Threat of Sanctions*

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Abstract

Does uncertainty created by the threat of sanctions affect trade above and beyond the sanctions actually imposed? While most restrictions on Russian imports were introduced immediately after the February 2022 invasion of Ukraine, sanctioning countries simultaneously pledged further escalation unless the conflict ended. In line with this threat, we estimate that the subsequent escalations were largely anticipated in advance, with trade flows declining many months before they actually became subject to sanctions. Crucially, this effect was not limited just to sanctioned trade flows: we also estimate a decline for a wide range of never-sanctioned trade flows that nonetheless could have been perceived as threatened by future sanctions. Overall, our results imply that Russia lost the equivalent of about a month and a half of imports over 2022–23 due to the escalation of sanctions after April 2022, with two-thirds of this loss driven by reductions in non-sanctioned trade flows that were only under the threat of sanctions.

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1 Introduction

We are in the midst of a wide trend of deglobalization. To a significant extent, it is caused by economic policies, including Brexit, sanctions against Russia, and trade policies of the current US administration. Recent theoretical developments emphasize how such deglobalizing policies can be effectively weaponized by governments as threats, to be used not only to achieve certain geopolitical goals, but also to enforce the global economic order (Clayton, Maggiori, and Schreger, 2023). At the same time, it is well understood that these policies can have devastating effects on the real economy not only by themselves but also by the uncertainty in their implementation (e.g., Hassan, Hollander, Lent, and Tahoun, 2024). An open question is whether such uncertainty can itself be weaponized to make threats more effective in practice, or whether instead it merely weakens them by making them more vague and less targeted.

To answer this question, we turn to arguably the biggest application of economic threats in recent history: trade sanctions against Russia. After its invasion of Ukraine in February 2022, practically overnight, Russia not only became the world's most sanctioned country, but it was also by far the largest economy under substantial sanctions. Importantly, from the very beginning of the conflict, policymakers in the sanctioning countries deliberately did not impose all their sanctions immediately so that they could further escalate them in the future if the war continued (Biden, 2022).[1] Equally important, they did not explicitly describe the details of these possible future sanctions. This way, the target economy could be hurt not only later by the future sanctions themselves, but also immediately by the considerable uncertainty in their possible implementation. While there is a fast growing literature on the effects of sanctions themselves[2], in this paper, we estimate that the *uncertainty* associated with possible future sanctions can significantly amplify their impact.

To show this empirically, we use an extensive database on sanctions on imports to Russia first introduced in Egorov, Korovkin, Makarin, and Nigmatulina (2025). For each of the nine main

[1]On February 22, President Biden said: "If Russia goes further with this invasion, we stand prepared to go further as [well] — with sanction", "we'll continue to escalate sanctions if Russia escalates", and "Russia will pay an even steeper price if it continues its aggression, including additional sanctions."

[2]See Egorov, Korovkin, Makarin, and Nigmatulina (2024), Chupilkin, Javorcik, and Plekhanov (2023), Babina et al. (2023), and Tyazhelnikov and Romalis (2024) among many others.

sanctioning authorities,[3] this database contains detailed product codes for all imposed sanctions along with their effective dates. We combine this dataset with the customs data for all imports to Russia.[4] These highly detailed data allow us to conduct our analysis at a very detailed level. Thus, from now on, by *product* we mean a narrowly defined 10-digit product category, where the first 6 digits match the Harmonized System (HS) product classification.[5]

We build our case in several steps. First, if a country is threatened with an escalation of future sanctions, these sanctions should not come as a complete surprise in the event of such escalation, at least on average. To test for this, we make use of the fact that while most trade sanctions against Russia were imposed just in the first two months of the conflict, almost every month since then has also witnessed introduction of new sanctions. Such rich variation in the timing of sanctions allows us to use the staggered difference-in-differences (DiD) approach, where we compare trade flows that were about to become sanctioned with all other trade flows, including those already sanctioned and those from neutral countries.[6] Within all sanctions imposed after April 2022, we find that to-be-sanctioned trade flows fell many months before they were actually sanctioned. This fall can be explained by neither any of the country-level shocks such as financial sanctions and consumer boycotts (absorbed by country-month fixed effects) nor any changes in demand for or prices of individual products (absorbed by product-month fixed effects).

Second, if this fall in to-be-sanctioned trade flows is indeed driven by sanctions anticipation and not something else, such anticipation should have not only a direct effect on the sanctioned flows themselves but also an indirect effect on some other trade flows. Specifically, in Egorov et al. (2024), we estimate that the imposed sanctions triggered a major increase in rerouting of sanctioned products through countries friendly to the Russian regime.[7] Now, using the same staggered DiD approach as in the previous step, we verify that anticipation of future sanctions triggered a similar increase in rerouting of to-be-sanctioned products many months before the first sanctions

[3] The US, the EU, the UK, Switzerland, Canada, Australia, Taiwan, Japan, and South Korea.

[4] See Egorov et al. (2024) for more details.

[5] A country-product *variety* is a part of a product that is supplied to Russia from a specific country.

[6] Recent research highlights potential biases in staggered DiD designs when treatment effects vary substantially across units and over time (see Arkhangelsky and Imbens, 2024 for a review). Following the guidance of Rios-Avila, Nagengast, and Yotov (2024), we address these concerns by employing the ETWFE estimator from Wooldridge (2021), which is particularly well suited for estimating large-scale gravity models.

[7] These include, most importantly, China, but also Turkey, Kazakhstan, and Armenia among a few others.

on them were implemented. Thus, our first two findings together reveal that the anticipation effects of sanctions are consistent with the effects of the already imposed sanctions.

The fact that *some* sanctions can be anticipated is hardly surprising since the intent to impose them was announced on the first day of the conflict. What is more surprising is that future sanctions can be predicted up to the country that imposes them and the narrowly defined product codes to which they apply. Of course, most sanctions are officially announced before they are implemented, but hardly so many months in advance. Some information on the details of future sanctions was also probably leaked through the media prior to the official announcements. But in addition to that, there is at least one other way in which many of the future sanctions could have been easily predicted. As we show in Egorov et al. (2025), different sanctioning countries often sanctioned the same products but at different times. Thus, once one country sanctioned a particular product, it was natural to expect other countries to follow suit. Indeed, most of the country-product varieties sanctioned after the first two months of the conflict fell into this pattern, that is they were varieties of the previously sanctioned products.

We use this fact to answer our central question: What effect did the threat of sanctions have on the Russian economy *beyond* the trade flows that were actually sanctioned (or rerouted)? Needless to say, there is hardly a credible way to find *all* trade flows where future sanctions were perceived as likely and yet were never implemented. Instead, we identify *some* of these trade flows. Specifically, for each product sanctioned at least by one country, we include in this "high-risk" group all of its country-product varieties from other sanctioning countries that were not sanctioned by the end of our sample in December 2023. Our logic is simple: since most later sanctions were imposed on some varieties of the already sanctioned products, it was reasonable to expect sanctions also on the remaining varieties of the same products. In this sense, we also interpret this as the *uncertainty* effects of future sanctions: within this group, there must have been a lot of uncertainty about which varieties would later become sanctioned. This way even a few actual sanctions in the future could have a substantial immediate impact on the economy.

Thus, in the third and central part of the paper, we use our staggered DiD approach to estimate a significant decline in trade flows that were arguably at high risk of future sanctions. To double check that this fall is not caused by some other factors, we specifically contrast the fall in trade of these "never" sanctioned varieties with the fall in the "later" sanctioned varieties, that is, those varieties of sanctioned products that eventually did become sanctioned. Presumably, at least at some point they must have been perceived as under even higher risk of sanctions. Consistent with this interpretation, we find that indeed the effects for the "never" sanctioned group are always smaller than those for the "later" sanctioned group. In other words, our estimated effects seem to be proportional to the risk of sanctions.

To test our interpretation of these results even further, we explore its implications for the dynamics of our estimated effects. In particular, it is natural to expect an improvement in accuracy for any prediction once the available sample size of the correctly and incorrectly predicted events grows. Therefore, as the conflict continued, it should have become easier to predict which trade flows would fall under sanctions and which would not. We verify that our results indeed follow this pattern for all three steps of our analysis. Specifically, the anticipation effects for sanctioned and rerouted trade flows became stronger for the later waves of sanctions. Such stronger effects are consistent with more accurate predictions of which trade flows would become sanctioned. In contrast, the uncertainty effects for trade flows under perceived risk of sanctions became weaker for the later waves of sanctions. These weaker effects are also consistent with a more accurate prediction of sanctions, since, under perfect foresight, these trade flows should have had no risk of being sanctioned.

Lastly, we investigate the aggregate implications of our reduced-form estimates with a simple aggregation exercise. We use our estimated coefficients to construct predicted values for each trade flow with and without various effects of sanctions.[8] We then sum up the individual trade flows to evaluate the various effects on the aggregate imports to Russia. In the end, we find that during 2022–23 Russia lost almost 36 billion dollars worth of imports due to all effects from the escalation of sanctions combined.[9] This sum is roughly equivalent to one and a half month of the Russian imports in 2021 (the average monthly imports in 2021 amounted to 24.12 billion dollars).

Curiously, two-thirds of this overall aggregate figure came from the uncertainty effects of future

[8]Specifically, predicted values with all effects present are just the predicted values from our regressions. To remove some of the effects in question, we re-calculate the predicted values from the same regression, but we manually equalize the relevant coefficients to zero.

[9]Recall that this is the effect of sanctions imposed only after April 2022, while most sanctions were imposed in March and April 2022.

sanctions. In this sense, just the threat of future sanctions had a larger impact on the Russian imports than the sanctions themselves. The reason behind this striking result is simple: even though the uncertainty effects of possible sanctions are significantly smaller than the effects of the sanctions themselves, they are applied to a much wider range of trade flows and thus become significantly more important in the aggregate. That is, a much larger share of imports was under the threat of sanctions than actually sanctioned.

If anything, our results are likely to be the lower bound of the actual uncertainty effects as we could identify only *some* trade flows that were perceived as under the risk of sanctions. Moreover, the reduced-form approach can identify only the effects of heterogeneity in risk. If there was some risk of sanctions for *all* trade flows, the effect of this risk would also be missed by our analysis.

We contribute to the burgeoning literature on the economics of geopolitical threats (see Mohr and Trebesch, 2025 for a recent overview, but also Thoenig, 2023; Alekseev and Lin, 2024; Becko, 2024; Bianchi and Sosa-Padilla, 2024; Broner, Martin, Meyer, and Trebesch, 2024; Clayton, Maggiori, and Schreger, 2024; Kooi, 2024; Mayer, Mejean, and Thoenig, 2024; Liu and Yang, 2024 among others). Our paper contributes to this literature not only by estimating the economic effects of geopolitical threats but also by highlighting the role of uncertainty in such threats.

On the empirical side, the literature made a significant progress in estimating the effects of imposed sanctions. In Egorov et al. (2024), we make use of even richer data sources to evaluate the effects of all import sanctions (and not only of a minority of them imposed after the first two months of the conflict, which are the main focus of this paper) on the Russian economy. In that paper, we show the effects of sanctions not only on trade flows but also on individual firms and their overall economic performance. Chupilkin et al. (2023) and Chupilkin, Javorcik, Peeva, and Plekhanov (2024) use UN COMTRADE and the Russian customs data, respectively, to document the importance of roundabout trade in circumventing the post-2022 trade sanctions against Russia.[10]

To the best of our knowledge, we are the first to contribute to this literature by estimating both the effects of *anticipation* of future sanctions and the effects of *uncertainty* in their implementation on related but non-sanctioned trade flows. Our results highlight the important role of the latter effects, mostly overlooked by this literature.

The remainder of the paper is organized as follows. Section 2 describes the data and provides key facts about sanctions that motivate our empirical strategy, most of which is laid out in Section 3. We present all our findings in Section 4 and conclude in Section 5.

2 Data and Background

Data Sources. We rely on two main sources of data. First, we use a transaction-level dataset of international shipments as recorded by the Federal Customs Service of Russia. It consists of the country of shipment, 10-digit product codes (where the first 6 digits match the Harmonized System (HS) product classification), the country where goods were produced, unit values, total weight of each shipment, and its total contract value. We verify the completeness of this dataset in Egorov et al. (2024), and the same data were also used in Babina et al. (2023), Chupilkin et al. (2023), and Huang et al. (2025). We also follow Pierce and Schott (2012) in using synthetic HS codes to deal with the changes in product classification over time.

Second, we use the dataset on sanctions against Russia's imports compiled based on official sources and introduced in Egorov et al. (2025). It consists of import sanctions imposed by nine major trading partners of Russia following February 2022: Australia, Canada, the EU, Japan, South Korea, Switzerland, Taiwan, the UK, and the US. It includes around 50 unique dates of sanction imposition, which in this paper we aggregate to a monthly frequency,[11] and 72,000 distinct country-

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

[11] Specifically, we use the nearest full month of the actual event date, using the 15th of the month as the cutoff date. E.g., we count the dates from February 16 to March 15 as "March".

product sanctioned varieties, where products are defined as 10-digit product codes.

An important caveat of the latter data source is that most sanctions are not just a complete ban on a product code. Often a product is included in the sanctions list not by its code but rather by a text description, where a specific code serves as a suggestion rather than a strict rule. Moreover, there are case-by-case exceptions to many specific sanctions. For example, within a specific product category only goods above a certain value may be forbidden to be shipped to Russia, but not others. Similarly, a firm can sometimes obtain a license to supply even forbidden goods to Russia. Based on public sources only and restricted by limitations of our customs data, we follow a more conservative approach and just use the list of all mentioned product codes as the list of products "subject to sanctions", without discriminating between different types of sanctions. Thus, even a perfect implementation of sanctions should not result in a complete collapse of sanctioned trade flows.

Background. Each country imposed its sanctions on imports to Russia in multiple waves.[12] Different countries also tended to impose their sanctions at different times. As a result, there is a lot of variation in the timing of sanctions. Panel A in Figure 1 shows 18 months during 2022 and 2023 when new sanctions took effect (from here on we refer to them as *cohorts*) and the number of country-product varieties or trade flows that became sanctioned in each cohort. In fact, 86.6% of all sanctions as measured by the number of trade flows were imposed just in the first 2 cohorts (March and April 2022). Still, the remaining minority of sanctioned trade flows represents around 21% of all sanctioned trade value measured by 2021 trade volumes, as shown dynamically in Panel B (red and green lines combined).

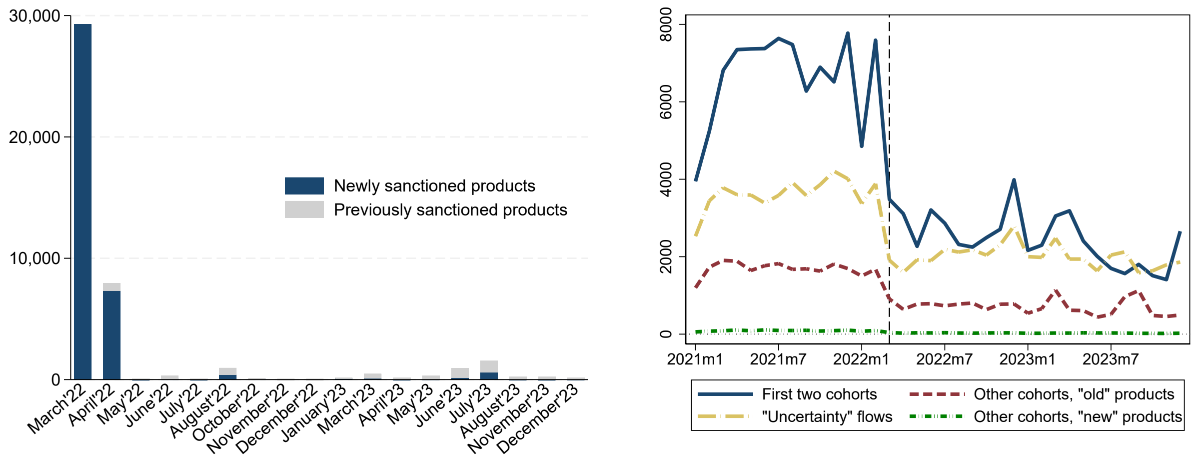
As we argue in Section 3, it's likely that the first 2 cohorts of sanctions were not anticipated or, more precisely, there are no pre-trends in these trade flows before March 2022. In contrast, as we estimate later in Section 4, the rest of the sanctions were well anticipated before they were imposed. There are at least two reasons for that. First of all, sanctions are typically announced some time before the start of their enforcement. But even prior to that, it's not uncommon to find some reports in the media about probable list of products that will be introduced in the next wave

[12] For a discussion of the specific role of import sanctions within the broader context of all types of sanctions, see Egorov et al. (2024).

Figure 1: Cohorts of sanctions, their number of trade flows and total trade value

Panel A: Number of sanctioned trade flows by cohort

Panel B: Total value of various trade flows



Notes: Panel A shows the total number of sanctioned country-product varieties in each month (cohort). These trade flows are further separated into two groups: those with products previously sanctioned by any other country and those with products sanctioned for the first time in the current month.
Panel B plots the total value of 4 types of trade flows over time. First, the blue line shows the country-product varieties sanctioned in March and April 2022. Next, country-product varieties sanctioned after April 2022 are further divided into two groups: varieties of previously sanctioned products (the red line) and varieties of newly sanctioned products (the green line). The latter varieties belong to countries who have been among the first to sanction these products. These three lines together contain all varieties sanctioned during 2022 and 2023. In addition, we also plot the non-sanctioned imports from sanctioning countries for sanctioned products, that is products sanctioned at least by one country by the end of 2023 ("uncertainty" flows, the yellow line). The composition of each group of varieties does not change over time. The vertical line marks the start of sanctions in March 2022.
See Figure A.1 in the appendix with the total weight instead of value in Panel B, and without the first two cohorts in Panel A.

of sanctions. Since we measure only the months when sanctions officially take effect, it's natural that everyone gets informed about this date some time in advance.

Second, at least to some degree, sanctioning countries did coordinate their efforts. One form of such coordination involved an attempt to impose sanctions on the same list of products across different countries. Yet, even for the same product, different countries introduced their sanctions in different months. In fact, Panel A in Figure 1 separates the sanctions imposed on previously sanctioned products (by any country) and the rest, i.e., products sanctioned for the first time. Panel B further shows that outside of the first 2 cohorts, the newly sanctioned products (the green line) account only for a negligible share of the total sanctioned trade value. Thus, after the first 2 months of the conflict, when 86.6% of all sanctions were already implemented, one could predict almost all of future sanctions simply by expecting sanctioning countries to join the ban of the products already sanctioned by others. We estimate various anticipation effects for these sanctions in Sections 4.1 and 4.2.

Crucially, the coordination efforts of the sanctioning countries were far from perfect. As we show in Egorov et al. (2025), different countries ended up sanctioning different sets of products. In particular, the correlation matrix between the sets of products sanctioned by 9 different countries always has positive values, which confirms some coordination efforts, but these values are typically less than 0.5 (see Table 1 in Egorov et al., 2025). For example, once a product was sanctioned at first by the US, there was considerable uncertainty whether the EU or South Korea would later also sanction the same product. As Panel B of Figure 1 shows, within all products sanctioned by at least one country, the imports of non-sanctioned country-product varieties was much larger than the imports of sanctioned varieties (the yellow and the red lines respectively). In Section 4.3, we test whether this large part of Russian imports experienced any negative effects from the "uncertainty" of whether the remaining countries would also sanction these products. Thus, we estimate the effect of sanctions not only for the actually sanctioned trade flows, but also for the trade flows that could have been sanctioned if all sanctioning countries had exactly the same list of sanctioned products.

To sum up, even though the bulk of sanctions against Russian imports came as a surprise (the blue line in Panel B of Figure 1), in this paper, we focus on the rest of the sanctions that were easy to predict some time in advance. Specifically, we estimate both the anticipation effects for later sanctions on previously sanctioned products (the red line) and the "uncertainty" effect for the non-sanctioned trade flows that would have been sanctioned under "perfect" coordination among participating countries (the yellow line).[13] Taken together, the total value of these trade flows with non-zero effects from sanctions is greater than the trade flows subject to the unanticipated sanctions of the first 2 months of the conflict.

Finally, there are many plausible reasons why particular sanctions were implemented in one cohort and not in the other. At least in part, the intention of sanctioning countries was to gradually build up the "pressure" against the Russian government, and thus some important products could

[13] Even in the raw data of Figure 1, the fall in the uncertainty flows (the yellow line) appears to be greater than the fall in the actually sanctioned trade flows (the red line). Our main results of Section 4 verify this conclusion after taking into account the rich variation in the timing of sanctions and a lot of additional war-time fixed effects. The overall fall in all sanctioned trade flows, including those sanctioned in the first 2 months of the conflict (the blue line), is analyzed in detail in Egorov et al. (2024) and is outside of the scope of this paper.

have been deliberately reserved for the later cohorts. It's also hard to rule out the possibility of lobbying of the governments by private firms to postpone sanctions of products for which the Russian market is especially important to their business. Because of this, we do not rely on exogenous selection of products into cohorts of sanctions in our identification strategy, even though some of the delays could have been caused by the negotiating process or other political factors orthogonal to economic conditions. Thus, we allow for a non-random composition of different cohorts.

Instead, we assume that a specific month when each cohort was implemented was not chosen strategically to match the behavior of most trade flows within this cohort. That is we assume that sanctioning countries do not wait until the targeted trade flows fall on their own to impose their sanctions on these flows.

3 Methodology

We begin by testing whether *any* sanctions were anticipated before the start of the conflict. Moreover, we do this separately for each cohort. Specifically, we estimate the following pre-post difference-in-differences (DiD) equation:

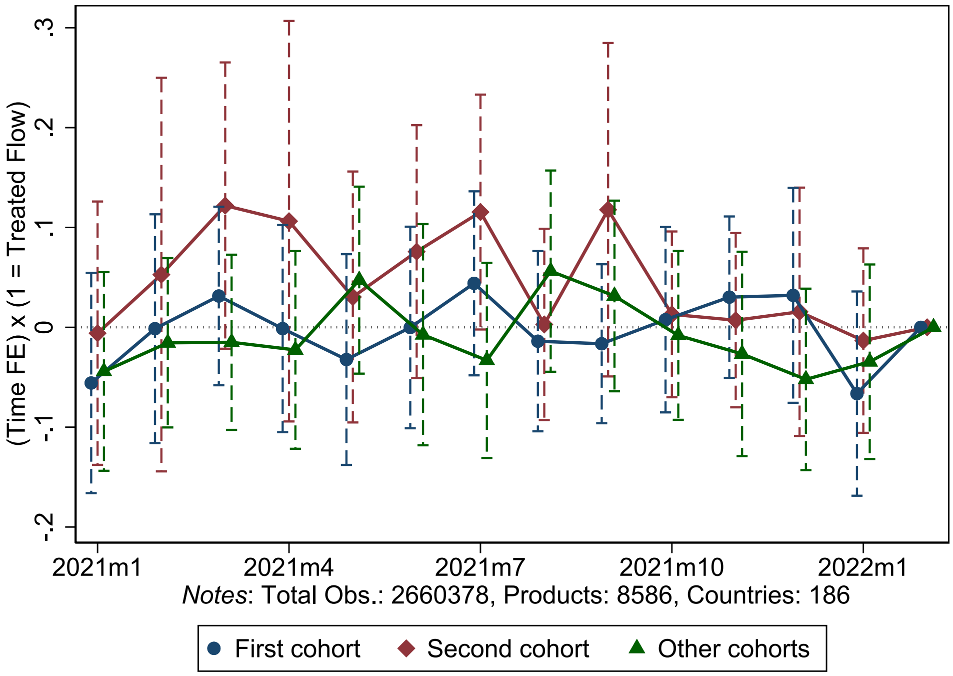
$$y_{gct} = \sum_{e} \alpha_{et} \times \mathbb{1}(E_{gc} = e) + \tau_{gc} + \eta_{gt} + \omega_{ct} + \zeta_{gct}, \quad t < t_0. \tag{1}$$

Here, y_{gct} are (log-)trade flows from country of shipment c to Russia of a ten-digit product code g at month t, measured either by total value or by total weight shipped;[14] τ_{gc} are the product-country fixed effects; η_{gt} are the product-month fixed effects; and ω_{ct} are the country-month fixed effects, netting out any country- and product-level shocks. E_{gc} is the month when sanctions take effect on product g by country c (for non-sanctioned imports, $E_{gc} = \infty$), and α_{et} are the cohort-month fixed effects common for all varieties gc within the same cohort e.

Following recent advances in the DiD literature (including Borusyak, Jaravel, and Spiess, 2024), we estimate equation (1) on a sub-sample of untreated observations only, that is for months

[14] We use weight of trade flows in our main exposition because it focuses on the effects on quantities without mixing them together with the effects on prices. Still, we repeat all our analysis for the value of trade flows as well and report them in Section 4.4. For our aggregation results we also use both measures, but choose value as the baseline as it's most standard and natural way to aggregate trade flows.

Figure 2: Pre-trends in sanctioned trade flows by cohort, log of weight



Notes: This figure presents the dynamic difference-in-differences estimates of equation (1), which assess the pre-trends in each cohort of sanctioned trade flows relative to the non-sanctioned trade flows prior to March 2022 (February 2022 serves as the baseline period). First two lines shows coefficients for the first two cohorts, while the last line shows the average for all of the remaining cohorts, weighted by the number of observations in each cohort. The figure uses the total import net weight of a given product from a given country in a given month as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

before March 2022, which we denote as t_0 (February 2022 is used as the omitted category). In other words, we estimate the set of α_{et} to test whether varieties of each cohort were on a different pre-trend prior to March 2022, once all country- and product-level shocks are netted out. The estimated pre-trends α_{et} are plotted in Figure 2, separately for the first two cohorts, and as an average for all other cohorts.

In fact, we observe no significant pre-trends in the weight of sanctioned varieties for any of the cohorts.[15] This suggests that none of the sanctions were anticipated prior to the start of the conflict in March 2022. Motivated by this finding, in all of our following regressions, we are using the pre-war period as the baseline period (or the omitted category) for our estimation of sanctions anticipation effects.

[15]See Panel A of Figure A.6 in the Appendix for results from a more conservative specification and Panel A of Figure A.7 for results on value instead of weight.

To estimate the anticipation effects during the war (or to test for their absence), we use the following equation with a staggered DiD design:

$$y_{gct} = \sum_{e} \beta_{et} \times \mathbb{1}(E_{gc} = e) \times \mathbb{1}(t \geq t_0) + \tau_{gc} + \eta_{gt} + \omega_{ct} + \zeta_{gct}. \tag{2}$$

As before, e denotes different cohorts of sanctions (months when they are imposed). For each cohort e, we estimate monthly fixed effects β_{et} for all months after the start of the war, $t \geq t_0$, leaving all of the pre-war months in the omitted category. Out of all included fixed effects, some estimate the causal effect of the sanctions, β_{et} for $t \geq e$, while the rest estimate sanctions anticipation effects, β_{et} for $t < e$.[16]

An alternative way to interpret equation (2) is to view sanctions as a setting with two treatments. The last treatment is "being subject to sanctions" which starts in month e for cohort e, as is typical in most staggered DiD designs. A standard staggered DiD methodology assumes no anticipation effects prior to month e, and thus it uses this entire period (or just month $e - 1$) as the omitted category. Instead, we aim to test the presence of any anticipation effects, which makes the standard methodology inapplicable. We go around this problem by assuming that all anticipation effects (if any) can start only since March 2022, thereby making the pre-war period a clean comparison point for all trade flows. We justify this assumption both by the background behind the Russian invasion of Ukraine in 2022 and our formal pre-trend test from Figure 2. Thus, it's as if March 2022 triggers a non-staggered treatment of "anticipation of future sanctions" for all trade flows that would be sanctioned later during 2022 and 2023. Our fixed effects β_{et} capture the effects of both of these treatments, with the pre-war period also serving as the omitted category for both of them.

In principle, anticipation of future sanctions is not the only treatment that was turned on in March 2022. The start of the war has also triggered a differential demand for different types of products, as well as changes in their prices and availabilities even in the world markets. We control for this by including the product-month fixed effects η_{gt}. Thus, we remove all the variation between different products (defined at 10-digit level) from our estimation of sanctions anticipa-

[16] Of course, $e \geq t_0 \; \forall e$. Thus, we can estimate at least some anticipation effects for all of the cohorts except the first one, when $e = t_0$.

tion, implicitly focusing instead on comparing the same narrowly defined products supplied from different countries.

Similarly, the first half of 2022 was also associated with consumer boycotts and voluntary withdrawals from the Russian market (e.g., see Chupilkin et al., 2024), payment system sanctions (e.g., SWIFT ban, Visa and Mastercard suspension), and physical infrastructure limitations (e.g., closure of airspace, ban on Russian trucks and ships in the EU), which made trade of even non-sanctioned products from sanctioning countries much more difficult. To the extent that these country-level shocks have affected all products similarly, they should get absorbed by our country-month fixed effects ω_{ct}. So, again, we exclude all country-level variation from our estimation of anticipation effects.

As is standard in staggered DiD design, our baseline specification (2) estimates its coefficients β_{et} for one of the sanctioned trade flows by comparing it with all the others. These include both trade flows sanctioned at different months and never sanctioned trade flows. The latter trade flows dominate our control group, and thus our estimation is mostly driven by the comparison between sanctioned trade flows and imports of "never treated" country-product varieties.

Our estimation also relies on the timing of sanctions adoption for each cohort. Thus, the main remaining threat to our identification strategy is the deliberate choice of the date of sanctions in such a way that to-be-sanctioned trade flows would change anyway around this date, whether sanctioned or not. This would imply that the sanctioning authorities had to not only predict the date of a sharp drop in the imports of each country-product variety, but also compose each wave of sanctions from those varieties that had these dates sufficiently close to each other. We assess the plausibility of this threat later in Section 4.

Lastly, following recent research highlighting potential biases in staggered DiD designs due to "forbidden comparisons" and negative weights (Arkhangelsky and Imbens, 2024), we allow for fully flexible patterns of heterogeneity in sanctions' impacts across time and cohorts. We estimate equation (2) using the ETWFE estimator from Wooldridge (2021), which is particularly well-suited for estimating computationally intensive gravity models (Rios-Avila et al., 2024).

4 Results

In this section, we estimate the preemptive impact of sanctions on various trade flows. First, we show what happens to a trade flow months before it falls under sanctions. Second, we estimate the increase in imports from third countries of sanctioned products (i.e., rerouting) before they are sanctioned for the first time. Third, we estimate the effects on those import flows from sanctioning countries that were under significant risk of becoming sanctioned, but were not actually sanctioned, at least by the end of 2023. We conclude this section with several robustness checks and an aggregation calculation where we evaluate the total effect of all effects from the escalation of sanctions after April 2022 on the aggregate Russian imports.

4.1 Sanctioned Trade Flows

We start by testing whether sanctions imposed after April 2022 exhibit any signs of being anticipated. We do this by examining the behavior of to-be-sanctioned trade flows *before* they actually got sanctioned but after the start of the conflict, when it was reasonable to expect such sanctions. Specifically, we estimate cohort-specific monthly fixed effects β_{et} from equation (2) and report their averages aggregated across all cohorts (except for the first two)[17] in Figure 3.

As we document in Egorov et al. (2024), there is a large and persistent drop in trade flows after they become sanctioned.[18] The striking feature of Figure 3 is the degree to which trade flows fall many months before sanctions take place. While some discontinuity remains around the start of sanctions, arguably, most of the sanctions' effects realize before their actual start. In particular, all *pre*-sanctions estimates aggregated to a single point sum up to an average decline of 0.42 log points or 34%, while all *post*-sanctions estimates sum up to an average decline of 0.64 log points or 47% (both relative to the pre-war period).[19]

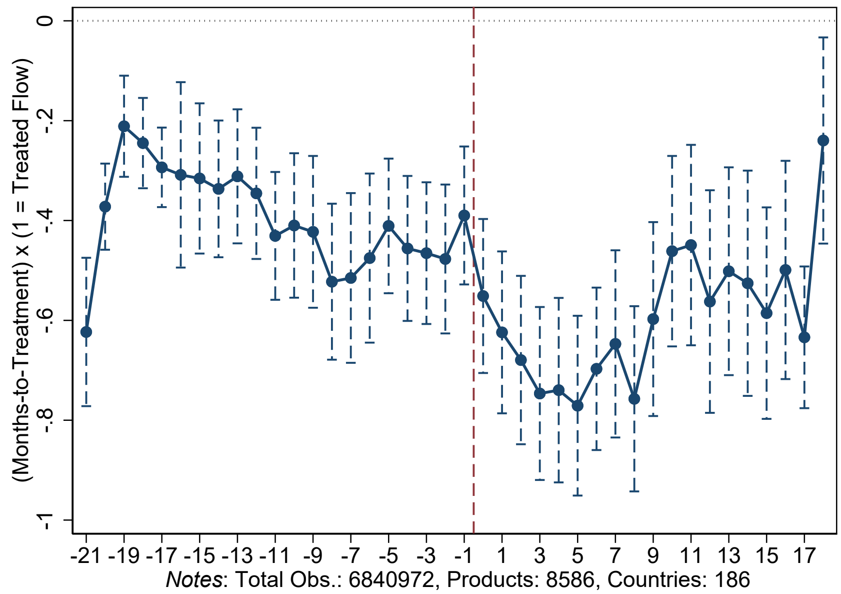
This finding is in sharp contrast to the notion that expected future sanctions can be easily avoided by preemptively stocking up on to-be-sanctioned products, especially since doing this would not violate any of the current trade restrictions. Not only we do not find any evidence of

[17] See the estimates for these cohorts in Figure A.2 in the Appendix.

[18] We omit the last point estimate of -1.33 for 19 months after the start of sanctions from Figure 3 as an outlier. In any case, the last (first) 2 points are based on 0.43% (0.46%) of all treated observations used in this Figure, which makes them not representative of most sanctions.

[19] See these and other results in Table A.1 in the Appendix.

Figure 3: Sanctions anticipation and treatment, sanctioned flows, log of weight



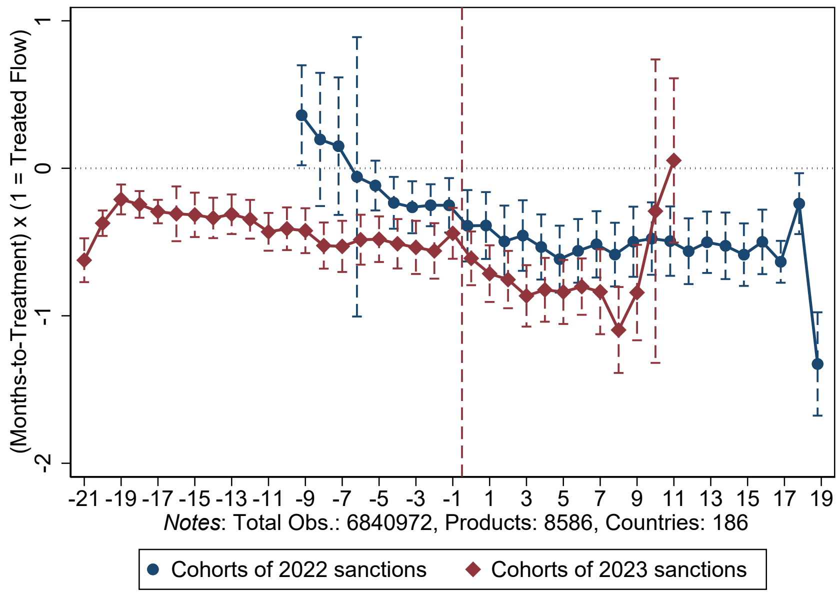
Notes: This figure presents the staggered difference-in-differences estimates of equation (2), which assess the anticipation and treatment effects for the sanctioned trade flows. The figure plots the average of estimated β_{et} for all the cohorts of sanctions except the first two (each cohort is weighted by the number of its observations). The x-axis shows the number of months before and after the trade flow falls under sanctions, where each coefficient is estimated relative to the pre-war months (which form the omitted category). We interpret coefficients to the left from the date of sanctions as "sanctions anticipation" and to the right as "the effect of sanctions". The last point estimate for 19 months after the start of sanctions is omitted. The figure uses the total import net weight of a given product from a given country in a given month as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

accumulating products prior to their ban, but, on the contrary, we estimate a large and substantial fall in imports before the sanctions, while it's still legal to continue with this trade.

To be clear, imports of all products – whether sanctioned or not – from the sanctioning countries have been falling since the start of the conflict, as captured by our country-level fixed effects. What is striking here is that within the set of non-sanctioned products, those that were sanctioned later fell by 34% more than the rest. Similarly, this decline cannot be accounted for by changes in demand for sanctioned products (captured by product-level fixed effects).

While the exact mechanism behind this fall remains unclear, it is consistent with the gradual winding down of business in anticipation of future sanctions. It is natural for individual exporters in the sanctioning countries not to invest in those of their relationships with Russian importers that may become sanctioned in the near future. If this is true, then one might expect the general accuracy of prediction of future sanctions to improve over time as the sample of correctly and

Figure 4: Early vs late sanctions anticipation and treatment, sanctioned flows, log of weight



Notes: This figure presents the staggered difference-in-differences estimates of equation (2), which assess the anticipation and treatment effects for the sanctioned trade flows. The figure plots the average of estimated β_{et} for all the cohorts of sanctions except the first two (each cohort is weighted by the number of its observations). The red line shows the average for all cohorts of sanctions in 2023, while the blue line shows the average for all sanctions imposed between May and December 2022. The x-axis shows the number of months before and after the trade flow falls under sanctions, where each coefficient is estimated relative to the pre-war months (which form the omitted category). We interpret coefficients to the left from the date of sanctions as "sanctions anticipation" and to the right as "the effect of sanctions". The figure uses the total import net weight of a given product from a given country in a given month as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

incorrectly predicted sanctions grows. Thus, the preemptive fall of to-be-sanctioned trade flows that we observe in the data should become even stronger over time. To check this, we disaggregate our estimates from Figure 3 into anticipation effects of 2022 sanctions vs 2023 sanctions. Figure 4 reports our estimates separately for these two groups of sanctions.

Since later cohorts may have been strategically composed of products more sensitive to sanctions, these results must be interpreted with caution. Still, at each available horizon, the anticipation effects of later sanctions appear to be stronger than those of earlier sanctions. Thus, this heterogeneity *across* cohorts of sanctions is consistent with our interpretation of the behavior of trade flows *within* each cohort.

It's also interesting to note that trade flows that were sanctioned much later in 2023 started to fall immediately since the start of the conflict, often more than a year ahead of the actual sanctions. This pattern is consistent with our guess of how some of the sanctions were anticipated. In particular, it was reasonable to expect that sanctioning countries would cooperate and would later sanction the same products as already sanctioned by others. However, it may have been hard to predict which of these would be sanctioned sooner rather than later. Thus, the early months of the conflict saw a similar decline for all such trade flows, resulting in substantial effects even for trade flows that got sanctioned much later.

4.2 Rerouting of Sanctioned Products

Since we find no evidence of stocking up on sanctioned products *directly* from the sanctioning countries, next we move on to evaluating whether such stocking up took place *indirectly* through third countries. Specifically, in this subsection, we focus on the imports of sanctioned products from a set of countries that we label as *friendly* to the Russian regime.[20] To do this, we estimate the following version of our baseline specification (2):

$$y_{gct} = \sum_e \gamma_{et} \times \mathbb{1}(E_g^{first} = e) \times Friendly_c \times \mathbb{1}(t \geq t_0) + \tau_{gc} + \eta_{gt} + \omega_{ct} + \zeta_{gct}, \quad E_{gc} = \infty. \tag{3}$$

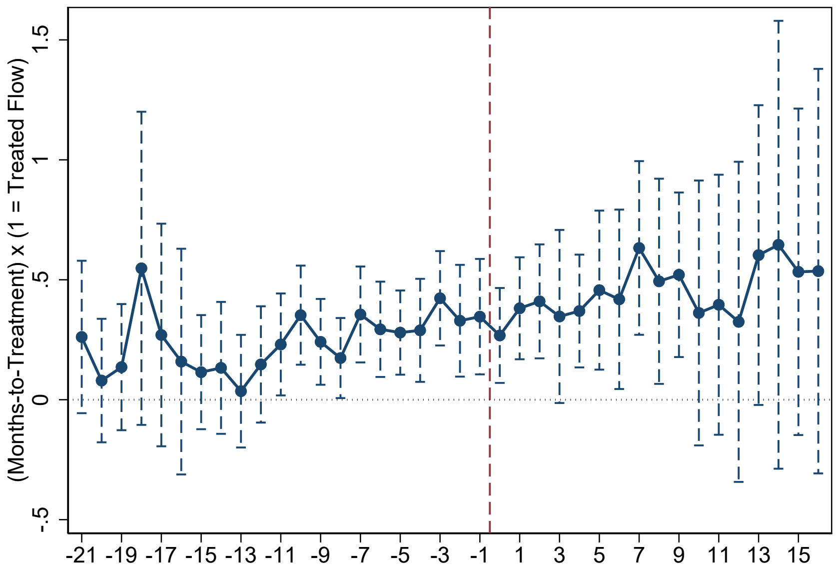
Here we focus only on the subsample of non-sanctioned trade flows, $E_{gc} = \infty$. For each product g, we define event E_g^{first} as the month when product g first was sanctioned by *any* country, $E_g^{first} \equiv \min_c E_{gc}$ (thus, $E_g^{first} = \infty$ for non-sanctioned products). $Friendly_c$ is an indicator that takes value of 1 if country c is one of the eight countries we defined as "friendly", and 0 otherwise. As before, we estimate monthly anticipation and treatment fixed effects γ_{et} only for the months after the start of the conflict, $t \geq t_0$, using the pre-war months as the omitted category.[21]

Thus, within the subsample of non-sanctioned trade flows, we estimate whether imports of to-be-sanctioned products from friendly countries have increased prior to the month when these products were sanctioned for the first time. Recall that most sanctions were relatively straightforward to predict because they were imposed on the products already sanctioned by someone else. In contrast, by construction, here we focus only on the trade flows with the products *before* they

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

[21] We repeat our pre-trend analysis from Section 3 for this specification as well. The results are in Panel B of Figure A.6 in the Appendix. See Section 4.4 for details of this estimation.

Figure 5: Anticipation and treatment for imports of sanctioned products from friendly countries, log of weight



Notes: Total Obs.: 4920192, Products: 8211, Countries: 185

Notes: This figure presents the staggered difference-in-differences estimates of equation (3), which assess the anticipation and treatment effects for the imports of sanctioned products from friendly countries. The figure plots the average of estimated γ_{et} for all the cohorts of sanctions except the first two (each cohort is weighted by the number of its observations). The x-axis shows the number of months before and after the product gets sanctioned for the first time by any country. All coefficients are estimated relative to the pre-war months (which form the omitted category). We interpret coefficients to the left from the date of first sanctions as "anticipation" effects and to the right as "treatment" effects. The last 3 point estimates are omitted (together they account for 0.78% of all treated observations used in this figure). All sanctioned trade flows are dropped from this estimation. The figure uses the total import net weight of a given product from a given country in a given month as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

got sanctioned for the first time. In this sense, our anticipation effects γ_{et}, $t < e$, are not directly comparable to the similarly defined anticipation effects for sanctioned trade flows, β_{et} with $t < e$, as the latter are much easier to predict.

Figure 5 presents the averages of our estimates for cohort-specific monthly fixed effects γ_{et} aggregated across all cohorts (except for the first two).[22] Remarkably, shipments of sanctioned products from friendly countries start to increase long before such products become sanctioned for the first time. In fact, the preemptive increase in shipments is so substantial that there is hardly any discontinuity at the time of sanctions. Moreover, all anticipation estimates aggregated to a single average sum up to an average increase of 0.26 log points or 23%, while all treatment effects sum

[22]See the estimates for these cohorts in Figure A.3 in the Appendix.

up to an average increase of 0.42 log points or 34% (both relative to the pre-war period).[23]

Our results indicate that stocking up on banned products does indeed take place, even though it does not happen from every possible source. Instead, the anticipation effects, in some sense, only reinforce the treatment effects: both declines and increases tend to realize sooner when future sanctions are expected. Thus, the efficiency of anticipated sanctions can indeed be undermined if one of these effects dominate the other. We postpone their comparison until our last subsection 4.4, where we calculate the implications of our estimates for the aggregate trade flows.

Next, we examine the evolution of anticipation effects over time. Similar to Figure 4, we report our average estimates of anticipation (and treatment) effects separately for two groups: trade flows with products sanctioned in 2022 and in 2023. The results are presented in Figure 6.

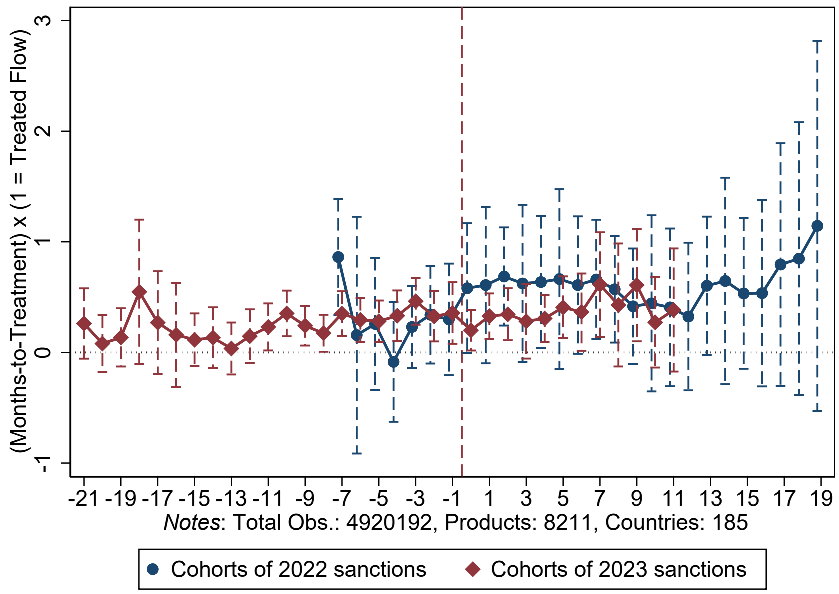
While most of the anticipation point estimates don't differ that much between the two groups, note that there are no significant anticipation effects for the products sanctioned in 2022. In a way, it's an even stronger confirmation of our previous conjecture that it takes time and accumulation of enough experience to be able to predict future sanctions accurately enough.

In addition, it might be surprising that treatment effects appear to be *stronger* for sanctions with *weaker* anticipation effects (and vice versa). This heterogeneity hints toward the idea that predictability of sanctions might have little effect on the total amount of rerouted shipments and instead can change only the distribution of these shipments over time. However, we once again approach any comparisons between cohorts with caution and view them as suggestive only.

Finally, all shipments of sanctioned products from friendly countries can be divided into three groups: products produced in sanctioning countries (and thus simply rerouted through friendly countries), products produced in friendly countries (so that they substitute for missing products from sanctioning countries), and products produced elsewhere. Since our customs data have information on the country of production, we can, in fact, distinguish between these three types of trade flows. In Egorov et al. (2024), we show that the substitution channel played only a negligible role in the response of imports from friendly countries to sanctions. We conclude this section by applying the same methodology here to show that the same is true for the anticipation effects as well.

[23] See Table A.1 in the Appendix for these aggregation results.

Figure 6: Early vs late anticipation and treatment for imports of sanctioned products from friendly countries, log of weight



Notes: This figure presents the staggered difference-in-differences estimates of equation (3), which assess the anticipation and treatment effects for the imports of sanctioned products from friendly countries. The figure plots the average of estimated γ_{et} for all the cohorts of sanctions except the first two (each cohort is weighted by the number of its observations). The red line shows the average for all cohorts of sanctions in 2023, while the blue line shows the average for all sanctions imposed between May and December 2022. The x-axis shows the number of months before and after the product gets sanctioned for the first time by any country. All coefficients are estimated relative to the pre-war months (which form the omitted category). We interpret coefficients to the left from the date of first sanctions as "anticipation" effects and to the right as "treatment" effects. All sanctioned trade flows are dropped from this estimation. The figure uses the total import net weight of a given product from a given country in a given month as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

Specifically, we split each trade flow from friendly countries into three different trade flows corresponding to each of the three groups. We then re-estimate our specification (3), replacing total imports of sanctioned products from friendly countries with these three disaggregated flows. And we allow for heterogeneity in our cohort-specific monthly fixed effects γ_{et} across these three groups.

Once again, our results[24] suggest that all of the anticipation effects are driven not by substitution but by rerouting, while the latter is dominated by rerouting from sanctioning countries. Thus, it

[24] See Figure A.4 in the Appendix.

reveals the prominent role of the most direct form of circumventing sanctions.[25]

4.3 Uncertainty for Non-Sanctioned Trade Flows

So far we have presented some evidence suggesting that the accuracy of prediction of future sanctions has improved over time. This implies that some mistakes must have been made in these predictions, especially early on. If so, there should also be a decrease in import flows that were never sanctioned but were perceived as likely to become sanctioned.

Since we don't know precisely how future sanctions were forecasted, we can not find all such "thought-to-become-sanctioned" import flows. Instead, we focus only on one set of trade flows that may have belonged to this group. Specifically, once again, we turn to the products sanctioned at first by some countries but not by others. In Section 4.1, we have estimated a decline for a subset of them that was, in fact, subsequently sanctioned and thus interpreted it as *anticipation* effects. In this section, we estimate any changes for the rest of these trade flows, that is, for the trade flows that did not get sanctioned by the end of 2023. Since at the time of the first sanctions on a specific product, it may have been hard to tell which of its country-product varieties would be subsequently sanctioned, we call any changes in trade of non-sanctioned varieties the *uncertainty* effects.

To estimate these uncertainty effects, we use the following specification:

$$y_{gct} = \sum_{e} \left[\delta^{L}_{et} Later_{gc} + \delta^{N}_{et} Never_{gc}\right] \mathbb{1}(E^{first}_{g} = e)\mathbb{1}(t \geq t_0) + \tau_{gc} + \eta_{gt} + \omega_{ct} + \zeta_{gct}, \tag{4}$$

where $Later_{gc}$ is an indicator that takes value of 1 if trade flow gc was sanctioned *later* than product g was sanctioned by some other country $c' \neq c$, and 0 otherwise. Similarly, $Never_{gc}$ is an indicator that takes value of 1 if trade flow gc from sanctioning country c was *never* sanctioned, but product g was, and 0 otherwise.[26]

To keep our control group as unaffected by sanctions as possible, we drop from this estimation all observations: 1) with all sanctioned trade flows outside of the "later" group (that is trade flows

[25] While there are always reasons to suspect that the government can manipulate its own statistics, these results, if anything, suggest that it's unlikely to be a major concern here. If anything, the government would have more incentives to replace rerouting, which is considered illegal in sanctioning countries, with substitution, which does not directly violate any sanctions.

[26] Formally, $Later_{gc} = \mathbb{1}(\infty > E_{gc} > E^{first}_{g})$ and $Never_{gc} = \mathbb{1}(E_{gc} = \infty)\mathbb{1}(E^{first}_{g} < \infty)\mathbb{1}(\min_{g} E_{gc} < \infty)$.

sanctioned at the same time as their product), 2) with trade flows with rerouting from friendly countries (the treatment group of Section 4.2), 3) for "later" flows with months after sanctions were imposed on them, that is observations with sanctions' treatment effects.

To paraphrase, in this Section, we estimate changes in trade flows under the risk of sanctions (and exclude any actually sanctioned observations). We do this separately for those flows where the risk has eventually materialized ("later") and where it has not ("never"), while our control group consists of trade flows with significantly smaller risk, if any. As before, we estimate all these anticipation or uncertainty effects of future sanctions relative to the pre-war period.[27]

Importantly, note that anticipation effects δ_{et}^{L} from equation 4 are very similar to anticipation effects β_{et} from our baseline specification (2), estimated in Section 4.1.[28] We re-estimate them here in the same way as uncertainty effects δ_{et}^{N} only as a benchmark for comparison. Specifically, we test that declines in the actually sanctioned trade flows were indeed larger than those in only "thought-to-become-sanctioned" trade flows.

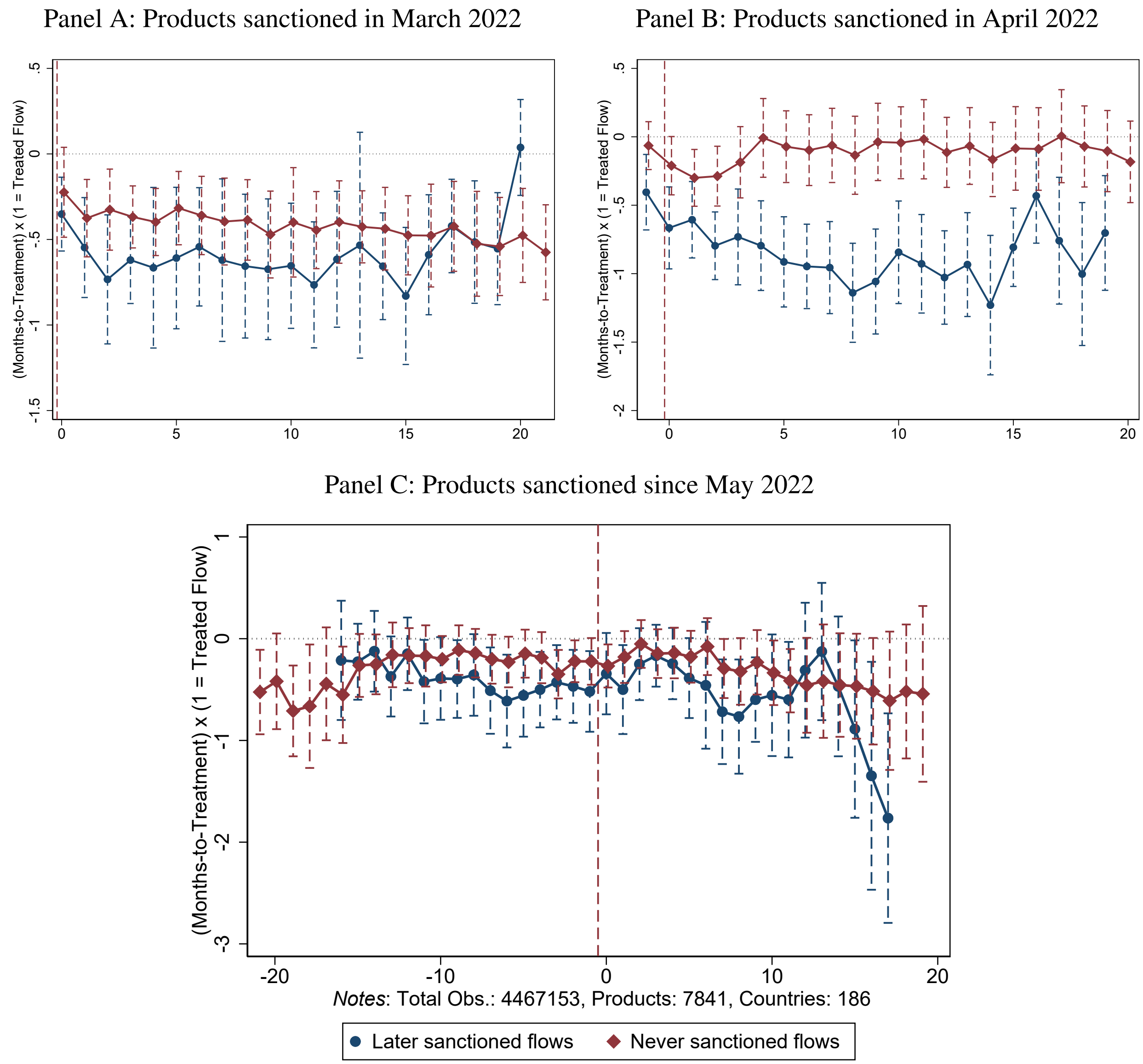
Figure 7 presents our results. Keep in mind that cohorts here are defined differently from Section 4.1. None of observations behind the presented coefficients are under sanctions. Instead, these reflect non-sanctioned varieties of products first sanctioned in different months. In fact, the first two cohorts account for 86% of all observations with uncertainty effects (27 and 59% respectively), which makes them the most "representative".

Consistent with our previous results in Section 4.1, anticipation effects of future sanctions, represented by the blue lines, are large and negative. Instead, the main of focus of this Figure is on the uncertainty effects, shown by the red lines. For the first cohort in Panel A, they are remarkably large and persistent. Aggregated to a single number, they amount to an average decline of 34% (0.42 log-points) against 45% (0.61 log-points) for anticipation effects of future sanctions. Thus, uncertainty effects are about 76% (34/45) of anticipation effects, on average, for the first cohort. Note also that estimated uncertainty effects are almost always smaller than anticipation effects, consistent with the presence of some information that allows to predict future sanctions better than

[27]See Panel C of Figure A.6 in the Appendix for the relevant pre-trend analysis during this period. The details of this estimation are in Section 4.4.

[28]In our baseline specification (2), we allowed for the heterogeneity of anticipation effects with respect to the cohorts of sanctions imposed on varieties. Instead, in the current specification (4), we allow for their heterogeneity with respect to the cohorts of sanctions imposed on products. Either way, we end up with large and persistent estimates.

Figure 7: Anticipation and uncertainty for non-sanctioned varieties of sanctioned products, first two cohorts, log of weight



Notes: This figure presents the staggered difference-in-differences estimates of equation (4), which assess the anticipation and uncertainty effects for the imports of non-sanctioned varieties of sanctioned products from sanctioning countries. Panels A and B present estimates for the products sanctioned in March and April 2022 respectively. Panel C plots the average of the estimates for all the cohorts of sanctions except the first two (each cohort is weighted by the number of its observations). The red lines show anticipation effects of future sanctions for varieties that were later sanctioned, δ_{et}^{L}, while the blue lines show uncertainty effects of possible sanctions for varieties that were not sanctioned by the end of 2023, δ_{et}^{N}. The x-axis shows the number of months before and after the product gets sanctioned for the first time by any county. All observations under sanctions are dropped from this estimation. All coefficients are estimated relative to the pre-war months (which form the omitted category). The figure uses the total import net weight of a given product from a given country in a given month as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

our strategy in this section.

Moreover, recall that our estimated average treatment effect for the sanctions themselves was about 47% decline (see Table A.1). This implies that the unrealized but perceived threat of sanctions can be 72% (34/47) as effective as the actual sanctions.

This is, however, not always the case, as Panel B illustrates. For the second cohort, there are significant uncertainty effects only for the first 3 months after the first sanctions on the same product. After that, there is virtually no perceived risk for this group of trade flows to be sanctioned.

This difference in uncertainty effects between the first two cohorts reflects both the possibly endogenous composition of various cohorts and all the additional information that we have missed with our simple strategy of identifying trade flows under some risk of future sanctions. At the very least, keeping track of some official announcements can reveal some trade flows with only minimal risk of future sanctions.

The estimates for the next 13 cohorts are considerably noisier, since there are only 14% of all observations with uncertainty effects to identify them. Thus, we report only our average estimates for these 13 cohorts together in Panel C. Interestingly, anticipation effects are significant not only after the first sanctions on the same product but before as well. Once again, this finding illustrates that firms at the time used a richer information set to predict sanctions than we exploit in this section.

The uncertainty effects for these later cohorts are mostly insignificant, though their point estimates often amount to economically significant effects. On top of this, averaged across time periods, the single point estimate for the uncertainty effect is about -0.22 log-points or the decline of 20%, which is also statistically significant.[29] Moreover, even individual uncertainty effects tend to stay between zero and anticipation effects most of the time. Thus, they are largely consistent with our results for the first two cohorts.

Lastly, we recall that our previous findings in Figures 4 and 6 suggested that the accuracy of predicting trade flows and products that will be sanctioned in the future has improved over time. Now we check whether the same pattern can be found in the evolution of our uncertainty effects.

As Panels A and B of Figure 7 illustrate, there could be many differences in the uncertainty

[29] See Table A.1 in the Appendix.

effects between individual cohorts, caused in part by their non-random selection. Thus, we combine our estimates across several cohorts to "average out" more of the idiosyncratic differences between them. This way the comparison between *groups* of cohorts has a better chance to reflect any *systematic* changes in uncertainty effects across time. Still, the resulting differences could also reflect systematic part of the non-random selection of cohorts, and thus we interpret our results here only as suggestive.

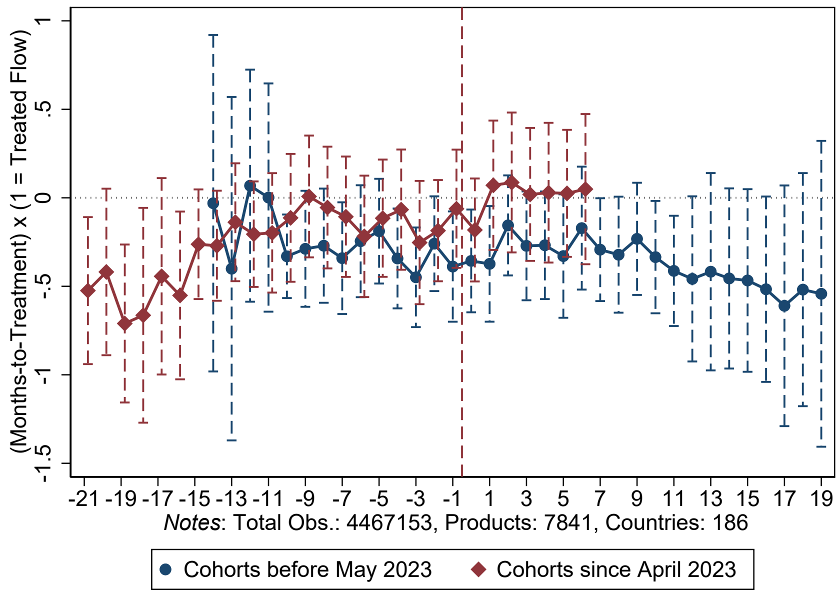
Figure 8 presents the average uncertainty effects separately for the period before and after May 2023.[30] Here, at almost all available horizons, the later uncertainty effects are smaller than the earlier ones. Moreover, after the first sanctions on a product, the point estimates of later uncertainty effects become very close to zero, while the point estimates of earlier effects continue to be quite substantial.

All of our findings based on the comparison between early and late cohorts of sanctions (Figures 4, 6, and 8) could, in fact, be driven by the endogenous selection of individual varieties and products into different cohorts of sanctions. However, for this to be the case, one needs a rather complicated system of selection. To be consistent with all three aforementioned figures, one sanctioning country should take into account not only future patterns of its own trade, but also those of other countries. Specifically, it should impose its sanctions on a product *earlier* when 1) the decline in trade of their own variety of this product would accelerate over time (Figure 4); 2) shipments of this product from friendly countries would increase over time (Figure 6); 3) those varieties of this product that will never get sanctioned by others should increase over time (Figure 8). Not only all of this should hold even in the absence of sanctions but also conditional on our rich set of country-month and product-month fixed effects.

Alternatively, the same set of facts is also consistent with a gradual improvement in forecasts, which we view as a much simpler explanation. Importantly, it simultaneously drives a reduction in errors of the "false negative" type (anticipation effects for the actually sanctioned products become stronger in Figures 4 and 6) and of the "false positive" type (effects for the non-sanctioned varieties

[30] The version that divides all cohorts into 2022 and 2023 is presented in Figure A.5 in the Appendix. At least at this horizon, we don't observe much of a difference between earlier and later uncertainty effects. Part of the problem here could be due to the fact that the May-December 2022 group of cohorts accounts only for 15% of all observations in the 13 later cohorts. To obtain more accurate estimates for two groups of cohorts, we divide all cohorts into two groups more evenly (49 and 51% of observations), with May 2023 as the breakpoint between the two groups.

Figure 8: Early vs late uncertainty effects for non-sanctioned varieties of sanctioned products, all cohorts since May 2022, log of weight



Notes: This figure presents the staggered difference-in-differences estimates of uncertainty effects δ_{et}^{N} from equation (4). The figure plots their averages for all the cohorts of sanctions except the first two (each cohort is weighted by the number of its observations). The blue line shows the average of all cohorts between May 2022 and April 2023, while the red line plots the average for cohorts since May 2023. The x-axis shows the number of months before and after the product gets sanctioned for the first time by any county. All observations under sanctions are dropped from this estimation. All coefficients are estimated relative to the pre-war months (which form the omitted category). The figure uses the total import net weight of a given product from a given country in a given month as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

become weaker in Figure 8).

4.4 Robustness and Aggregation

Robustness. In general, any DiD regression requires the Stable Unit Treatment Value Assumption (SUTVA), which in our context means that sanctions had no effect on non-sanctioned trade flows. Yet, any shock large enough to cause general equilibrium effects is likely to violate this assumption. Of course, sanctions imposed on Russia were so unprecedented in scale that they had at least some impact on all of Russia's trade flows.

Thus, an important concern for our baseline specification (2) is that it includes trade flows from friendly countries from Section 4.2 and uncertainty flows from Section 4.3 as part of the control group. A similar concern applies to specification (3) as well. To avoid bias resulting from such comparisons, we repeat our analysis with excluding all trade flows most likely affected by sanctions from the control group.

Specifically, we jointly estimate all anticipation and uncertainty effects from specifications (2), (3), and (4) in a single regression:

$$
\begin{aligned}
y_{gct} = \sum_e \big[&\beta_{et} \times \mathbb{1}(E_{gc} = e) + \gamma_{et} \times \mathbb{1}(E_g^{first} = e) \times Friendly_c \\
&+\delta_{et}^N \times Never_{gc} \times \mathbb{1}(E_g^{first} = e)\big] \times \mathbb{1}(t \geq t_0) + \tau_{gc} + \eta_{gt} + \omega_{ct} + \zeta_{gct}.
\end{aligned} \tag{5}
$$

Importantly, all three sets of our main coefficients of interest (β_{et}, γ_{et}, and δ_{et}^N) are then estimated relative to the control group that does not include any sanctioned products from sanctioning or friendly countries. This way we have excluded any effects of sanctions that we have detected, both before and after realization of sanctions, from our control group.

Similarly, we re-estimate all pre-trends in a single regression instead of our baseline (1):

$$
\begin{aligned}
y_{gct} = \sum_e \big[&\alpha_{et}^S \times \mathbb{1}(E_{gc} = e) + \alpha_{et}^F \times \mathbb{1}(E_g^{first} = e) \times Friendly_c \\
&+\alpha_{et}^N \times Never_{gc} \times \mathbb{1}(E_g^{first} = e)\big] + \tau_{gc} + \eta_{gt} + \omega_{ct} + \zeta_{gct}, \quad t < t_0.
\end{aligned} \tag{6}
$$

The results are in Figure A.6 in the Appendix, and, as before, they justify the use of the pre-war months as the baseline period in estimating the effects of sanctions in (5).[31]

The results from single specification (5) are in Figures A.8 and A.9 for weight and Figures A.10 and A.11 for value in the Appendix. Our estimates for the effects on sanctioned flows became even stronger, while our estimates of rerouting became mostly insignificant. Still, our central finding – the presence of large and significant uncertainty effects – is reaffirmed by this specification.

Aggregation. So far we have estimated five different types effects of sanctions: anticipation of sanctions along with their actual effect, anticipation of rerouting along with its actual effect, and the so-called uncertainty effects for non-sanctioned imports of sanctioned products from sanctioning countries. In this section, we calculate the implications of our estimates for the aggregate Russian imports.

[31] See Figure A.7 for similar results for total value instead of weight

In particular, we start by computing the predicted values for all trade flows $\hat{y}_{gct}$ based on our estimates from equation (5), but we manually set to zero all our estimated effects of sanctions and their anticipation, $\hat{\beta}_{et} = \hat{\gamma}_{et} = \hat{\delta}^N_{et} = 0$. We convert these logs to the absolute levels of weight (or value) by taking an exponent, and then sum them up across all trade flows to get the aggregate Russian imports. This is our benchmark figure in the absence of any sanctions after April 2022. Importantly, we keep the first two waves of sanctions (March and April 2022) fixed in all of our calculations, thus focusing only on the escalation of sanctions after that.

Next, we repeat a similar calculation several times, but we set some of our effects to their estimated values while we keep all other coefficients unchanged. For example, to single out the role of the anticipation effects of sanctioned trade flows, we change $\hat{\beta}_{et}$ for all $t < e$, while keeping intact the effects of realized sanctions $\hat{\beta}_{et}$ for $t \geq e$ and all other coefficients. We then take exponents of these predicted values and sum them up. We interpret the resulting sum as the aggregate Russian imports in the presence of only the anticipation effects for sanctioned trade flows, without these sanctions themselves.[32]

Once we aggregate all such calculations, we can compute the total value (or weight) of all imports lost due to the escalation of sanctions after April 2022. The results presented in Table 1 imply that the total value of Russian imports has declined by almost 36 billion dollars (spread out over 22 months of the conflict). For comparison, the average Russian monthly imports in 2021 amounted to 24.12 billion dollars. Thus, the total losses due to the escalation of sanctions were roughly equivalent to losing one and a half months of the pre-war imports' value.

Crucially, two-thirds of these losses are driven by the uncertainty effects, that is, they are driven by the reduction in trade flows that were never actually sanctioned. Of course, they might still be sanctioned after the end of our sample in December 2023, but then it would still be hard to justify such large losses *years* before that happens. Such possibility is also inconsistent with our finding that the uncertainty effects diminish over time (Figure 8) in contrast to the increasing anticipation effects for the actually sanctioned trade flows (Figure 4). Therefore, the threat of sanctions' escalation appears to have had a larger impact on the Russian economy than the escalation itself.

[32]Similarly, we change the values of $\hat{\gamma}_{et}$ for $t < e$ to calculate the aggregate imports with anticipation effects for rerouting, or we change $\hat{\gamma}_{et}$ for $t \geq e$ to calculate imports with the actual rerouting. But for the calculation with uncertainty effects we always change $\hat{\delta}^N_{et}$ for all t, including the first two cohorts.

Table 1: Change in Total Russian Imports due to Escalation of Sanctions after April 2022

Change due to...	Value, bln USD	Weight, bln kg
anticipation of sanctions	-2.74	-0.05
sanctions themselves	-10.96	-0.08
anticipation of rerouting	0.30	-0.04
rerouting itself	1.38	0.05
uncertainty in sanctions	-23.94	-1.68
All effects combined	-35.96	-1.80

Notes: This table aggregates the reduced-form estimates to calculate their implications for the aggregate Russian imports over the period of March 2022 - December 2023. The two columns are based on the estimates from equation (5), where the dependent variable y_{gct} is value and weight respectively. The last line shows the change in Russian imports due to the presence of all effects together, while the other lines break down this total effect into five separate sources: $\hat{\beta}_{et}$ $t < e$, $\hat{\beta}_{et}$ $t \geq e$, $\hat{\gamma}_{et}$ $t < e$, $\hat{\gamma}_{et}$ $t \geq e$, and $\hat{\delta}^{N}_{et}$ $\forall t$ from (5). The calculation of the first four effects is made for all cohorts of sanctions after the first two.

The explanation behind the magnitudes of our results is straightforward. The total non-sanctioned value of all import flows to Russia from sanctioning countries remains so high that even relatively modest and short-lived uncertainty effects can amount to very substantial losses (recall Panel B of Figure 1).

Our results for the total weight of lost imports are mostly consistent with the results for value (the average monthly imports in 2021 amounted to 6.25 billion kilograms, but sanctioned products have much higher value per weight on average). We also repeat our analysis only on nonzero trade flows, where we estimate the intensive margin of anticipation effects (as opposed to both intensive and extensive margins in our main specification). The aggregated results are summarized in Table A.2 in the Appendix and remain largely consistent with our baseline figures.

5 Conclusion

Most sanctions on Russia were imposed during the first two months of the conflict and had large effects on the economy, as we have shown in Egorov et al. (2024). In this paper, we have focused on the minority of sanctions that followed after the first two months of a conflict. We have shown that this further escalation of sanctions has significantly reduced Russian imports, but the uncertainty in its implementation appears to have played an even greater role than the actual sanctions themselves. Thus, our results provide reduced-form evidence on the mechanism behind the effects of economic threats, specifically highlighting the role of implicit uncertainty left in these threats.

It is important to note, however, that our results do not imply that greater uncertainty always makes threats more effective. In fact, we did not find any significant pre-trends in trade flows sanctioned at the very beginning of the conflict, even though arguably there was a considerable threat of sanctions even before the start of the invasion. It is possible that this earlier threat turned out to be ineffective because of the *too much* uncertainty behind it, as there was not enough information for individual firms to adjust for what was coming.[33] We leave estimating the nonlinearities in the effects of uncertainty for future research.

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[33] Alternatively, part of this could also be driven by the limitations of the reduced-form analysis. If sanctions were expected to be applied uniformly on all imports to Russia, then our comparison of different trade flows would not have revealed any pre-trends. This, however, appears to be not as likely since it was hard to expect highly sophisticated and dual-use products to be under the same threat as some benign consumer products.

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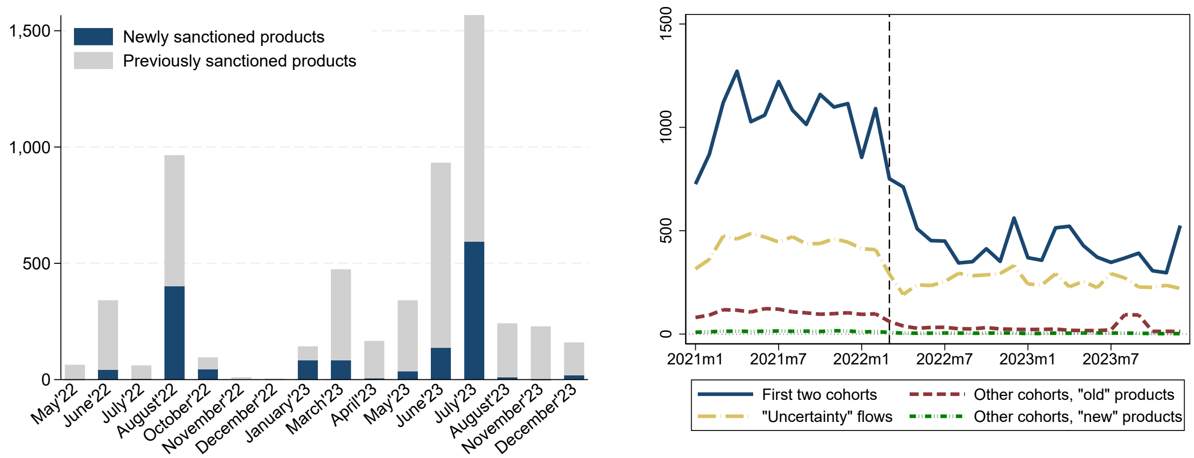
Appendix

A Appendix Figures & Tables

Figure A.1: Cohorts of sanctions, their number of trade flows and total weight

Panel A: Number of sanctioned trade flows by cohort, since May 2022

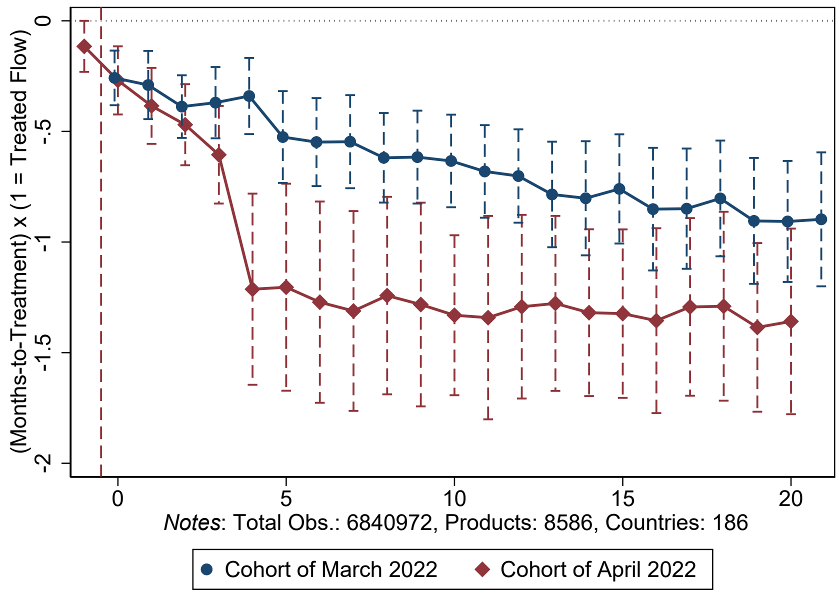
Panel B: Total weight of various trade flows



Notes: Panel A shows the total number of sanctioned country-product varieties in each month (cohort) after the first two. These trade flows are further separated into two groups: those with products previously sanctioned by any other country and those with products sanctioned for the first time in the current month.

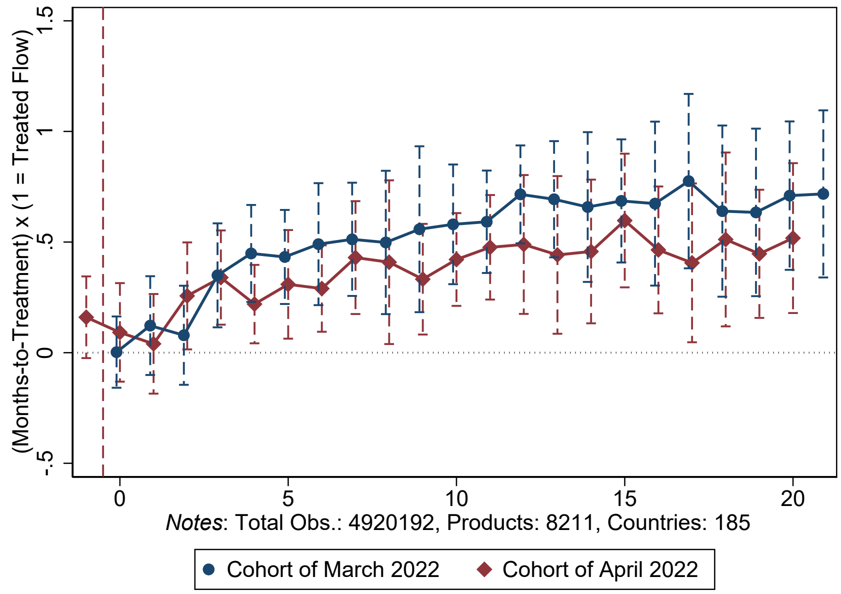
Panel B plots the total value of 4 types of trade flows over time. First, the blue line shows the country-product varieties sanctioned in March and April 2022. Next, country-product varieties sanctioned after April 2022 are further divided into two groups: varieties of previously sanctioned products (the red line) and varieties of newly sanctioned products (the green line). The latter varieties belong to countries who have been among the first to sanction these products. These three lines together contain all varieties sanctioned during 2022 and 2023. In addition, we also plot the non-sanctioned imports from sanctioning countries for sanctioned products, that is products sanctioned at least by one country by the end of 2023 (“uncertainty” flows, the yellow line). The composition of each group of varieties does not change over time. The vertical line marks the start of sanctions in March 2022.

Figure A.2: Sanctions anticipation and treatment, sanctioned flows, log of weight



Notes: This figure presents the staggered difference-in-differences estimates of equation (2), which assess the anticipation and treatment effects for the sanctioned trade flows. The figure plots the estimated β_{et} for the first two cohorts of sanctions. The x-axis shows the number of months before and after the trade flow falls under sanctions, where each coefficient is estimated relative to the pre-war months (which form the omitted category). We interpret coefficients to the left from the date of sanctions as "sanctions anticipation" and to the right as "the effect of sanctions". The figure uses the total import net weight of a given product from a given country in a given month as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

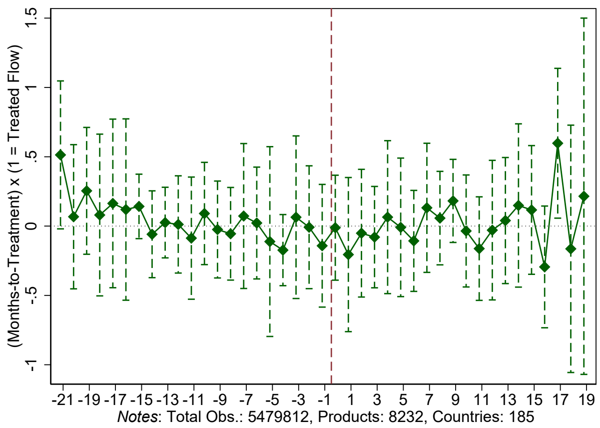
Figure A.3: Anticipation and treatment for imports of sanctioned products from friendly countries, log of weight



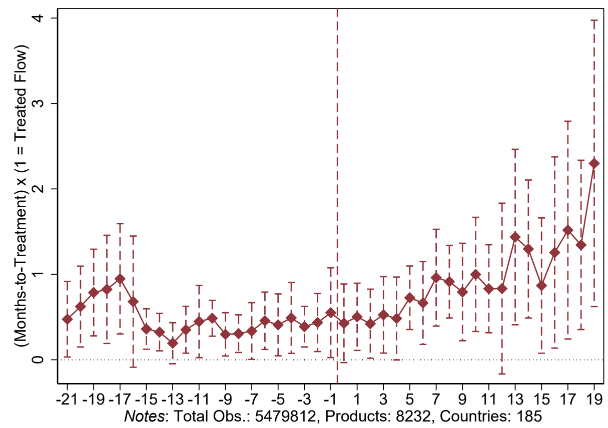
Notes: This figure presents the staggered difference-in-differences estimates of equation (3), which assess the anticipation and treatment effects for the imports of sanctioned products from friendly countries. The figure plots the average of estimated γ_{et} for the first two cohorts of sanctions. The x-axis shows the number of months before and after the product gets sanctioned for the first time by any country. All coefficients are estimated relative to the pre-war months (which form the omitted category). We interpret coefficients to the left from the date of first sanctions as "anticipation" effects and to the right as "treatment" effects. All sanctioned trade flows are dropped from this estimation. The figure uses the total import net weight of a given product from a given country in a given month as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

Figure A.4: Decomposing substitution vs rerouting of sanctioned products via friendly countries, log of weight

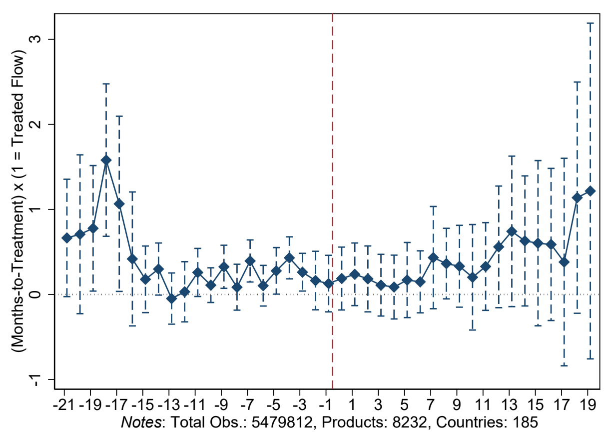
Panel A: Substitution



Panel B: Rerouting, sanctioning countries

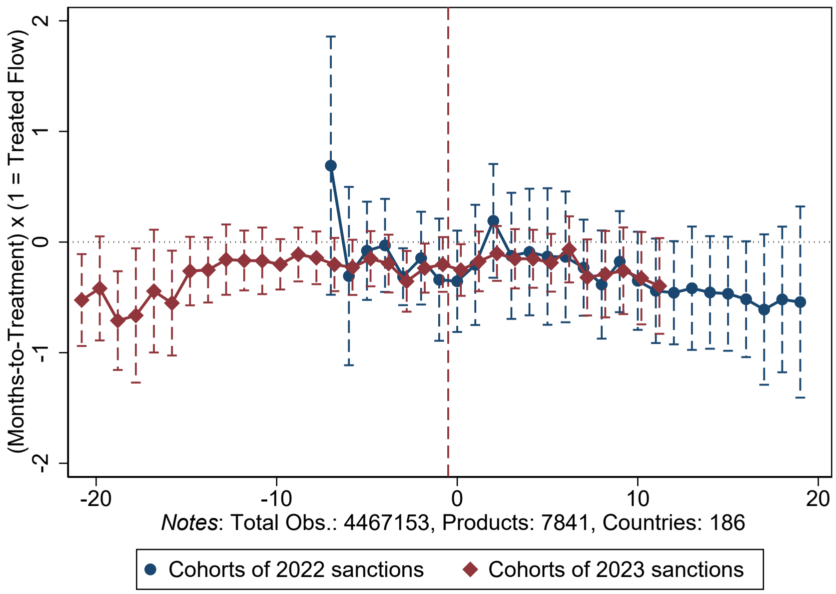


Panel C: Rerouting, other countries



Notes: These figures disentangle the effects of substitution to and rerouting through friendly countries. Specifically, each import flow of the sanctioned products from firendly countries is separated into three flows: those produced within the same friendly country (Panel A), those produced in sanctioning countries (Panel B), and those produced elsewhere (Panel C). The impact of import sanctions on all three groups is estimated in the same regression, while it's allowed to differ by group. Directly sanctioned flows are not included in the estimation sample. The figures plot the average of estimated effects for all the cohorts of sanctions except the first two (each cohort is weighted by the number of its observations). The x-axis shows the number of months before and after the product gets sanctioned for the first time by any country. All coefficients are estimated relative to the pre-war months (which form the omitted category). We interpret coefficients to the left from the date of first sanctions as "anticipation" effects and to the right as "treatment" effects. The figures use the total import net weight of a given product from a given country in a given month as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

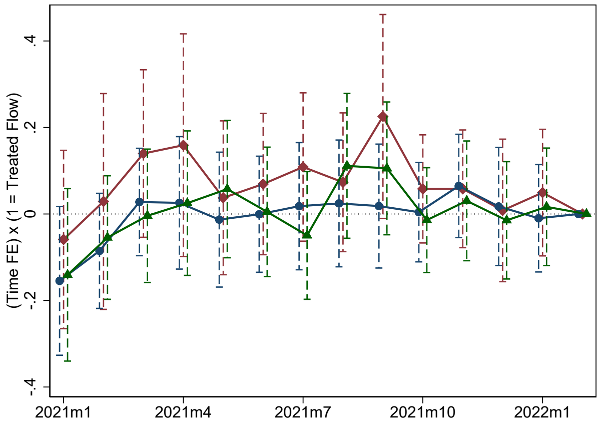
Figure A.5: Early vs late uncertainty effects for non-sanctioned varieties of sanctioned products, all cohorts since May 2022, log of weight



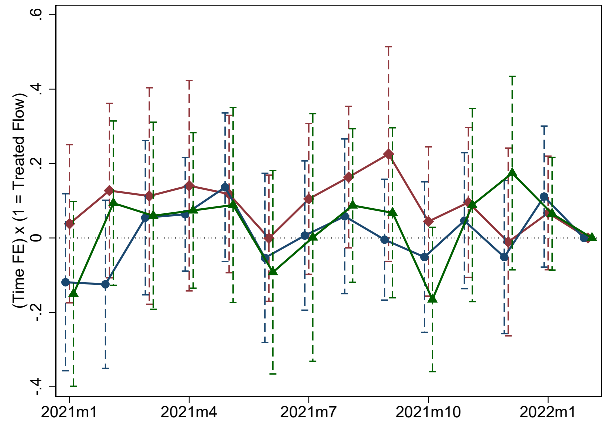
Notes: This figure presents the staggered difference-in-differences estimates of uncertainty effects δ_{et}^{N} from equation (4). The figure plots their averages for all the cohorts of sanctions except the first two (each cohort is weighted by the number of its observations). The blue line shows the average of all cohorts between May and December 2022, while the red line plots the average for cohorts since January 2023. The x-axis shows the number of months before and after the product gets sanctioned for the first time by any county. All observations under sanctions are dropped from this estimation. All coefficients are estimated relative to the pre-war months (which form the omitted category). The figure uses the total import net weight of a given product from a given country in a given month as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

Figure A.6: Pre-trends prior to the start of the conflict,
by type of trade flow and by cohort, log of weight

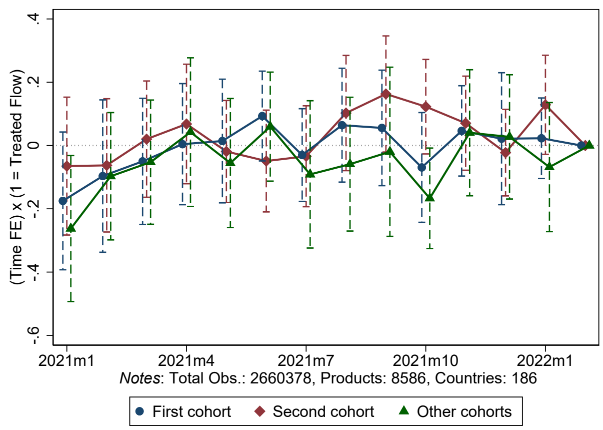
Panel A: Sanctioned trade flows



Panel B: Imports of sanctioned products from friendly countries



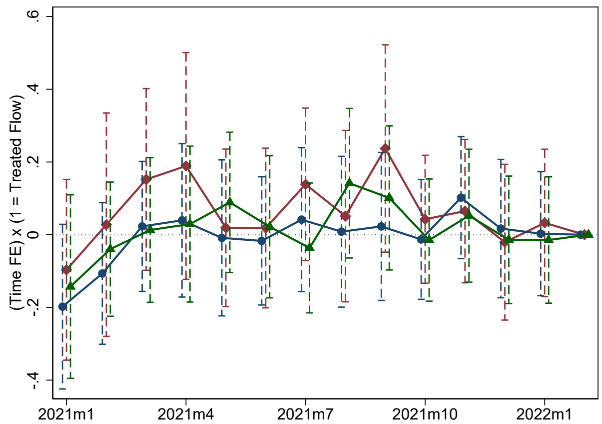
Panel C: Non-sanctioned imports of sanctioned products from sanctioning countries



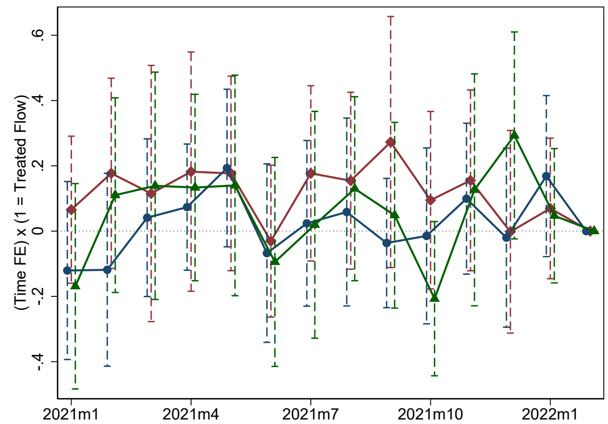
Notes: This figure presents the dynamic DiD estimates of equation (6), which assess the pre-trends in each cohort of each type of trade flows relative to the untreated trade flows prior to March 2022 (February 2022 serves as the baseline period). Panel A presents the results for sanctioned trade flows, Panel B – for imports of sanctioned products from friendly countries, and Panel C – for non-sanctioned imports of sanctioned products from sanctioning countries. In each panel, the first two lines shows coefficients for the first two cohorts, while the last line shows the average for all of the remaining cohorts, weighted by the number of observations in each cohort. The figure uses the total import net weight of a given product from a given country in a given month as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

Figure A.7: Pre-trends prior to the start of the conflict,
by type of trade flow and by cohort, log of value

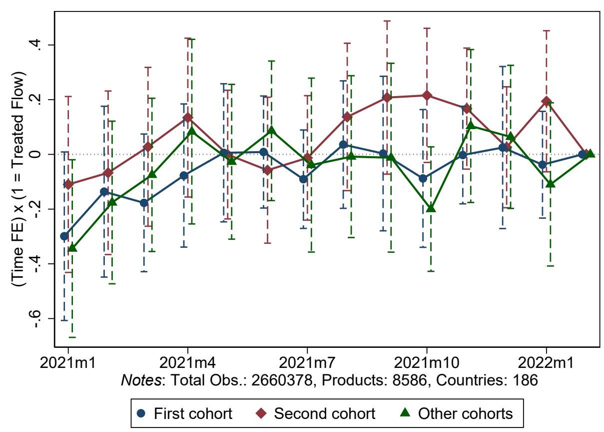
Panel A: Sanctioned trade flows



Panel B: Imports of sanctioned products from friendly countries



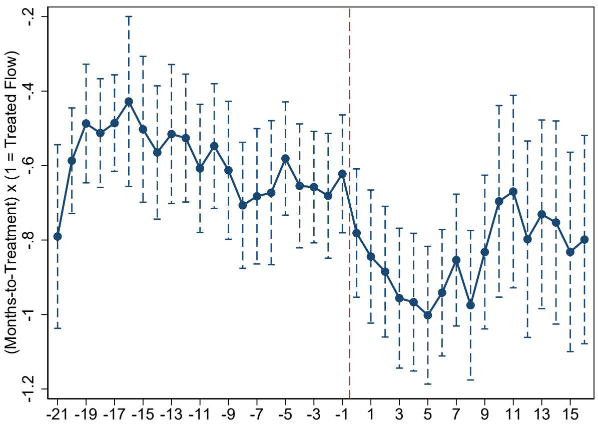
Panel C: Non-sanctioned imports of sanctioned products from sanctioning countries



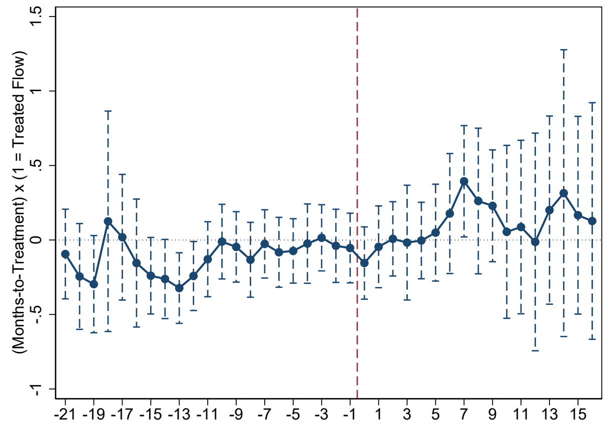
Notes: This figure presents the dynamic DiD estimates of equation (6), which assess the pre-trends in each cohort of each type of trade flows relative to the untreated trade flows prior to March 2022 (February 2022 serves as the baseline period). Panel A presents the results for sanctioned trade flows, Panel B – for imports of sanctioned products from friendly countries, and Panel C – for non-sanctioned imports of sanctioned products from sanctioning countries. In each panel, the first two lines shows coefficients for the first two cohorts, while the last line shows the average for all of the remaining cohorts, weighted by the number of observations in each cohort. The figure uses the total import value of a given product from a given country in a given month as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

Figure A.8: Treatment, anticipation, and uncertainty effects,
by type of trade flow, log of weight

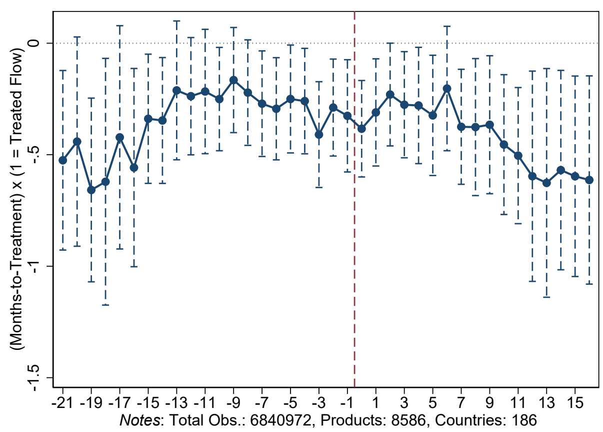
Panel A: Sanctioned trade flows



Panel B: Imports of sanctioned products from friendly countries



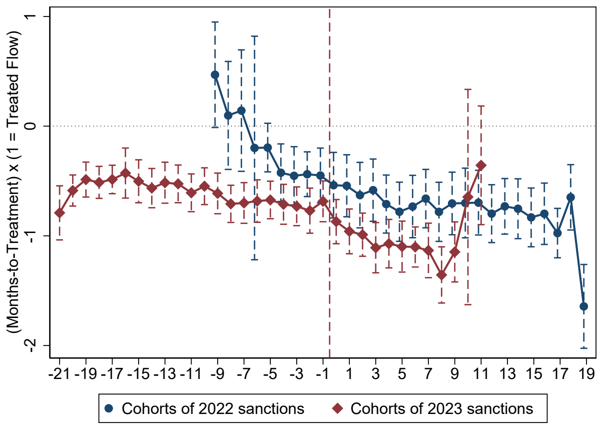
Panel C: Non-sanctioned imports of sanctioned products from sanctioning countries



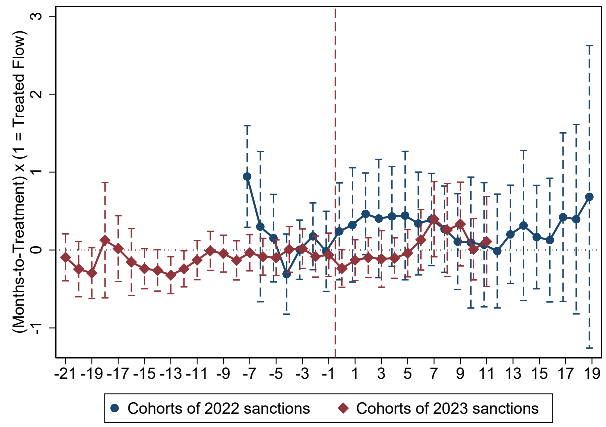
Notes: This figure presents the staggered DiD estimates of equation (5), which all effects together in a single regression: treatment and anticipation for the sanctioned and the rerouted trade flows (Panels A and B), and uncertainty effects for the imports of non-sanctioned varieties of sanctioned products from sanctioning countries (Panel C). These figures represent versions of Figures 3, 5, and 7 respectively. The figures plot the average of estimated coefficients for all cohorts of sanctions (except the first two for Panels A and B, each cohort is weighted by the number of its observations). The x-axis shows the number of months before and after the trade flow falls under sanctions (Panel A) or the product gets sanctioned for the first time by any country (Panels B and C). All coefficients are estimated relative to the pre-war months (which form the omitted category). The figure uses the total import net weight of a given product from a given country in a given month as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

Figure A.9: Treatment, anticipation, and uncertainty effects,
early vs late, by type of trade flow, log of weight

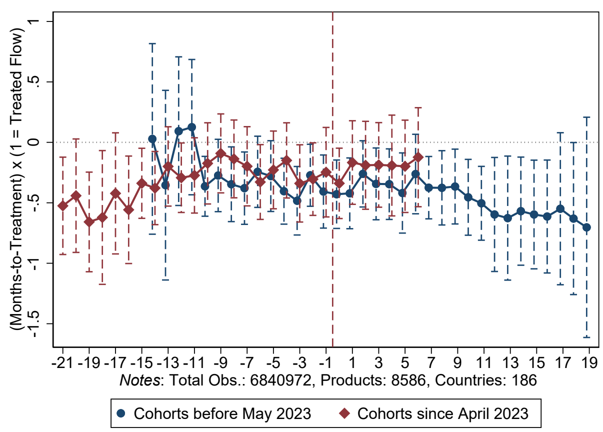
Panel A: Sanctioned trade flows



Panel B: Imports of sanctioned products from friendly countries



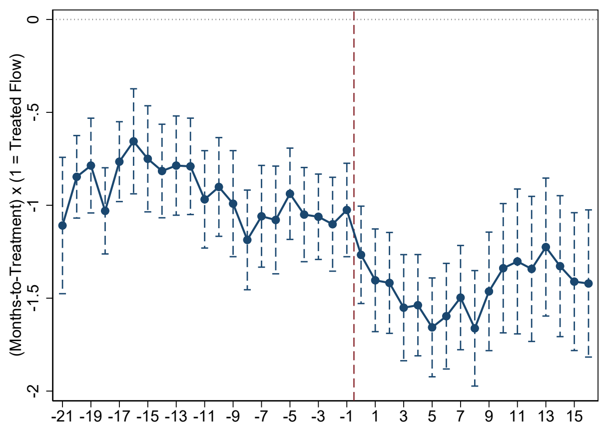
Panel C: Non-sanctioned imports of sanctioned products from sanctioning countries



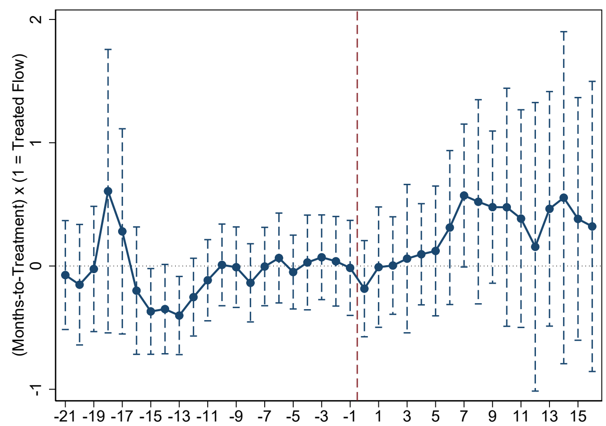
Notes: This figure presents the staggered DiD estimates of equation (5), which all effects together in a single regression: treatment and anticipation for the sanctioned and the rerouted trade flows (Panels A and B), and uncertainty effects for the imports of non-sanctioned varieties of sanctioned products from sanctioning countries (Panel C). These figures represent versions of Figures 4, 6, and 8 respectively. The figures plot the average of estimated coefficients for all cohorts of sanctions (except the first two for Panels A and B, each cohort is weighted by the number of its observations). The red line shows the average for all cohorts of late sanctions (those imposed in 2023 for Panels A and B and those imposed since April 2023 for Panel C), while the blue line shows the average for all cohorts of early sanctions. The x-axis shows the number of months before and after the trade flow falls under sanctions (Panel A) or the product gets sanctioned for the first time by any country (Panels B and C). All coefficients are estimated relative to the pre-war months (which form the omitted category). The figure uses the total import net weight of a given product from a given country in a given month as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

Figure A.10: Treatment, anticipation, and uncertainty effects,
by type of trade flow, log of value

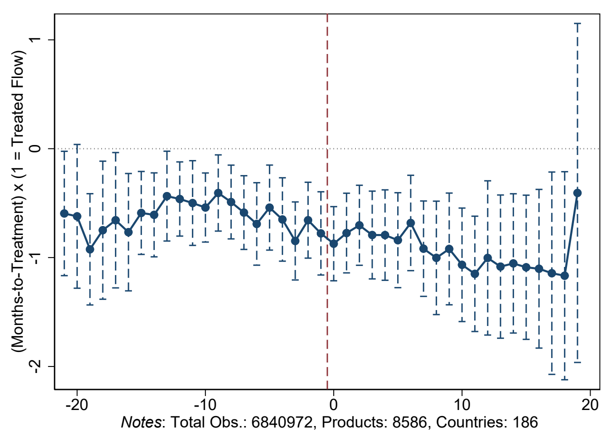
Panel A: Sanctioned trade flows



Panel B: Imports of sanctioned products from friendly countries



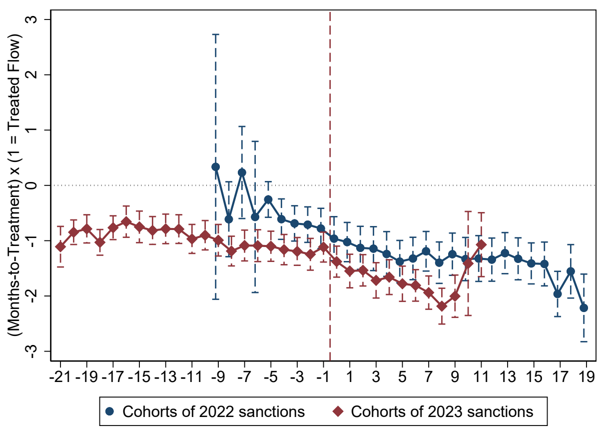
Panel C: Non-sanctioned imports of sanctioned products from sanctioning countries



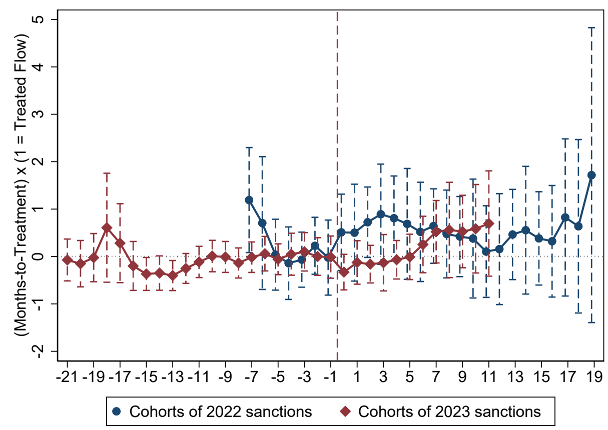
Notes: This figure presents the same effects as Figure A.8, but estimated for the total import value instead of weight. Specifically, it presents the staggered DiD estimates of equation (5), which all effects together in a single regression: treatment and anticipation for the sanctioned and the rerouted trade flows (Panels A and B), and uncertainty effects for the imports of non-sanctioned varieties of sanctioned products from sanctioning countries (Panel C). These figures represent versions of Figures 3, 5, and 7 respectively. The figures plot the average of estimated coefficients for all cohorts of sanctions (except the first two for Panels A and B, each cohort is weighted by the number of its observations). The x-axis shows the number of months before and after the trade flow falls under sanctions (Panel A) or the product gets sanctioned for the first time by any country (Panels B and C). All coefficients are estimated relative to the pre-war months (which form the omitted category). The figure uses the total value of imports of a given product from a given country in a given month as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

Figure A.11: Treatment, anticipation, and uncertainty effects, early vs late, by type of trade flow, log of value

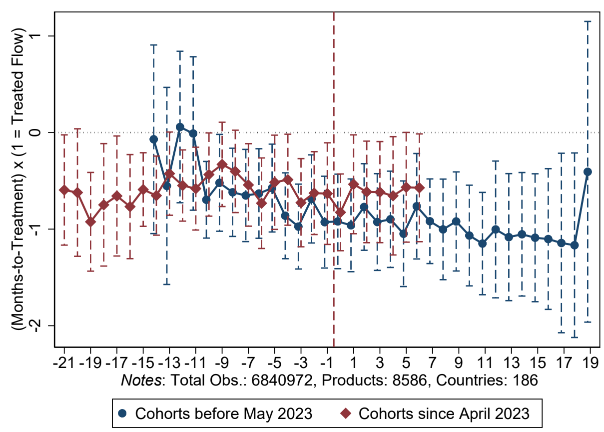
Panel A: Sanctioned trade flows



Panel B: Imports of sanctioned products from friendly countries



Panel C: Non-sanctioned imports of sanctioned products from sanctioning countries



Notes: This figure presents the same effects as Figure A.9, but estimated for the total import value instead of weight. Specifically, it presents the staggered DiD estimates of equation (5), which all effects together in a single regression: treatment and anticipation for the sanctioned and the rerouted trade flows (Panels A and B), and uncertainty effects for the imports of non-sanctioned varieties of sanctioned products from sanctioning countries (Panel C). These figures represent versions of Figures 4, 6, and 8 respectively. The figures plot the average of estimated coefficients for all cohorts of sanctions (except the first two for Panels A and B, each cohort is weighted by the number of its observations). The red line shows the average for all cohorts of late sanctions (those imposed in 2023 for Panels A and B and those imposed since April 2023 for Panel C), while the blue line shows the average for all cohorts of early sanctions. The x-axis shows the number of months before and after the trade flow falls under sanctions (Panel A) or the product gets sanctioned for the first time by any country (Panels B and C). All coefficients are estimated relative to the pre-war months (which form the omitted category). The figure uses the total total value of imports of a given product from a given country in a given month as an outcome. The logarithms add 1 to the argument's value to avoid missing values. The bars represent 95% confidence intervals. Standard errors are clustered two-way by country and product levels.

Table A.1: The Average Estimates for Various Anticipation Effects

	(1)	(2)	(3)	(4)	(5)	(6)
	Sanctioned flows		Friendly flows		Uncertainty flows	
	Anticipation effects	Sanctions effects	Anticipation effects	Sanctions effects	Before 1st sanctions	After 1st sanctions
Average Estimate	-0.418***	-0.644***	0.264***	0.422***	-0.225**	-0.225**
	(0.061)	(0.078)	(0.070)	(0.157)	(0.099)	(0.113)
Product-Country FE	✓	✓	✓	✓	✓	✓
Product-Month FE	✓	✓	✓	✓	✓	✓
Country-Month FE	✓	✓	✓	✓	✓	✓
Observations	6,840,972	6,840,972	4,920,192	4,920,192	4,467,153	4,467,153
Number of Products	8,586	8,586	8,211	8,211	8,930	8,930
Number of Countries	186	186	185	185	186	186

Notes: This table calculates the average estimates from regressions (2) (columns 1 and 2), (3) (columns 3 and 4), and (4) (columns 5 and 6). These are averages over all time periods and over all cohorts after the first two (each estimate is weighted by the number of its observations). Columns 1, 3, and 5 show averages for periods before the "event", that is for $t < e$, while columns 2, 4, and 6 show averages for periods after the "event", for $t \geq e$. We interpret estimates in columns 1 and 3 as anticipation effects and estimates in columns 2 and 4 as the effects of sanctions. Estimates in columns 5 and 6 are interpreted as uncertainty effects, before and after the first sanctions on the same product respectively. The outcome variable is the log of total weight imported. The logarithms add 1 to the argument's value to avoid missing values. Standard errors in parentheses are two-way clustered at the country and product levels. * p<0.1, ** p<0.05, *** p<0.01.

Table A.2: Change in Total Russian Imports due to Escalation of Sanctions after April 2022, estimated on the intensive margin of trade only

Change due to...	Value, bln USD	Weight, bln kg
anticipation of sanctions	-2.49	-0.17
sanctions themselves	-4.01	-0.11
anticipation of rerouting	-0.44	-0.08
rerouting itself	-0.38	-0.20
uncertainty in sanctions	-14.56	-2.32
All effects combined	-21.87	-2.88

Notes: This table aggregates the reduced-form estimates to calculate their implications for the aggregate Russian imports over the period of March 2022 - December 2023. The two columns are based on the estimates from equation (5), where the dependent variable y_{gct} is value and weight respectively. All observations with zero value or weight were dropped from the estimation. The last line shows the change in Russian imports due to the presence of all effects together, while the other lines break down this total effect into five separate sources: $\hat{\beta}_{et}$ $t < e$, $\hat{\beta}_{et}$ $t \geq e$, $\hat{\gamma}_{et}$ $t < e$, $\hat{\gamma}_{et}$ $t \geq e$, and $\hat{\delta}^N_{et}$ $\forall t$ from (5). The calculation of the first four effects is made for all cohorts of sanctions after the first two.