cursory glance at the trade data suggests that the 2014 sanctions were unexpected—therefore considered as an exogenous policy shock—and had a differentially stronger impact on restricted products relative to non-restricted products. Inspired by Gullstrand (2020), Figure 1 plots the growth in Dutch exported quantities of sanctioned

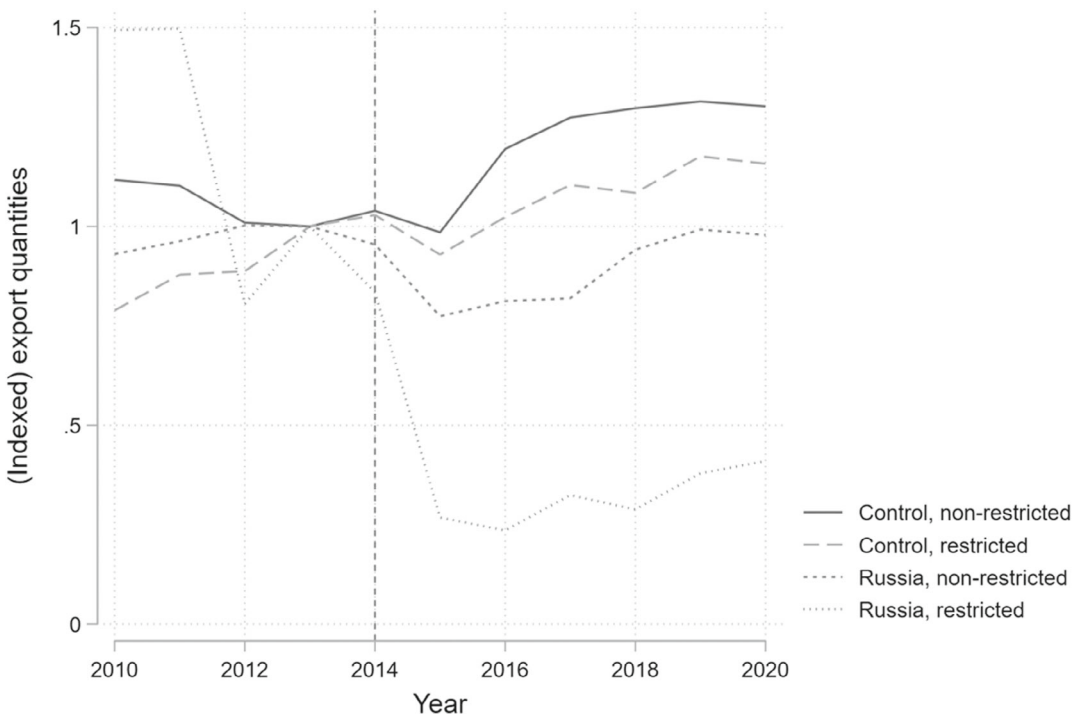


FIGURE 1 Trend in Dutch exported quantities to Russia and the control group for restricted and non-restricted products (baseline 2013 quantities). Figure plots the indexed export quantities of Dutch firms (baseline 2013) by export destination and distinguishes between non-restricted and restricted products under any of the four sanction regimes discussed in the main text. *Source:* Authors’ calculations.

TABLE 1 Sanction regimes and Dutch firms.

Period	EU sanctions		Annex-II		Arms		Dual use		Retaliation	
	2010–2013	2015–2020	2010–2013	2015–2020	2010–2013	2015–2020	2010–2013	2015–2020	2010–2013	2015–2020
Ave. annual no. of firms exporting to Russia	1555	1426	112	89	13	11	1531	1412	268	119
Ave. annual no. of products exported to Russia	690	712	26	21	2	3	671	696	156	75
Ave. annual no. of firms with affiliate in Russia	570	572	81	74	8	10	566	567	174	102
Ave. volume of annual exports to Russia (€)	38,097	28,172	46,007	18,970	12,317	8098	38,160	28,323	75,648	28,739
Ave. quantity of annual exports to Russia	3654	2592	3111	1150	642	186	3684	2613	102,091	12,398

Note: Averages based on annual firm-level data for the period 2010–2013 and 2015–2020, respectively. 2014 omitted because it is a transitory year during which sanctions were progressively implemented.

and non-sanctioned products to Russia and to a set of European control countries described in Section 4.1. Compared to the trend for products exported to the control group, we observe a substantial decline in Dutch exports to Russia for both non-restricted and restricted products. However, in line with our expectations, the decrease in exports is the largest for restricted goods.

Second, we observe considerable heterogeneity in the coverage of the four sanction regimes. Table 1 provides an overview of the number of firms that were affected by the various sanction regimes presented above. The average annual number of firms that exported goods to Russia that eventually became subject to sanctions declined from 1555 over the 2010–2013 period to 1426 over the period of 2015–2020. The dual-use sanctions by far cover the largest number of exporters, firms with a Russian affiliate, and number of products exported to Russia. The range of firms and products covered by Annex-II restrictions is remarkably smaller, and only a handful of firms and products are covered by the arms ban. In contrast, the Russian retaliatory sanctions cover a sizeable number of firms and products.

In absolute terms, the largest decline was among those firms that were subject to Russian countersanctions. The average export value of goods sanctioned by the EU was €38,097 over the period 2010–2013, and remarkably lower at €28,172 over 2015–2020. Among the EU restrictions, the largest relative decline in the volume of annual exports was under the Arms embargo (–34%), followed by the Dual-use restrictions (–27%) and Annex-II restrictions (–26%). However, the Russian countersanctions caused the average firm-level volume of exports in restricted products to decline by 62%.

Third, the 2014 EU-Russian sanctions and countersanctions caused a loss in Dutch exports of €6.9 billion. Ideally, one would like to compare the post-2014 export values to their pre-sanction levels. However, substantial price changes due to inflationary pressure in the later years of our

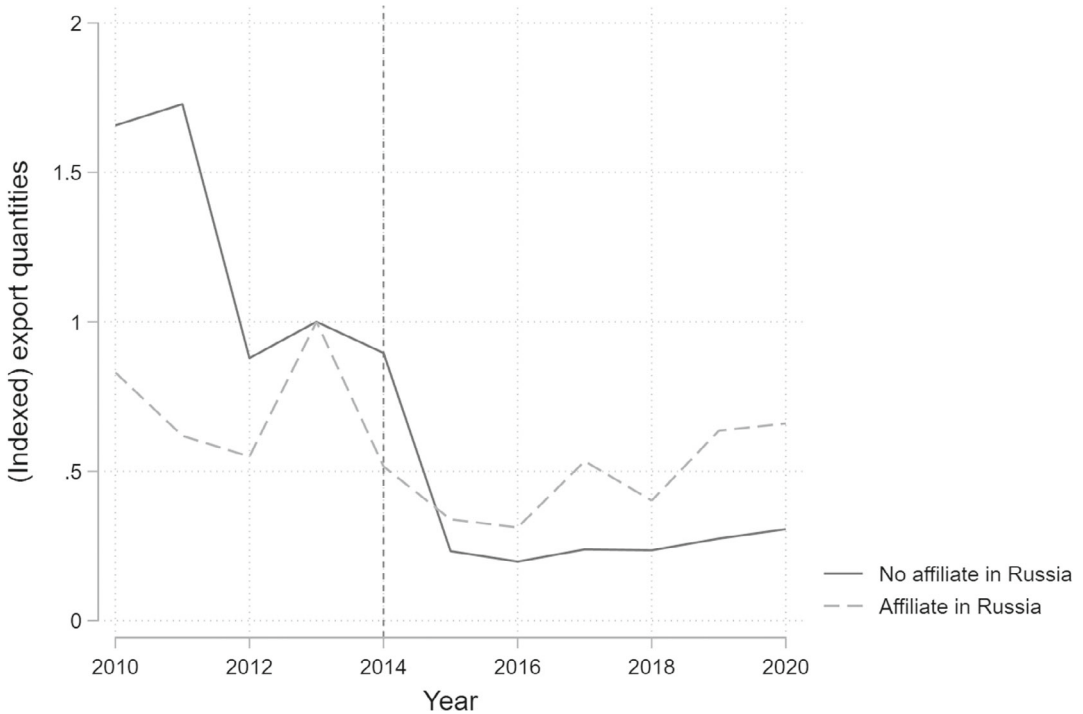


FIGURE 2 Trend in Dutch exported quantities to Russia for restricted products, by firm type (baseline 2013 quantities). Figure plots the indexed export quantities of Dutch firms by export status (baseline 2013), for firms with and without a Russian affiliate. *Source:* Authors’ calculations.

sample would bias our estimate downwards. Nevertheless, we can provide an estimate based on changes in traded quantities towards Russia and the control group, weighted by nominal pre-sanction export values. Specifically, the nominal export value of Dutch firms’ exports to Russia in 2013, of products that became subject to sanctions in 2014, was about €1.46 billion. In 2014, the exported quantities of sanctioned products to Russia dropped by about 16.5%, while it grew by almost 2.9% to the control group. We then calculate the sanctions-induced loss in export value to Russia as 19.4% of €1.46 billion in that year, or €282.2 million. Repeating this calculation for every year up to and including 2020, we estimate that the total loss amounts to €6.9 billion.

Fourth, while sanctions have reduced Dutch firms’ exports to Russia, we document that this decline in trade varies depending on whether the firm is solely an exporter or also owns a foreign affiliate in Russia. As Figure 2 shows, we find that firms with a Russian affiliate faced a relatively smaller decline in their annual exported quantities than firms without a Russian affiliate. In addition, Figure 2 highlights that firms with a foreign affiliate have been better able to at least partially recover their export sales since 2016. In contrast, pure exporters’ exported quantities have remained virtually flat since their initial steep decline in 2014.

Finally, the data do not suggest that pre-sanction exporters circumvented sanctions by entering the Russian market through FDI after 2014, or by temporarily withdrawing as an exporter and returning a few years later. Figure 3 presents a heatmap of the evolution of firms’ export and FDI activity in Russia over the 2010–2020 period. Based on their activities in 2010–2013, we classify firms as exporters, exporters with a foreign affiliate, non-exporters with a foreign affiliate, non-exporters without a foreign affiliate, and non-existing firms (i.e., post-2013 entrants).¹³ The figure dynamically traces the share of firms that transition from one status to another in the

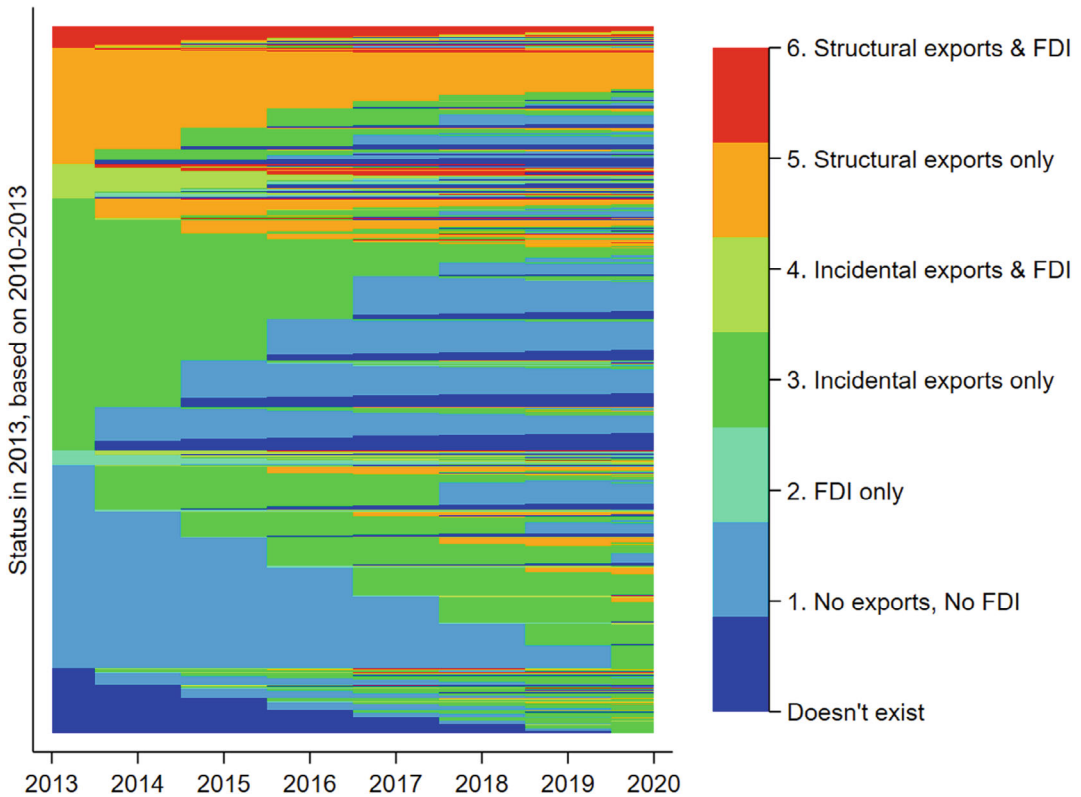


FIGURE 3 Dynamics of firm status (based on 2010–2013 activity). Heatmap of the change in firm status, based on its observed status in the 2010–2013 period as discussed in the main text. *Source:* Authors' calculations. [Colour figure can be viewed at wileyonlinelibrary.com]

post-sanction period. Overall, we see a sizeable churning of exporters in the post-sanction period, while firms with FDI remained largely unaffected over time. Importantly, we do not find that pre-sanction exporters navigated around the sanctions by entering the Russian market through FDI after 2014. If anything, pre-sanction exporters quit exporting to Russia, and were eventually replaced by new exporting firms. In contrast, pre-sanction firms with a Russian affiliate by and large maintained a Russian presence despite the 2014 sanctions.

In the empirical analyses that follow, we quantify how sanctions affect a firm's exports to Russia relative to its exports to other destinations. Our research breaks down into analyses of the intensive margin of exports, as well as an analysis of the extensive margin of exports and FDI to Russia under the 2014 sanctions imposed by the EU and Russia's retaliatory import ban.

4 | INTENSIVE MARGIN OF EXPORTS

4.1 | Methodology

We use a triple difference-in-difference (DDD) approach to analyze how sanctions against Russia and Russian countersanctions since 2014 affected the value of firm-level exports. Drawing

on the DDD specification in Besedeš et al. (2020) and following the literature in using PPML (Frank, 2018; Santos-Silva & Tenreyro, 2006), we estimate:

$$\begin{aligned}
 X_{f\text{pdt}} = \exp & \left[\alpha_1 \text{Restricted}_p + \alpha_2 \text{Russia}_d + \alpha_3 \text{Post}_t + \alpha_4 \text{Restricted}_p \times \text{Russia}_d \right. \\
 & + \alpha_5 \text{Restricted}_p \times \text{Post}_t + \alpha_6 \text{Russia}_d \times \text{Post}_t + \beta \text{Restricted}_p \times \text{Russia}_d \times \text{Post}_t \\
 & \left. + \delta C_{f\text{pdt}} + \gamma_{f\text{pd}} + \zeta_t \right] \times \varepsilon_{f\text{pdt}}, \tag{1}
 \end{aligned}$$

where exports (X) from firm f , 8-digit CN product p , to destination d in year t are regressed on the presence of product-specific sanctions targeting the destination at that time. Restricted_p , Russia_d , and Post_t are dummy variables indicating, respectively, (i) whether product p is subject to a restrictive measure by the EU or Russia, (ii) whether the destination country d is Russia, and (iii) whether year t is in the post-implementation period of 2014 onwards. $\text{Restricted}_p \times \text{Russia}_d$ accounts for changes in the export of restricted products to Russia stemming from time-invariant characteristics. $\text{Restricted}_p \times \text{Post}_t$ controls for changes in exports of restricted products across all destinations in the post-implementation period, and $\text{Russia}_d \times \text{Post}_t$ for changes in exports to Russia across all products in the post-implementation period. Our key parameter of interest is β , which measures the extent to which Dutch firms' exports of sanctioned products to Russia decline compared to non-restricted products, relative to other export destinations.

Due to the nature of our fixed-effects specification, and augmenting our treatment variable with the four distinct sanction regimes, Equation (1) simplifies to:

$$\begin{aligned}
 X_{f\text{pdt}} = \exp & \left[\beta_1 \text{Annex II}_{\text{pdt}} + \beta_2 \text{Arms}_{\text{pdt}} + \beta_3 \text{DualUse}_{\text{pdt}} \right. \\
 & \left. + \beta_4 \text{Retaliation}_{\text{pdt}} + \delta C_{f\text{pdt}} + \gamma_{f\text{pd}} + \zeta_t \right] \times \varepsilon_{f\text{pdt}}, \tag{2}
 \end{aligned}$$

where Annex II refers to the EU's Annex II restrictions, Arms refers to the embargo on arms and military equipment, DualUse refers to the EU's export restrictions on dual-use goods, and Retaliation pertains to the Russian countersanctions. C is a vector of controls and includes the log of firm-year-varying labor productivity and the log of (product-destination-time-varying) import tariffs obtained from WITS.¹⁴ To control for a host of characteristics that are constant over time, we include firm-product-destination fixed effects, as well as year fixed effects to control for unobserved aggregate differences over time.¹⁵ Robust standard errors are clustered by product \times year and firm.

Our sample consists of all Dutch firms that either exported a product to or invested in a foreign subsidiary in either Russia and/or one of the control group countries (discussed below) at least once during the period 2010–2020. This yields a dataset of roughly 48,000 firms potentially exporting around 10,000 CN8-digit codes to 24 countries over a period of 11 years. To construct a proper control group, we need to impute zero trade flows. In line with Crozet et al. (2021), we impute zeros for years when the firm did not export a particular product to a particular country only if it exported that product to that country at least once,¹⁶ and of course if the firm was still operational in that year. That is, we do not impute zeros for products or countries for which the firm never was an exporter. The theoretical reason for only imputing these values is that it ensures the zeros that we impute are realistic zeros in the sense that the firm could have exported these products. The practical reason for this restriction is that imputing zero trade flows for all missing firm-product-destination-years would amount to a dataset with more than 100 billion observations. This ensures that we observe the full time period in which a particular transaction occurs, or could have taken place.

Following Crozet and Hinz (2020), we define our main control group as a set of countries subject to the same sanction regimes, and in geographic proximity to Russia, namely Bulgaria, Croatia, Czechia, Estonia, Finland, Hungary, Greece, Latvia, Lithuania, Norway, Poland, Romania, Slovakia, Slovenia, and Sweden. We argue that these destinations are a plausible control group because firms affected by the Russian sanctions will seek to divert their sanctioned products to those markets that are relatively close to the Russian market. This is because their existing production capacity and supply routes may be better suited at serving geographically proximate markets at relatively low transport costs, rather than building or increasing new production and logistics capabilities to serve distant markets where they face relatively higher transport costs.¹⁷ At the same time, all of these countries imposed the same sanctions on Russia and faced the same countermeasures, such that we can reasonably expect it unlikely that exporters from one country in the control group would export to Russia via another country in the control group and thereby bias our estimated treatment effect.

We first analyze whether and how sanctions impact the exported volume, quantities (units), and their prices (unit values). We then augment our product-level trade data with annual firm-level tax-records to observe firm-destination-year variation in foreign affiliate ownership. In doing so, we will gauge whether exporters with a foreign affiliate somehow benefit from having a local subsidiary in the target market.¹⁸

4.2 | Results

The results for the intensive margin of Dutch exports are reported in Table 2. Column 1 shows the aggregate effect across all EU-imposed sanctions on Russia since 2014, that is, the arms and military equipment embargo, the export restrictions on oil-industry related equipment listed in Annex II, and the export restrictions on dual-use products. The point estimate is negative and not statistically significant. The indicator for Russian retaliation is also included, with the negative and statistically significant coefficient suggesting a $[e^{-0.947} - 1] \times 100 = 61.2\%$ decrease in Dutch firm-level exports to Russia of products subject to countersanctions relative to non-sanctioned products, all else equal.

Column (2) includes $\ln(\text{tariffs})$ and $\ln(\text{productivity})$ as two key control variables, the latter reflecting that the intensive margin of exports is positively associated with productivity. Column (3) distinguishes between all three EU-imposed sanction regimes, and column (4) includes the control variables. Here, we find that Annex-II restrictions reduced exports by 57.6% and the arms embargo reduced exports by about 47.8%.

However, we do not find that dual-use restrictions affected the intensive margin of exports. A possible explanation for this finding is that dual-use goods can still be exported subject to strict export controls and government approval. Exporting goods that are destined for military use is prohibited, while civilian use is legally permitted.

Next, column (5)–(6) break down our intensive-margin results into the effects on exported quantities, and column (7)–(8) for their unit values. For Annex-II products, we find that the negative effects on the volume of exports are entirely driven through a drop in quantities, and not through lower prices. The same conclusion holds for products affected by the arms ban, as well as for products targeted by the Russian countersanctions.

Interestingly, we find no change in the quantities of traded dual-use goods. However, we do detect (statistically insignificant) increases of their unit values. This may reflect the additional costs of trading under these restrictive measures: exporters must apply for export licenses,

TABLE 2 Intensive margin of exports: volume, quantities, and unit values.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Volume	Volume	Volume	Volume	Quantity	Quantity	Unit Value	Unit Value
EU Sanctions	-0.136 (0.183)	-0.183 (0.181)						
Annex-II			-0.871*** (0.318)	-0.858** (0.340)	-1.249*** (0.402)	-1.138*** (0.359)	-0.409 (0.275)	-0.357 (0.278)
Arms			-0.693** (0.0492)	-0.651*** (0.0557)	-1.352*** (0.0977)	-1.392*** (0.101)	-0.134 (0.414)	-0.166 (0.414)
Dual use			-0.118 (0.186)	-0.166 (0.184)	0.155 (0.387)	-0.0982 (0.364)	0.0578 (0.0531)	0.0125 (0.0577)
Retaliation	-0.947*** (0.292)	-0.895*** (0.300)	-0.947*** (0.292)	-0.895*** (0.300)	-1.722*** (0.443)	-1.762*** (0.465)	-0.0266 (0.0602)	-0.0504 (0.0713)
ln(tariffs)		0.111 (0.103)		0.113 (0.104)		-0.262 (0.244)		-0.144 (0.180)
ln(productivity)		0.0469*** (0.0122)		0.0469*** (0.0122)		0.0837*** (0.00988)		0.000899 (0.00540)
Constant	14.10*** (0.00293)	13.88*** (0.0577)	14.10*** (0.00293)	13.87*** (0.0577)	14.71*** (0.00154)	14.37*** (0.0680)	9.247*** (0.00126)	9.202*** (0.0393)
Observations	15,603,784	15,131,211	15,603,784	15,131,211	14,383,412	13,952,475	2,857,104	2,789,627

Note: PPML estimates obtained using $ppmlhdfe$ (Correia et al. 2019). Dependent variable: firm-product-destination-year exports in volumes (column 1–4), quantities (column 5–6) and unit values (columns 7–8). Firm \times product \times destination and year fixed effects not reported. Robust standard errors in parentheses are clustered by firm and product \times destination. ***, **, and * refer to statistical significance at the 1%, 5%, and 10% level, respectively. The control group consists of the sample of European countries described in the main text (definition 1).

TABLE 3 Intensive margin of exports for exporters with and without Russian affiliates.

	(1)	(2)	(3)
	Volume	Volume	Volume
1 = FDI in Russia	0.137*** (0.0494)	0.144** (0.0663)	0.109 (0.110)
Annex-II	-0.765* (0.405)	-0.836** (0.409)	-0.903** (0.416)
Annex-II × FDI	-1.738*** (0.605)	-1.801*** (0.602)	-1.854*** (0.589)
Arms	-0.885*** (0.0692)	-0.928*** (0.0808)	-1.014*** (0.0868)
Arms × FDI	-0.00308 (0.0624)	-0.0605 (0.0726)	-0.150* (0.0785)
Dual use	-0.203 (0.214)	-0.247 (0.229)	-0.335 (0.236)
Dual use × FDI	-0.0266 (0.193)	-0.0693 (0.202)	-0.137 (0.214)
Retaliation	-0.961*** (0.347)	-1.009*** (0.349)	-1.104*** (0.351)
Retaliation × FDI	-0.571*** (0.215)	-0.606*** (0.230)	-0.695*** (0.230)
ln(tariffs)	0.118 (0.102)	0.239 (0.192)	0.246 (0.195)
ln(productivity)	0.0462*** (0.0123)	0.0620*** (0.0132)	0.0620*** (0.0201)
Constant	13.85*** (0.0579)	13.58*** (0.0604)	13.61*** (0.102)
Observations	15,131,211	7,196,843	2,166,275

Note: PPML estimates. Dependent variable: firm-product-destination-year exports in volumes. Firm × product × destination and year fixed effects not reported. Robust standard errors in parentheses are clustered by firm and product × destination. ***, **, and * refer to statistical significance at the 1%, 5%, and 10% level, respectively. The control group in column (1) consists of all sanctioned products exported to the sample of European and non-sanctioned products exported to Russia and/or the sample of European countries. In column (2), the control group only includes firms that do not export any products to Russia throughout the sample period. In column (3), the control group only includes firms that do not export any products to Russia throughout the sample period, and only sanctioned products.

provide technical information about the goods, contractual information, declarations concerning the traded products' end-use, legal statements explaining the receiving firm's activities, and so on.¹⁹ Moreover, restrictions on the exports of dual-use products imposed by the United States have been found to raise third parties' perceived risk and cost of doing business in dual-use goods with sanctioned states, a result which is consistent with the unilateral and extraterritorial scope of U.S. sanctions (Kohl, 2022; Peterson, 2021).

What about exporters with a Russian affiliate? A priori, we expect that relative to pure exporters, exporters with foreign affiliates might be better able to use their local resources and capabilities to adapt to export restrictions. Table 3 shows that exporters with a foreign affiliate

export $[e^{0.137} - 1] \times 100 = 146.8\%$ more compared to exporters that do not engage in FDI. Exports increase with firm productivity as per Table 2, and we see that the intensive margin of exports decreases for products subject to Annex II restrictions, the arms ban, and the Russian retaliatory measures.

Zooming in on the interaction term of the regime-specific sanction with FDI, we find that the point estimate for the interaction between Annex II sanctions and exporters with a foreign affiliate actually suggests that Annex-II restrictions hurt exports more when exporters have a Russian affiliate compared to sole exporters. However, the point estimates are not statistically different from each other. And, while the negative impact of the retaliatory sanctions is less pronounced for exporters with a Russian affiliate compared to those exporters that do not engage in FDI in Russia, the difference is not statistically significant.

While we find a similar pattern emerging for the arms sanctions, we are less inclined to attribute this to local presence because the arms ban is effectively an embargo with no exemptions. Instead, the insignificant coefficient estimate concerning the arms ban for firms with an affiliate is most likely explained by a very small number of underlying observations. Moreover, we find no difference in the association between dual-use sanctions and the intensive margin of trade conditioned on the presence of a Russian affiliate. While we might have hypothesized a priori that the insignificant result for dual-use sanctions in Table 2 is mainly driven by firms with a Russian affiliate, Table 3 shows that this is not the case.

To examine the robustness of our findings, we explore different configurations of the control group. In column (1), we use the full baseline sample as in Table 2, where the control group consists of all sanctioned products exported to the sample of European and non-sanctioned products that were exported to Russia and/or the European control group countries. A concern with the control group in column (1), is that includes firms that export non-sanctioned products to Russia, and that sanctions and the economic uncertainty they bring may cause these firms to reconsider their Russian business operations and relocate their exports and/or affiliates elsewhere. Therefore, in column (2), the control group only includes firm that do not export any products to Russia throughout the sample period. Column (3) presents a third and final alteration to the control group, which only includes firms that do not export any products to Russia throughout the sample period and only export sanctioned products. Note, in this case, that our triple diff-in-diff specification simplifies to a diff-in-diff setting because we no longer distinguish between sanctioned and non-sanctioned products.

Additional robustness checks are provided in Appendix C, where we show that our main results also hold when using our alternative control group of non-sanctioning, Central Asian countries. We also account for potential asymmetries between firms' responses to sanctions by interacting the sanction regime indicators with the terciles of $\log(\text{productivity})$.

Taken together, we draw two main takeaways from our analyses of the intensive margin of exports. First, sanction regimes have a heterogeneous impact in part due to differences in their design. The Annex-II restrictions, arms ban, and retaliatory measures reduce the intensive margin of exports. We do not observe any noticeable effect of dual-use restrictions for which exemptions can be more readily made, despite the fact that these cover the largest share of EU sanctions in terms of the number of exporters, products, and firms with Russian affiliates (as per Table 1). Second, exporters with a Russian affiliate are not necessarily better equipped than pure exporters at mitigating the negative impact of economic sanctions on the intensive margin of exports.

5 | EXTENSIVE MARGIN OF EXPORTS

5.1 | Estimation

In addition to investigating the effect of sanctions along the intensive margin of firm-level exports, we also look at their effect on the probability that a firm starts or stops exporting to Russia along the extensive margin of firm-level trade. Our methodology for the extensive margin of exports is a linear probability model that can be summarized as:

$$EM_{fzt} = \alpha + \beta_1 EU\text{sanction}_{zt} + \beta_2 \text{Retaliation}_{zt} + \delta C_{ft} + \zeta_{st} + \varepsilon_{fzt}. \quad (3)$$

Although this specification is very similar to Equation (2), there are important differences. First, we only focus on firms exporting to or investing in Russia at least once in the years 2010 through 2020. This a necessary step in order to be able to compare firms starting to export to Russia with continuous non-exporters. Second, we have to significantly increase the number of observations in our sample. The reason for this is because we are now interested in the probability of a firm starting to export new products, above and beyond those we observed in the intensive-margin analyses.

In other words, we now need to explicitly account for all firm-product-year-level “zeros” for all firms, even if these never exported a particular product to Russia throughout our sample. In addition, in the process of rectangularizing our dataset for all possible firms, products, and years in the sample used for the intensive-margin, we aggregate our eight-digit product dimension (p) into five classes (z), that is, (i) products listed in Annex II, (ii) products targeted by arms sanctions, (iii) dual-use products, (iv) products subject to Russian retaliation, and (v) non-sanctioned products, all while retaining the firm-year dimensions.²⁰ In doing so, we aim to facilitate the interpretation of our findings and keep our dataset manageable while retaining the product-level heterogeneity present in our data.

The dependent variable now is EM, a binary indicator that is unity when firm (f) started to export in product class z to Russia in year t . A condition is that this firm must have exported in the same product class to Russia in the preceding year, and at most once in the preceding three years. In line with our aggregation strategy, the binary sanctions variables now effectively vary by destination-class-year as opposed to destination-product-year in the intensive-margin case.

We are particularly interested in the degree to which owning a foreign affiliate in Russia affects the decision to enter or exit the Russian goods export market in the presence of sanctions. Given the available data from annual tax records, we observe all destination-years in which a Dutch firm operates a foreign affiliate.²¹ We include this information as a dummy variable in our regressions with value 1 if the firm owns an affiliate in Russia and value 0 otherwise, both separately and interacted with our sanctions variables. We expect Dutch exporters with an affiliate in Russia to be less hampered by sanctions in setting up new trade relations. Indeed, it seems reasonable to expect that a firm with deep affiliate ties with Russia will be better equipped at dealing with various sanctions regimes.

Since the extensive margin analysis only concerns Russia and we are interested in foreign affiliate ownership, the inclusion of firm fixed effects poses a serious complication because foreign affiliate ownership varies considerably less through time. We therefore include a set of firm characteristics in addition to the foreign affiliate dummy variable in our regressions in the vector C instead of firm fixed effects. More precisely, we include log labor productivity, a categorical variable for a combination of firm size and nationality of ownership (Small and Medium Enterprises,

the reference category; Large non-MNE firms, Dutch-owned MNEs, and foreign-owned Dutch MNEs), and a dummy variable for firms that Statistics Netherlands recorded as being a rapid grower, that is, if their workforce grew with at least 10% annually for at least three subsequent years. All regressions include sector (s) \times year fixed effects (ζ_{st}), and standard errors are clustered by firm.

To further explore how sanctions affect the extensive margin of trade, we also analyze export market exit following the same analogy. That is, we expect exporters with a foreign affiliate to have a stronger incentive to maintain their trading operations despite the presence of sanctions than in case of non-affiliated trade. The dependent variable here is a dummy variable with value 1 if the firm terminates exports to Russia after reporting a positive export value in the preceding year and zero for incumbent exporters. In order to be classified as an incumbent exporter, the firm needs to report exports to Russia in a particular product class in at least three of the most recent four years including in year t .

5.2 | Results

Table 4 presents the regression results based on Equation (3). Columns 1–4 show the results for export entrants. We find that the probability of entry is significantly and negatively affected by all sanction regimes (columns 1 and 3). Column 2 and 4 interact the respective sanction regime variables with a dummy that accounts for the presence of a firm's Russian affiliate. The interaction terms in column 2 reflects that firms subject to sanctions and without a Russian affiliate are *less* likely to enter Russia as exporters, compared to firms with a Russian affiliate. This difference (not shown) is statistically significant for all of the four sanction regimes. Thus, while all sanction regimes decrease the extensive margin of exports, the asymmetric effect on firms without a Russian affiliate is stronger. The parameter estimates for other control variables are in line with expectations: the probability of product market entry increases with productivity, firm growth, and activity as a multinational enterprise.

Columns 5–8 present our findings for the probability that sanctions affect the firm-level decision to exit Russia as an exporter of particular products. We find that the presence of a Russian affiliate reduces the overall probability of exit, while all sanction regimes increase the probability of product market exit. Unlike the case of product-market entry, we now do not find statistically different coefficients for the sanction-exporter and sanction-affiliate interactions. The only exception is for firms subject to Russian retaliatory measures. Indeed, having a Russian affiliate seems to insulate firms that are confronted with retaliatory measures: these sanctions do not change the incumbent firm's probability of exiting the market as an exporter. In contrast, exporters subject to Russian retaliation face an increased probability of exit, as do firms subject to any of the EU restrictions. Also observe that the parameter estimates for our main control variables are as expected, with product-market exit less likely for more productive firms and multinational firms.

Based on these findings, we draw two main conclusions for the extensive margin of exports. First, all four sanction regimes of interest had a negative impact of the extensive margin of exports through a decreased probability of entry into, as well as an increased probability of withdrawal from Russia. Second, foreign affiliates dampen the otherwise negative impact of sanctions on the probability of product market entry and helped incumbents to prolong their export activities in Russia despite retaliatory sanctions.

TABLE 4 Extensive margin of exports: Probability of entry and exit as exporter.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Entry	Entry	Entry	Entry	Exit	Exit	Exit	Exit
Russian affiliate = 1	-0.0156*** (0.00149)	-0.0949*** (0.00491)	-0.0156*** (0.00155)	-0.0952*** (0.00493)	-0.0828*** (0.0106)	-0.0741*** (0.0103)	-0.0821*** (0.0106)	-0.0740*** (0.0103)
Any EU sanction	-0.141*** (0.00195)				0.0795*** (0.00556)			
Retaliation	-0.159*** (0.00208)		-0.159*** (0.00208)		0.0756*** (0.0199)		0.0751*** (0.0199)	
Any EU sanction × Russian Affiliate = 0		-0.154*** (0.00211)				0.0815*** (0.00621)		
Any EU sanction × Russian Affiliate = 1		-0.0629*** (0.00399)				0.0670*** (0.0119)		
Retaliation × Russian Affiliate = 0		-0.172*** (0.00224)		-0.172*** (0.00225)		0.103*** (0.0261)		0.103*** (0.0261)
Retaliation × Russian Affiliate = 1		-0.0798*** (0.00444)		-0.0800*** (0.00444)		-0.00487 (0.0236)		-0.00584 (0.0237)
Annex-II			-0.160*** (0.00208)				0.219*** (0.0307)	
Arms			-0.164*** (0.00209)				0.224*** (0.0783)	
Dual use			-0.0924*** (0.00190)				0.0698*** (0.00556)	
Annex-II × Russian Affiliate = 0				-0.173*** (0.00224)				0.212*** (0.0334)
Annex-II × Russian Affiliate = 1				-0.0823*** (0.00442)				0.264*** (0.0711)
Arms × Russian Affiliate = 0				-0.177*** (0.00225)				0.202** (0.0860)

TABLE 4 (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Entry	Entry	Entry	Entry	Exit	Exit	Exit	Exit
Arms × Russian Affiliate = 1								
				-0.0878*** (0.00442)				0.312 (0.190)
Dual Use × Russian Affiliate = 0								0.0723*** (0.00623)
				-0.106*** (0.00207)				
Dual Use × Russian Affiliate = 1								0.0549*** (0.0116)
				-0.00925** (0.00408)				
In(reactivity)	0.00150*** (0.000212)	0.00146*** (0.000211)	0.00159*** (0.000216)	0.00155*** (0.000215)	-0.0204*** (0.00208)	-0.0203*** (0.00208)	-0.0204*** (0.00209)	-0.0204*** (0.00209)
Large non-MNEs	-0.0188*** (0.00170)	-0.0189*** (0.00171)	-0.0189*** (0.00174)	-0.0190*** (0.00175)	0.00900 (0.0242)	0.00859 (0.0242)	0.00857 (0.0242)	0.00821 (0.0242)
Dutch-owned MNEs	0.0126*** (0.00131)	0.0128*** (0.00131)	0.0134*** (0.00135)	0.0136*** (0.00135)	-0.151*** (0.0106)	-0.150*** (0.0106)	-0.152*** (0.0106)	-0.151*** (0.0106)
Foreign-owned MNEs	0.00544*** (0.00111)	0.00568*** (0.00112)	0.00678*** (0.00116)	0.00699*** (0.00117)	-0.180*** (0.00991)	-0.180*** (0.00993)	-0.180*** (0.00995)	-0.180*** (0.00996)
Rapid growth	0.00680*** (0.00167)	0.00676*** (0.00167)	0.00692*** (0.00170)	0.00687*** (0.00170)	-0.0124 (0.0119)	-0.0124 (0.0119)	-0.0122 (0.0119)	-0.0124 (0.0119)
Constant	0.158*** (0.00215)	0.169*** (0.00232)	0.157*** (0.00216)	0.168*** (0.00232)	0.487*** (0.0100)	0.486*** (0.0100)	0.487*** (0.0101)	0.486*** (0.0101)
Observations	295,950	295,950	295,950	295,950	31,993	31,993	31,993	31,993

Note: LPM estimates. Dependent variable (column 1–4): 1 = firm that start exporting to Russia in t = 0; 0 otherwise. Dependent variable (column 5–8): 1 = firm stops exporting to Russia in t = 0; 0 for firms that continue exporting to Russia. Sector × year fixed effects not reported. Robust standard errors in parentheses are clustered by firm. ***, **, and * refer to statistical significance at the 1%, 5%, and 10% level, respectively.

6 | FDI DYNAMICS

6.1 | Estimation

The remainder of our analysis delves deeper into understanding how sanctions affect firms' FDI activities in the target destination. A possibility may be that firms exposed to trade sanctions will engage in "sanctions-jumping" behavior, that is, start a foreign affiliate in the target destination as a means to circumvent the new trade restrictions imposed by the sanctions on that destination. In contrast, firms face a wide range of entry barriers and sanctions further increase the firm's entry costs and liability of foreignness, which may make other non-sanctioned markets relatively more attractive and reduce their probability of investing in the target market (also see Chen & Moore, 2010; Denk et al., 2012).

To investigate how sanctions affect firm-level foreign market entry decisions through FDI, we consider the case of firms starting a Russian affiliate through FDI versus those firms that do not start a Russian affiliate. This implies that we restrict the sample to only those firms that exported t , or invested in Russia at least once in 2010–2020, so that we can analyze if exposure to sanctions incentivizes change in the choice of entry mode for firms that risk seeing their exports restricted by the sanctions. We employ a linear probability model to determine how sanctions impact the dynamics of FDI entry along the extensive margin. That is, we estimate:

$$FDI_{ft} = \alpha + \beta_1 \text{exposure}_{f,2010-2013} + \delta C_{ft} + \zeta_{st} + \epsilon_{ft}, \quad (4)$$

where FDI is a binary variable that is unity for a firm f which starts a foreign affiliate in Russia in period t after not having owned an affiliate there in the preceding year, having reporting an affiliate in Russia at most once in the preceding three years, and that exported a product to Russia at least once in the period $t - 3, t - 1$; and 0 for firms that do not start a Russian affiliate in period t in addition to the three preceding years but did export a product to Russia at least once in the period $t - 3, t - 1$.²²

We measure exposure to sanctions at the firm-level as follows: We calculate the share of products exported to Russia that are sanctioned from 2014 onwards in the export portfolio of individual firms in the pre-sanction period of 2010–2013. That is, for each sanction regime we sum the exports of the relevant products to Russia over the years 2010 through 2013 and divide this number by the total value of the firm's goods exports in these four years. This yields one measure of export exposure to Russia for each firm and each sanction regime, which does not vary over time.

Given that firm exposure to sanctions is defined at the firm level, we are again unable to include firm fixed effects in the regressions and resort to using a vector C of potentially important firm-level characteristics defined as discussed in Section 5.1. All regressions include sector \times year fixed effects (ζ_{st}), and standard errors are clustered by firm.²³

Finally, we also explore if exposure to sanctions increases the likelihood of firms to terminate their operations through their Russian affiliates. That is, we expect that incumbent firms with Russian affiliates have an incentive to retain their foreign operations unless the cost of remaining exceed the cost of leaving/relocating elsewhere, a phenomenon observed when more than a thousand globally active firms withdrew their Russian operations following the 2022 escalation of the Russo-Ukrainian War (see Sonnenfeld et al., 2022).

Our approach enables us to empirically determine whether the 2014 sanctions incentivized firms with Russian affiliates that were exposed to these sanctions to terminate their Russian affiliates. To that end, we modify the dependent variable in Equation (4) such that it is 1 for firms that

terminate their affiliate in Russia in period t , and 0 for firms that continue operations through a Russian affiliate in period t (also see Alvarez & López, 2005). In order to qualify as an incumbent investor, the firm needs to report owning an affiliate in Russia in at least three of the most recent four years including in year t .

6.2 | Results

We first consider the probability that exposure to sanctions increases the probability that exporters will circumvent the additional sanctions-induced trade costs and uncertainties by establishing a market presence in Russia through a foreign affiliate, that is, the “sanctions-jumping” hypothesis.

Table 5 presents our main result on FDI entry. We find that exposure to any sanction regime does not affect the probability of exporters to establish a Russian affiliate (column 1), even when distinguishing between different sanction regimes (column 2). This also holds when we only focus on majority-owned foreign affiliates (column 3), widen the analysis to consider all available industries ranging from Agriculture up to and including Services (column 4), or only consider Manufacturing (column 5), Trade (column 6) or both Manufacturing and Trade combined (column 7). If anything, our controls suggest that prior export experience increases the probability of FDI entry, and that the decision to engage in FDI is positively associated with productivity. We also find that the results are consistent with firm type: compared to small and medium Dutch enterprises, Dutch-owned and foreign-owned MNEs operating from the Netherlands are more likely to establish an affiliate in Russia. Overall, our results do not suggest that there is evidence of “sanctions jumping,” at least not through the extensive margin of FDI.

Do sanctions affect the probability of firms withdrawing from Russia by terminating their Russian affiliate? This question is addressed in Table 6, which follows an identical structure as described before for Table 5. As with FDI entry, we do not find that exposure to any European sanction regime increases the probability of foreign affiliate termination. However, we do find that a higher exposure to Russian countersanctions significantly increases the probability of closing the local affiliate (column 2). This result is particularly strong for Russian affiliates owned by Dutch wholesale firms (column 6). Interestingly, we see the opposite for Russian affiliates owned by Dutch manufacturing firms (column 5).

The seemingly contradictory finding raises an important question concerning the complementarity between (intrafirm) trade with, and the activities of, foreign subsidiaries. It is possible that the decision to close a local affiliate crucially hinges on the degree to which the activities of the Russian affiliate depend on supplies provided by the Dutch parent or other affiliated firms and the degree to which these supplies are subject to sanctioning. The results seem to suggest this is a more imminent issue for wholesalers supplying to local Russian distributors than for manufacturing firms, whose Russian affiliates may be less dependent on supplies from their Dutch parent.

Overall, we conclude that the EU sanctions did not affect the probability of firm entry or exit through FDI. We do not find that exporters exposed to sanctions switch to FDI as an alternative means to serving a target destination. However, the Russian retaliatory measures did affect the exit decisions of firms with a Russian affiliate. We find that a greater exposure to these sanctions increases the probability of wholesalers closing down their Russian affiliates due to restricted access to import markets. In contrast, Dutch manufacturing firms in exposed sectors were less likely to terminate their Russian operations, possibly because of Russian demand for manufacturing products shifting from the international to the domestic market.

TABLE 5 Extensive margin of FDI: Probability of exporter starting a Russian affiliate.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	FDI entry	FDI entry	FDI entry	FDI entry	FDI entry	FDI entry	FDI entry
Exposure ₁₀₋₁₃ : Any regime	0.00456 (0.00485)						
Exposure ₁₀₋₁₃ : Annex-II		-0.0109 (0.0107)	-0.00945 (0.0100)	-0.000615 (0.0102)	-0.0104 (0.0214)	-0.0106 (0.00983)	-0.0113 (0.0108)
Exposure ₁₀₋₁₃ : Arms		-0.0201 (0.0242)	-0.0197 (0.0234)	-0.00375 (0.0196)	-15.67*** (3.151)	-0.0247 (0.0256)	-0.0201 (0.0243)
Exposure ₁₀₋₁₃ : Dual Use		0.00417 (0.00570)	0.00387 (0.00559)	0.000754 (0.00483)	-0.00195 (0.00544)	0.00782 (0.00812)	0.00444 (0.00581)
Exposure ₁₀₋₁₃ : Retaliation		0.00878 (0.00681)	0.00727 (0.00636)	0.00171 (0.00707)	-0.0305 (0.0804)	0.0109 (0.00784)	0.0108 (0.00790)
Exporter _{t-1} = 1	0.00379*** (0.00106)	0.00379*** (0.00106)	0.00395*** (0.000987)	0.00171 (0.00107)	0.00749*** (0.00201)	0.00158 (0.00125)	0.00372*** (0.00108)
ln(productivity)	0.00209** (0.000811)	0.00209** (0.000812)	0.00191** (0.000789)	0.00304*** (0.000846)	0.00175 (0.00212)	0.00238*** (0.000848)	0.00213** (0.000837)
Large non-MNEs	-0.00204* (0.00123)	-0.00204* (0.00124)	-0.00159 (0.00116)	-0.00183 (0.00130)	-0.00156 (0.00185)	-0.000669 (0.000649)	-0.00209* (0.00124)
Dutch-owned MNEs	0.0124*** (0.00175)	0.0124*** (0.00175)	0.0119*** (0.00170)	0.0141*** (0.00174)	0.0155*** (0.00285)	0.0102*** (0.00222)	0.0123*** (0.00176)
Foreign-owned MNEs	0.0150*** (0.00172)	0.0150*** (0.00172)	0.0135*** (0.00163)	0.0168*** (0.00170)	0.0182*** (0.00286)	0.0132*** (0.00217)	0.0151*** (0.00174)
Rapid growth	0.0000173 (0.00233)	0.0000174 (0.00233)	-0.0000702 (0.00219)	-0.0000302 (0.00227)	0.00254 (0.00438)	-0.00124 (0.00271)	0.000104 (0.00240)
Constant	-0.0108*** (0.00356)	-0.0108*** (0.00357)	-0.0104*** (0.00348)	-0.0133*** (0.00367)	-0.0118 (0.00933)	-0.0111*** (0.00368)	-0.0109*** (0.00366)
Observations	22,646	22,646	22,837	26,277	8503	13,552	22,055
Sectors	A-G (Agri-Trade)	A-G (Agri-Trade)	A-G (Agri-Trade)	A-S (Agri-Service)	C (Manufac- turing)	G (Trade)	C + G
Subsidiaries	All	All	Majority owned	All	All	All	All

Note: LPM estimates. Dependent variable: 1 for firms starting a foreign affiliate in Russia in period t after not owning an affiliate there in the preceding year and reporting an affiliate in Russia at most once in the preceding three years, and that exported a product to Russia at least once in the period $t-3$, $t-1$; and 0 for firms that do not start a Russian affiliate in period t in addition to the three preceding years but did export a product to Russia at least once in the period $t-3$, $t-1$. Sector \times year fixed effects not reported. Robust standard errors in parentheses are clustered by firm. ***, **, and * refer to statistical significance at the 1%, 5%, and 10% level, respectively.

7 | DISCUSSION AND CONCLUSION

This study analyzes the case of the 2014 EU export restrictions on trade with Russia, and Russia's retaliatory import restrictions on certain EU exports. Using detailed firm-level trade and tax records for all Dutch firms over the period 2010–2020, we empirically investigate how four distinct sanctions regimes impacted exports and FDI. Our product-level sanction data at the 8-digit

TABLE 6 Extensive margin of FDI: Probability of foreign affiliate termination.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	FDI exit	FDI exit	FDI exit	FDI exit	FDI exit	FDI exit	FDI exit
Exposure ₁₀₋₁₃ : Any regime	-0.140 (0.110)						
Exposure ₁₀₋₁₃ : Annex-II		0.819 (0.649)	0.977 (0.850)	0.857 (0.660)	-0.157 (0.822)	0.989 (0.732)	0.812 (0.646)
Exposure ₁₀₋₁₃ : Arms		-2.519 (3.435)	-8.180** (3.756)	8.158 (12.26)	-5.885 (3.950)	0(.)	-2.716 (3.443)
Exposure ₁₀₋₁₃ : Dual Use		-0.174 (0.112)	-0.0623 (0.0861)	-0.122 (0.0842)	-0.0998 (0.0980)	-0.213 (0.163)	-0.175 (0.113)
Exposure ₁₀₋₁₃ : Retaliation		0.256*** (0.0739)	-0.847 (0.575)	0.267*** (0.0683)	-0.792* (0.455)	0.320*** (0.0302)	0.256*** (0.0740)
Exporter _{t-1} = 1	-0.0126 (0.0115)	-0.0123 (0.0115)	-0.00910 (0.0119)	-0.0132 (0.00960)	-0.0161 (0.0160)	-0.00935 (0.0163)	-0.0130 (0.0116)
ln(productivity)	-0.0147** (0.00616)	-0.0148** (0.00616)	-0.0222*** (0.00646)	-0.0135*** (0.00437)	-0.0272** (0.0119)	-0.0105 (0.00720)	-0.0152** (0.00627)
Large non-MNEs	0.507*** (0.0818)	0.505*** (0.0809)	0.0415 (0.0791)	0.567*** (0.0610)	0.459** (0.182)	0.499*** (0.0876)	0.497*** (0.0832)
Dutch-owned MNEs	-0.422*** (0.0817)	-0.426*** (0.0806)	-0.859*** (0.0773)	-0.374*** (0.0591)	-0.476** (0.189)	-0.419*** (0.0841)	-0.431*** (0.0831)
Foreign-owned MNEs	-0.339*** (0.0814)	-0.340*** (0.0805)	-0.757*** (0.0778)	-0.279*** (0.0593)	-0.401** (0.189)	-0.324*** (0.0843)	-0.346*** (0.0829)
Rapid growth	-0.00203 (0.0170)	-0.00165 (0.0171)	-0.00482 (0.0183)	-0.0191 (0.0125)	0.0150 (0.0283)	-0.00772 (0.0220)	0.00129 (0.0174)
Constant	0.547*** (0.0868)	0.549*** (0.0856)	1.020*** (0.0837)	0.487*** (0.0628)	0.660*** (0.196)	0.517*** (0.0916)	0.556*** (0.0880)
Observations	3488	3488	3119	5502	1785	1626	3411
Sectors	A-G (Agri-Trade)	A-G (Agri-Trade)	A-G (Agri-Trade)	A-S (Agri-Services)	C (Manufacturing)	G (Trade)	C + G
Subsidiaries	All	All	Majority owned	All	All	All	All

Note: LPM estimates. Dependent variable: 1 for firms that terminate their affiliate in Russia in period *t*; 0 for firms that continue operations through a Russian affiliate in period *t*. Sector × year fixed effects not reported. Robust standard errors in parentheses are clustered by firm. ***, **, and * refer to statistical significance at the 1%, 5%, and 10% level, respectively.

CN level accounts for the EU’s export restrictions on arms, equipment used for oil exploration and extraction (so-called “Annex-II” goods), dual-use products suitable for civilian and military use, as well as the Russian retaliatory import ban on various raw materials and agricultural and food products.

Our findings highlight the negative impact of sanctions along the intensive margin of exports, which is entirely driven by a decrease in quantities exported. This result applies to all sanction regimes except for the dual-use restrictions. For the extensive margin of exports, all four sanction regimes reduce the probability that firms start exporting to Russian product markets, and increase

the probability of withdrawal. We also show that such withdrawal is permanent: once exporters have left the market, they do not re-enter later through either exports or FDI.

Our unique dataset on firm-level trade and FDI allow us to also shed light on how sanctions affect firms with foreign affiliates differently than firms that exclusively serve foreign markets through exports. Indeed, we find evidence that exporters with a foreign affiliate in Russia seem better able to cope with trade sanctions. While sanctions reduce the probability of entry for all firms, this effect is smaller for firms with an affiliate in the target market relative to exporters. Moreover, Russian countersanctions only seem to have induced withdrawal among exporters without a Russian affiliate. These findings could be explained by superior local resources and capabilities that these firms may have to navigate around the restrictive measures. Another possibility is that firms with a local presence may offer a larger variety of (non-sanctioned) products compared to exporters, making it relatively easier to start and continue exporting to Russia.

We also explore the question of “sanctions jumping,” that is, that exporters faced with higher trade costs imposed by sanctions will seek to circumvent these trade restrictions by starting an affiliate in the target market. We do not find any evidence that this was the case for the 2014 EU-Russian sanction episode. However, our results do show that higher exposure to retaliatory trade sanctions increases the likelihood that firms may terminate their Russian affiliate, particularly among wholesalers.

Our findings paint an interesting and novel picture of the way in which a local affiliate can be instrumental in dealing with trade sanctions. A local presence helps exporters mitigate some of the restrictions imposed on the extensive margin of trade. However, our results also indicate that in particular cases a high exposure to trade sanctions can have a detrimental effect on the extensive margin of FDI. This raises follow-up questions with respect to the complementarity between trade and FDI. Our results suggest that local affiliates that are more dependent on supplies by the parent company for their operations might be more sensitive to sanctions on these supplies. If that dependence is lower, local presence may be a valuable instrument to dealing with countersanctions. Future research could dig deeper into this apparent complementarity between trade with and activities of local affiliates, for example by employing data distinguishing between vertical and horizontal FDI and supply-chain interlinkages.

Our results also highlight the importance of accounting for the heterogeneous nature and impact of sanction regimes. Particularly dual-use sanctions and the Russian countersanctions show to be omnipresent and induce differential trade and FDI patterns relative to Annex-II sanctions and arms bans. It is our hope that future research will continue along this path of distinguishing between the products that are, and are not, subject to various specific sanction regimes. Doing so allows empirical researchers to improve upon the measurement error implied by aggregate-level studies that fail to account for the specific designs of uniquely crafted sanction regimes.

Another exciting avenue for future research relates to further examining how firms can, or cannot, reorganize their supply chains and foreign entry modes to weather the potential economic storms brought on by restrictive measures. A possibility is that firms with foreign affiliates may be better able—relative to exporters—to create carveouts or preferential trade policies to navigate around trade barriers brought on by sanctions or other restrictive trade policies (see, e.g., Blanchard & Matschke, 2015; Rodrik, 2018). An alternative channel could be through so-called “sanctions busting,” in that firms with superior organizational or logistical capabilities can more easily find alternative supply routes to bring their sanctioned products to the target destination through co-operative, non-sanctioning states (see, e.g., Early, 2015).

For now, we conclude that both the EU's export restrictions, as well as the Russian countermeasures, imposed a sizeable cost on Dutch firms operating in Russia. Ultimately, the Dutch economy ended up paying not just for one bill, but two.

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CONFLICT OF INTEREST STATEMENT


The authors declare that they have no relevant conflict of interests related to the findings in this article.

DATA AVAILABILITY STATEMENT

The data used in this study are subject to licensing by CBS/Statistics Netherlands. Stata do-files used to replicate the findings in this paper are available upon request. A replication package for the product-level sanction regimes is publicly available at <https://doi.org/10.34894/O1FB3L> (see Appendix A for details).

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ENDNOTES

- ¹ See Dreger et al. (2016) for a detailed account of how the political conflict evolved.
- ² For a detailed description of the timeline and political decisions taken, see Hedberg (2017) and Cheptea and Gagné (2020).
- ³ Sanctions-jumping FDI is a closely related to tariff-jumping FDI, whereby firms facing a proximity-concentration trade-off will opt to serve a foreign market through (horizontal) FDI to circumvent a trade barrier such as tariffs (for an overview, see Bloningen et al., 2004).
- ⁴ While Crozet and Hinz (2020) and Gullstrand (2020) also account for sanctions regimes (i), (ii), and (iv), we are the first to also consider restrictions on dual-use goods.
- ⁵ See Section 3.1 and Appendix A for details.
- ⁶ <https://longreads.cbs.nl/european-scale-2019/>.
- ⁷ <https://www.cbs.nl/en-gb/news/2019/03/agricultural-export-value-over-90-bn-euros-in-2018>. In 2013, the total amount of Dutch exports to Russia was 4.7 billion euro, of which €1.3 billion (28%) accounts for primary or secondary agricultural products. Approximately €226 million, or 21.5% of these agricultural exports, were subject to the Russian retaliatory restrictions that were imposed in 2014.
- ⁸ The only exception is Onderco and Veer (2021), who study the impact of the 2014 Russian sanctions on Dutch firms' survival with a matching method. They find that compared to non-affected peers, firms exposed to sanctions (i.e., exporting products affected by the EU sanctions or Russian counter-sanctions) were more likely to see a decline in their foreign sales and to quit as exporter shortly after the sanctions were imposed. However, conditional on export survival, firms exposed to sanctions do not perform worse compared to non-exposed firms.
- ⁹ Council Decision 2014/512/CFSP (Article 2.1), Council Regulation (EU) No. 833/2014 (Article 4.1(a) and 4.2).
- ¹⁰ Council Decision 2014/512/CFSP (Article 4.1), Council Regulation (EU) No. 833/2014 (Article 3.1–3.6 & Annex II).
- ¹¹ Council Decision 2014/512/CFSP (Article 3.1), Council Regulation (EU) No. 833/2014 (Article 2.1 and 2.2).

- ¹² See a translation of Resolution No. 830 (August 20, 2014) of the Government of the Russian Federation, available at https://food.ec.europa.eu/system/files/2016-10/ia_eu-russia_ru-eu-import-ban_20140820_unoff-trans-en.pdf, accessed October 31, 2022.
- ¹³ We further distinguish between structural and incidental exporters, that is, firms that consistently serve a given destination with a certain product every year as opposed to firms that only do so intermittently (van den Berg et al., 2022).
- ¹⁴ Missing intra-EU tariffs are set to zero.
- ¹⁵ The combination of economic sanctions and low oil prices set the Russian economy on a path towards recession in 2014, from which it gradually recovered through an uptake in domestic demand in the second half of 2016 and first half of 2017 (World Bank, 2017). The period of modest economic growth between 2017 and 2019 came to an abrupt end in 2020 with the onset of the COVID-19 pandemic (World Bank, 2020). While the destination and year fixed effects control for these changes in macroeconomic conditions over time, our approach does not specifically distinguish between the direct effect of sanctions on trade and FDI, and their indirect effect on macroeconomic performance through increased economic uncertainty for doing business in Russia (see, e.g., Altug & Yesiltas, 2021).
- ¹⁶ That is, if a firm only exported product X in 2015 to country Y, we will impute zero trade flows for the other years between 2010 and 2020 for this specific firm x country x product combination. However, we do not impute zeros for this firm to other countries or other products.
- ¹⁷ A concern may be that our results are driven by this selection of countries. Therefore, as a robustness check, we also consider a second control group consisting of non-European, non-sanctioning countries consisting of Belarus, Kazakhstan, Kyrgyz Republic, Turkmenistan, Turkey, Ukraine, and Uzbekistan. While the number of observations in this alternative control group is significantly smaller compared to our preferred European control group, our main findings remain qualitatively similar. All results are available from the authors upon request.
- ¹⁸ For a recent discussion on the complementarity versus substitutability tradeoff between FDI and exports, see Bricongne et al. (2023).
- ¹⁹ See <https://www.government.nl/documents/directives/2012/04/12/user-guide-on-strategic-goods-and-services> for the Government of the Netherlands' official user guide on strategic goods and services, accessed November 15, 2022.
- ²⁰ Note that as explained in Appendix A, there is a minor overlap of 9 product codes that are subject to two EU sanction regimes. These codes are double-counted, that is, they feature in all applicable sanction regimes.
- ²¹ Unfortunately, affiliate size is not observed, which constrains the analysis to the extensive margin of FDI.
- ²² Note that the product and class dimensions from earlier equations are no longer included on account of us now observing all firms' FDI activities *regardless* of whether these firms engage in international trade. That is, here we consider the full range of Dutch firms including those that do not trade in goods.
- ²³ In unreported robustness checks, we analyzed these results at the sectoral level but these did not reveal qualitatively different results. The same conclusion holds for regressions in which we interacted the exposure variable with export values. These results are available from the authors upon request.
- ²⁴ See <https://doi.org/10.34894/O1FB3L>.
- ²⁵ See <https://circabc.europa.eu/ui/group/0e5f18c2-4b2f-42e9-aed4-dfe50ae1263b/library/c3d06bd7-6ef0-4771-bbd7-f92b976ae9a0>, accessed October 31, 2022.
- ²⁶ See https://food.ec.europa.eu/system/files/2016-10/ia_eu-russia_ru-eu-import-ban_20140820_unoff-trans-en.pdf, accessed October 31, 2022.

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APPENDIX A. CODING OF RESTRICTIVE MEASURES AT THE CN8-DIGIT LEVEL

This appendix documents how information was retrieved from available sources to identify CN8-digit products by sanction regime. For brevity and ease of use, we refer the reader to our publicly available Stata dataset and do-files for a full list of CN8-digit codes per sanction regime.²⁴

A.1. Arms embargo

The first sanction regime we consider is the arms embargo, formally defined as an export prohibition of “arms and related materiel of all types, including weapons and ammunition, military vehicles and equipment, paramilitary equipment, and spare parts therefore” in Council Decision 2014/512/CFSP, Article 2.1. A formal list of relevant CN8-codes is not available. We therefore perform a keyword search in the official descriptions of all 8-digit Common Nomenclature codes to identify any possible matches with words related to weapons, ammunition, arms, military, etc. We then manually go over all potential matches to filter out any possible mistakes (e.g., toy weapons). In addition, we consider all products in Chapter 93 (Arms and ammunition; parts and accessories thereof) to be subject to this export prohibition. All in all, the arms embargo covers 33 CN8-digit product codes.

A.2. Export restrictions on Annex-II goods

The second sanction regime is “[an] export restriction subject to prior authorization of certain technologies suited to [arctic, deep sea or shale] oil exploration and production,” as per Council Decision 2014/512/CFSP, Article 4.1, and Council Regulation (EU) No. 833/2014, Article 3.1. Note that exporting these goods is subject to restrictions, but not prohibited as in the case of arms and military equipment. The products subject to these restrictions are stated in Annex-II of the Council Decision and comprise a list of 43 CN8-digit product codes.

A.3. Export restrictions on dual-use goods

The EU’s third and final sanction regime is “[an] export restriction subject to prior authorization on the exports of dual-use goods and technology” to Russia, that is, products with both a civilian and military application. This is stated in Council Decision 2014/512/CFSP, Article 3.1, and Council Regulation (EU) No. 833/2014, Article 2.1. Note that exporting these goods is subject to restrictions, but not prohibited as in the case of arms and military equipment. The EU’s list of dual-use products at the CN8-digit level covers 1512 products and is available via TARIC.²⁵

A.4. Russian retaliatory import restrictions

In response to the EU’s export restrictions and prohibitions, Russia imposed import restrictions on certain agricultural products, raw materials and foodstuffs originating from Australia, Canada, the EU, Norway, and United States. The relevant CN codes, 1009 in total, are contained in an unofficial translation by the EC of the Russian Federation’s Resolution 830 of August 20, 2014.²⁶

A.5. Overlapping CN-codes

A total of 9 CN8-codes are subject to more than one sanction regime. In all cases, these products are subject to, at most, two sanction regimes. The following products are covered by both the arms ban and the dual-use restrictions: 36.02.00.00 (Prepared explosives (excl. propellant powders), 93.01.10.00 (Artillery weapons “e.g., guns, howitzers and mortars”), 93.01.90.00 (Military weapons, incl. sub-machine guns), 93.03.90.00 (Firearms and similar device which operate

by the firing of an explosive charge), and 93.04.00.00 (Spring, air or gas guns and pistols, truncheons and other non-firearms). The remaining products are covered by the Annex-II restrictions and dual-use restrictions: 84.13.50.40 (Dosing and proportioning reciprocating positive displacement pumps, power-driven), 84.13.60.80 (Rotary positive displacement pumps, power-driven), 84.13.82.00 (Liquid elevators), and 84.31.49.20 (Parts of machinery of heading 8426, 8429 and 8430 of cast iron or cast steel, n.e.s.)

APPENDIX B. DESCRIPTIVE STATISTICS

Table B1 provides descriptive statistics for the main variables of interest on the volume, quantity and unit values of exports. FDI is a binary variable that is one for a firm with a foreign affiliate at the firm-destination-year level. Labor productivity varies at the firm-year level and tariffs at the product-destination-year level.

TABLE B1 Descriptive statistics.

Variable	Observations	Mean	Std. dev.	Min.	Max.
Full sample					
Exports: Volume	18,819,738	22,158.6	645,846.2	0.0	49,500,000.0
Exports: Quantities	18,819,738	11,093	900,268.3	0.0	1,300,000,000.0
Exports: Unit values	3,743,382	217.9	8947.3	0.0	8,094,400.0
FDI	18,819,738	0.1	0.3	0.0	1.0
Labor productivity	18,819,738	216.1	9043.5	-204,696.4	1,106,849.0
Tariffs	18,587,501	1.30	7.0	0.0	495
Observations under EU sanctions					
Exports: Volume	182,533	31,835.8	526,813.7	0.0	47,500,000.0
Exports: Quantities	182,533	2834.2	120,510.0	0.0	33,100,000.0
Exports: Unit values	30,583	504.8	7074.6	0.0	430,848.2
FDI	182,533	0.2	0.4	0.0	1.0
Labor productivity	182,533	138.5	1292.2	-72,543.4	77,664.0
Tariffs	182,533	3.7	4.1	0.0	20.0
Observations under Russian countersanctions					
Exports: Volume	19,618	32,917.8	249,146.1	0.0	15,300,000.0
Exports: Quantities	19,618	20,714.4	210,498.6	0.0	12,500,000.0
Exports: Unit values	4204	3.9	5.5	0.1	91.8
FDI	19,618	0.1	0.3	0.0	1.0
Labor productivity	19,618	124.2	685.0	-2610.0	77,664.0
Tariffs	19,130	9.4	8.0	0.0	80.0

Note: Descriptive statistics for key variables discussed in the main text.

APPENDIX C. ADDITIONAL RESULTS FOR THE INTENSIVE MARGIN OF EXPORTS

We hypothesize, consistent with the firm heterogeneity literature, that more productive firms are better able to navigate around sanctions and/or are impacted less severely by sanctions due to a diversified export portfolio spanning several countries. We therefore repeat our analyses of Table 2 for the sample of non-sanctioning Central Asian countries to verify that these results are not driven by the selection of European countries in the control group. Table C1 repeats the structure of Table 2, with all results now based on the alternative control sample. Comfortingly, all parameter estimates are similar in terms of size, sign, and statistical significance. We therefore conclude that with the exception of dual-use goods, the negative impact of the EU arms ban, Annex-II goods, and the Russian retaliatory measures on the intensive margin of Dutch firm-level exports to Russia reduced the intensive margin of exports, largely driven through a change in lower quantities traded.

As a further sensitivity analysis, we consider asymmetries between firms in how firm characteristics may affect the extent to which sanctions diminish the intensive margin of trade. Our guiding intuition à la Melitz (2003) is that, to the extent that sanctions are not complete embargos, more productive firms are better able to incur additional trade costs imposed by sanctions compared to their less productive peers. As a result, sanctions reduce the intensive margin of exports to a relatively greater extent for firms on the lower end of the productivity distribution compared to firms on the higher end of this distribution. We test this hypothesis by interacting the sanction regime indicators in Equation (2) with terciles of $\log(\text{productivity})$. The results are presented in Table C2, which follows the same structure as Table 3 in the main text with various configurations of the control group to verify the robustness of the results.

Interestingly, we find partial evidence in support of our hypothesis across all three versions of our control group. Annex-II restrictions indeed reduce the intensive margin of exports for firms in the lowest tercile of the productivity distribution, but not for firms in the second or third tercile. As expected, the arms embargo, with its complete ban on arms and military equipment, negatively affects all firms across the productivity distribution. And, given that we did not find a significant effect of dual-use restrictions on the intensive margin of trade, it is not surprising that we do not find a systematic effect for any particular productivity tercile. However, we also find that the Russian sanctions reduced the intensive margin of exports across all productivity terciles, without a clear pattern that is consistent with our prior expectations. Regardless of the control group considered, our findings are qualitatively and quantitatively quite similar. These results suggest that the detrimental impact of economic sanctions on the intensive margin of exports are not systematically biased towards the least productive firms: the design and scope of the trade restriction matters.

TABLE C1 Intensive margin of exports: volume, quantities, and unit values (Central Asian control group).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Volume	Volume	Volume	Volume	Quantity	Quantity	Unit value	Unit value
EU sanctions	0.0127 (0.184)	-0.0354 (0.178)						
Annex-II			-0.760** (0.314)	-0.717** (0.335)	-1.300*** (0.408)	-1.184*** (0.374)	-0.417 (0.269)	-0.383 (0.272)
Arms			-0.530*** (0.0591)	-0.492*** (0.0614)	-1.440*** (0.220)	-1.427*** (0.173)	-0.116 (0.419)	-0.122 (0.423)
Dual Use			0.0291 (0.187)	-0.0201 (0.181)	0.0901 (0.415)	-0.129 (0.388)	0.0737* (0.0404)	0.0349 (0.0523)
Retaliation	-0.789*** (0.293)	-0.740** (0.302)	-0.789*** (0.293)	-0.740** (0.302)	-1.800*** (0.474)	-1.792*** (0.482)	-0.00372 (0.0620)	-0.0126 (0.0651)
ln(tariffs)		-0.0133 (0.0858)		-0.0117 (0.0859)		-0.105 (0.254)		0.0146 (0.0791)
ln(productivity)		0.0485** (0.0188)		0.0485** (0.0188)		0.0877* (0.0462)		-0.00612 (0.0134)
Constant	14.22*** (0.0120)	14.03*** (0.137)	14.22*** (0.0120)	14.03*** (0.137)	15.83*** (0.00592)	15.32*** (0.422)	10.38*** (0.00313)	10.41*** (0.120)
Observations	3,277,541	3,045,270	3,277,541	3,045,270	3,159,756	2,941,112	405,171	386,929

Note: PPML estimates. Dependent variable: firm-product-destination-year exports in volumes (column 1–4), quantities (column 5–6) and unit values (columns 7–8). Firm × product × destination and year fixed effects not reported. Robust standard errors in parentheses are clustered by firm and product × destination. ***, **, and * refer to statistical significance at the 1%, 5%, and 10% level, respectively. The control group consists of the sample of Central Asian countries described in the main text.

TABLE C2 Intensive margin of exports and firm productivity.

	(1)	(2)	(3)
	Volume	Volume	Volume
T2.log(productivity)	0.069 (0.0437)	0.167*** (0.0385)	0.119* (0.0666)
T3.log(productivity)	0.164*** (0.0430)	0.230*** (0.0546)	0.191** (0.0834)
Annex-II ×			
T1.log(productivity)	-1.460*** (0.290)	-1.529*** (0.294)	-1.614*** (0.301)
T2.log(productivity)	-0.456 (0.361)	-0.544 (0.360)	-0.580 (0.360)
T3.log(productivity)	-0.496 (0.380)	-0.568 (0.377)	-0.631* (0.370)
Arms ×			
T1.log(productivity)	-0.377*** (0.0628)	-0.355*** (0.0891)	-0.483*** (0.105)
T2.log(productivity)	-0.627*** (0.0609)	-0.680*** (0.0688)	-0.767*** (0.0750)
T3.log(productivity)	-0.811*** (0.0840)	-0.840*** (0.0762)	-0.928*** (0.0853)
Dual use ×			
T1.log(productivity)	-0.163 (0.221)	-0.148 (0.224)	-0.260 (0.233)
T2.log(productivity)	-0.489 (0.323)	-0.560* (0.338)	-0.634* (0.344)
T3.log(productivity)	0.00914 (0.148)	-0.0246 (0.162)	-0.104 (0.169)
Retaliation ×			
T1.log(productivity)	-1.194*** (0.366)	-1.194*** (0.373)	-1.324*** (0.374)
T2.log(productivity)	-0.630** (0.301)	-0.697** (0.301)	-0.777** (0.302)
T3.log(productivity)	-0.974*** (0.339)	-1.018*** (0.346)	-1.109*** (0.346)
ln(tariffs)	0.119 (0.104)	0.264 (0.193)	0.271 (0.196)
Constant	13.98*** (0.0355)	13.71*** (0.0409)	13.76*** (0.0751)
Observations	15,131,211	7,196,843	2,166,275

Note: PPML estimates. Dependent variable: firm-product-destination-year exports in volumes. Firm × product × destination and year fixed effects not reported. Robust standard errors in parentheses are clustered by firm and product × destination. ***, **, and * refer to statistical significance at the 1%, 5%, and 10% level, respectively. The control group in column (1) consists of all sanctioned products exported to the sample of European and non-sanctioned products exported to Russia and/or the sample of European countries. In column (2), the control group only includes firms that do not export any products to Russia throughout the sample period. In column (3), the control group only includes firms that do not export any products to Russia throughout the sample period, and only sanctioned products.