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Preliminary and Incomplete. Comments Welcome

Abstract

This paper examines the impact of Russia's WTO accession on trade patterns at the firm level. A large literature of cross-country studies examines the long run trade effects of GATT/WTO membership and generates surprisingly conflicting results. Our paper contributes to this literature by bringing micro-level evidence from the experience of a large trading country. Using customs level data on the import and export transactions of Russian firms over the period 2011-2015, we investigate the firms' short-run trade responses along the intensive and extensive margins following Russia's WTO accession in 2012. Our results indicate an increase in the number of exporters following the accession, an increase in the number of foreign countries that Russian firms import from or export to, and a significant increase in the number of imported products. The evidence of the effects of WTO accession on the intensive margin of firm level trade is mixed. Although it is difficult to extend our findings to longer time periods, they nevertheless bring support in favor of countries' efforts to seek WTO membership.

JEL: F13, F14, F15
Keywords: GATT, WTO, Russian firms, trade policy uncertainty, trade barriers

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1   Introduction

The World Trade Organization (WTO) and its predecessor the General Agreement on Tariffs and Trade (GATT) have been the pillars of our global trading system, continuously promoting market integration through the gradual removal of tariffs and other barriers to trade. Today, the WTO is the largest international trade agreement with over 160 member countries worldwide. Membership to the GATT/WTO not only guarantees market access benefits and a more predictable trade policy environment (e.g., the most favored nation (MFN) tariffs), but also provides rules and procedures for settlements over disputes, regulations in the sphere of trade in services, or a framework for intellectual property rights protection. These benefits of trade liberalization have motivated most countries around the world to seek accession to the WTO.

Because of this general belief that GATT/WTO provides important trade gains to its member countries, Rose (2004)'s seminal paper that disputes such gains has stirred a lot of attention and interest in the empirical trade literature. The failure to identify empirically any positive benefits of WTO membership on international trade flows has raised questions about the data sample and estimation strategy. Yet more than fifteen years later, after substantial empirical research on this topic, there still isn't a consensus in the literature about the role of WTO membership in promoting international trade.

This paper aims to contribute to this on-going debate by bringing micro-level evidence from the experience of Russian importers and exporters following the country's 2012 accession to the WTO. Using customs level data on all international transactions over the period 2011-2015, we investigate the ways in which trading firms in Russia responded to this significant trade policy change. We examine several dimensions of firm-level trade that may be directly impacted by the WTO, with a particular focus on capturing any short-run changes along the intensive and extensive margins. Following the work of Handley & Limao (2017), we hypothesize that Russia's accession to the WTO has the potential to decrease the trade policy uncertainty surrounding Russia's trade partners. This decrease in uncertainty can

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manifest through an increase in the number of importing and exporting firms, an increase in the frequency of trade shipments, and possibly an increase in the average trade flow per firm and product-country pair. Furthermore, accession to the WTO also provides Russian trading firms easier access to new markets along both the product and partner country dimensions as a result of reduced barriers to trade. This paper undertakes all of these empirical exercises in order to provide micro-level evidence on the main effects of WTO accession.

Using a difference-in-differences estimation strategy applied to a firm-level regression model of international trade, we find evidence of strong positive trade effects along the partner-country margins for both exporting and importing firms and along the product margin for the importers. For example, the importers import on average 8.6% more HS 8-digit level products after the accession to the WTO, while for the exporters the increase of 5% in the average number of partner countries is significant. We also find some evidence of an increase in the number of exporting firms in the market after the WTO accession, and an increase in the frequency of import shipments for importers of about 6%.

We also explore the connection between two of Russia's foreign trade policies – the WTO accession and the food retaliatory embargo. Not too long after becoming a WTO member, Russia became the target of economic sanctions following its 2014 intervention in Crimea (Ukraine), to which Russia retaliated by imposing a food trade embargo. While only a small share of Russia's trade is the subject of these trade disputes, the proximity in time of the two trade policy events requires careful consideration.[1] Our analysis provides evidence of disproportionate positive impacts of WTO membership on agricultural imports such as a significant increase in the frequency of imports, an increase in the average number of products imported, and a significant increase in the average firm-product-country import flow. These findings could serve as suggestive evidence that the retaliatory embargo imposed

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[1]The embargo has been proven to have adverse impacts on Russia's foreign trade (Miromanova (2019)). To alleviate concerns with identifying the firm level trade effects of the WTO membership, our econometric analysis will pay close attention to the macroeconomic characteristics of the Russian economy and to particular state-connected sectors, as well as directly control for the set of products and countries targeted by the retaliatory embargo.

by Russia on all the countries that sanctioned its foreign policy actions was also intended as a protectionist policy to help a vulnerable domestic industry (i.e., agricultural sector) impacted by an increase in import competition following Russia's WTO accession. Because protectionist policies are against WTO provisions, the retaliatory embargo may have been a convenient way to kill two birds with one stone - retaliate against the economic sanctions and protect domestic agricultural production.

Our paper makes two important contributions. First, it brings firm level evidence on the trade effects of WTO membership using the experience of a large economy other than China. Most of our knowledge to date about the impact of WTO accession on firm level dynamics relies on Chinese data. In part, this is because micro-level datasets have become increasingly available only in recent years and there are only a few countries with prominent presence on global markets whose WTO accession happened in recent years. However, China represents an unusual case study since it is a planned economy with a substantial manufacturing base that is predominantly export-oriented, particularly towards specific foreign markets such as the U.S. This calls for the need to examine other countries whose WTO accession experience may be more representative for countries around the world. Russia, by contrast, may serve this purpose well as it is a large economy with a significant presence on foreign markets[2] and an economic structure that is more oriented towards trade in natural resources.

A second key contribution of our paper comes from our empirical findings, which identify significant but economically small effects of Russia's accession to the WTO. Our analysis suggests three explanations for these outcomes: i) Russia didn't reduce import tariffs significantly after its WTO accession; ii) it found an excuse to put in some significant non-tariff measures (such as the food embargo on agricultural imports); and iii) it was already enjoying the most favored nation (MFN) status on its exports in most foreign countries. Other countries around the world may have experienced similar conflicting behaviors following their

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[2]International trade is an important component of Russia's economy, accounting for 24 percent of its GDP in 2017. Worldwide, Russia ranks 14th in exports of merchandise and 22nd in imports of merchandise for year 2018.

WTO accession by going through phased liberalization while also manifesting protectionist tendencies. This could provide some explanations as to why the cross-country evidence on the trade effects of WTO membership is often mixed.

Our work contributes to several strands of literature. First of all, it contributes to the substantial work on the trade effects of the WTO membership. Most of this literature follows the seminal work of Rose (2004) and consists of cross-country studies investigating the long-term effects of WTO participation. Some subsequent studies confirm Rose (2004)'s findings of no effect of GATT/WTO membership on bilateral trade flows even after refining the estimation strategy following the latest developments in gravity equation estimations (e.g., Eicher & Henn (2011), Esteve-Perez et al. (2019)). Others found positive effects of WTO membership on total bilateral trade flows once the treatment group was redefined to include *de facto* WTO members (Tomz et al., 2007), or once country heterogeneity based on level of development was directly accounted for (Subramanian & Wei, 2007). Still other studies attempted to reconcile Rose (2004)'s results by decomposing the aggregate WTO trade effects along the extensive and intensive margins of trade (Liu (2009), Dutt et al. (2013)). Our findings are in line with the aggregate results in the literature in that, like Dutt et al. (2013), we find a strong effect of WTO membership on the extensive margin but not much of an effect on the intensive margin, and like Liu (2009), we find that these effects are robust to departing from the traditional Ordinary Least Squares (OLS) estimation method and instead using the Pseudo-Poisson Maximum Likelihood (PPML) method.

A second strand of literature that closely relates to our study investigates the effect of WTO accession on various firm- or industry-level economic outcomes other than international trade patterns. Most of these studies exploit China's 2002 accession to the WTO as a major trade liberalization shock. Brandt et al. (2017) examine the impact that China's WTO accession had on firm-level productivity and price mark-ups. Lu & Yu (2015) exploit the same trade liberalization episode to investigate changes in industry-level markup dispersion as a way to shed light on resource misallocations. Baccini et al. (2017) use the

experience of Vietnam's accession to the WTO in 2007 to investigate whether state-owned enterprises (SOEs) respond differentially to trade liberalization compared to privately owned firms, focusing on market entry and exit rates, access to capital, as well as changes in productivity and in profitability. Handley & Limao (2017) examine the impact of trade policy uncertainty on industry-level trade by treating China's accession to the WTO not only as a tariff liberalization event but also a policy that significantly reduced the U.S. threat of a trade war with China. Handley & Limao (2017) show that this reduction in trade policy uncertainty explains a significant fraction of China's export growth to the U.S. While not directly related in research scope, our paper relates to all these studies in its use of micro-level data to analyze the economic consequences of the WTO accession of a large country.

Perhaps the paper closest related to ours is Feng et al. (2017), which also studies changes in firm-level trade patterns following China's accession to the WTO. However, the aim of that paper is to understand trade policy uncertainty as a barrier to trade, hence its specific focus on Chinese exports to the U.S. By contrast, our paper departs from the experience of China, and instead considers Russia's import and export patterns with respect to *all* its global trade partners, distinguishing between the status of those partners as WTO versus non-WTO members.

Lastly, our work relates to existing research evaluating the effects of the WTO on the Russian economy. While we are not the first to ever examine Russia's accession experience, most of the existing studies are either descriptive in nature or employ a computable general equilibrium (CGE) framework.[3]

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[3]For example, Chowdhury (2004) concentrates on the analysis of the negotiations, and emphasizes that some of the serious barriers to Russia's membership in the WTO is the presence of heavy subsidization in several sectors of the economy, lack of liberalization and intellectual property rights. Connolly & Hanson (2012) and Tochitskaya (2012) describe the commitments Russia undertook when it decided to join WTO, including the tariff schedules, foreign investment liberalization, and non-tariff barriers. Lissovolik & Lissovolik (2006) attempt to estimate whether Russia's "WTO outsider" status had an impact on its exports. They show that Russia's export structure was skewed significantly away from WTO members in the pre-accession period 1995-2002. Jensen et al. (2004) and Rutherford et al. (2005) utilize a CGE model to estimate the impact of Russia's accession to the WTO on a host of economic characteristics. The largest gains are predicted to come from the liberalization of barriers against multinational service providers. Babetskaia-Kukharchuk & Maurel (2004) investigate the impact of institutions on trade and estimates the potential for an increase in trade between the Commonwealth of Independent States (CIS) and the European Union (EU). They use

The remainder of the paper proceeds as follows. In the next section we describe in more detail Russia's process of accession to the WTO. Section 3 presents the estimation strategy and discusses model identification. Section 4 describes the main data sources, the construction of the estimation sample. and provides some descriptive statistics. The estimation results are discussed in section 5 while section 6 describes the robustness checks implemented to further validate our findings. Finally, section 7 concludes.

2   Policy Background: Russia's WTO Accession

The Russian Federation applied to the GATT in 1993, but it only joined the GATT/WTO on August 22, 2012 after 19 years of negotiations. However, the negotiations were not continuous throughout this period, with the longest break in the negotiation process taking place from 2006 to 2011. After this hiatus, President Putin announced Russia's accession to the WTO as one of the main goals of his upcoming presidency.

There are several reasons for the significant delays in Russia's accession process. Among the most important reasons is that when Russia initially applied to the WTO, its economy had a different structure from the decentralized market economies of the existing GATT/WTO members. After the dissolution of the Soviet Union, Russia went through a host of socio-economic, legislative, and political reforms, which left its financial and fiscal systems in disarray for a long time. The absence of rigorous structure and regulation of many aspects of the economy led a number of WTO members to doubt Russia's ability to fulfill its obligations as a WTO member (Chowdhury, 2004).

Another major reason for the delays in Russia's WTO negotiations process has been the strong lobbying interests of certain exporting industries such as the auto and airplane production, agricultural production, and services. The auto and airplane industries typically exploited the infant industry protection argument - i.e., the increased need of protection for certain industries that are more prone to be displaced by competition in the short run but are

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their estimates to back out the potential benefits of joining the WTO.

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capable of upgrading in the medium-to-long run. The agricultural industry in Russia, similar to the other countries, generally struggled with WTO's restrictions on state subsidies to the sector and with the fear of foreign competition. The service sector lobbied against intellectual property rights and the issue of foreign ownership in telecommunications, insurance, and banking industries (Åslund (2010)).

Among the commitments Russia undertook when joining the WTO is the liberalization of services (including telecommunications, insurance companies and banks), the elimination of quotas that are unjustified under the WTO provisions, the elimination of industrial subsidy programs, the enforcement of the intellectual property rights, and the augmentation of the tariff schedule, which is one of the main steps of the WTO accession. According to the WTO provisions, all WTO member countries apply the Most Favored Nation (MFN) tariffs to each other. For Russia, tariffs on more than one third of national tariff lines had to be reduced immediately after Russia's accession to the WTO. The rest of the tariff cuts were scheduled to be implemented gradually over a three year period (Tochitskaya (2012)). Prior to the accession to the WTO, Russia's average bound tariff for all products was 10%, for agricultural products 13.2%, and for manufactured goods 9.5%. According to the negotiated agreement, the average bound tariff for all products had to decrease to 7.8% by 2017, and for the manufactured products to 7.3%. Agricultural tariffs must be decreased to 10.8% by 2021. In 2018, the simple average final bound tariff for Russia was 7.6%, with 7.1% for the manufactured goods, and 11.2% for agricultural products. The products that receive the highest import tariffs are animal products (23.2 percent on average) and beverages and tobacco (23.3 percent). The products with the lowest import tariffs are petroleum (5.0 percent) and chemicals (5.2 percent).[4] The tariff changes do not apply to the sectors that Russia deemed "most vulnerable", for which a transition period of 7 to 8 years was negotiated. These industries include agriculture, automotive and civil aircraft industries (Tochitskaya (2012)).

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[4]Information from the WTO Russian Federation member profile. The averages do not include zero tariff lines.

[Insert Figure 1]

Figure 1 uses information collected by the WTO on Russia's ad-valorem MFN tariffs. The grey bars correspond to the (unweighted) average MFN tariff computed across all HS 4-digit products codes. The overlapping dark lines indicate the inter-quartile range (IQR) of ad-valorem MFN tariffs over all HS 4-digit product codes. The figure conveys two main points. First, it confirms our earlier claim about the modest changes in *average* MFN tariffs in the first three years following Russia's WTO accession. While several HS 4-digit sectors witnessed tariff changes, the number of these sectors and/or the size of the tariff cuts weren't large enough to change Russia's average tariffs by a significant margin over time. Second, the figure also illustrates that any tariff liberalization efforts were focused particularly on the sectors with the highest import tariffs, as suggested by the fall in the IQR post-accession. We further explore this insight using a different data display.

[Insert Figure 2]

Figure 2 provides a direct illustration of the change in Russia's MFN tariffs at the HS 4-digit product level over the period 2011-2015. The scatterplot correlates the tariff changes between 2011-2015 to the initial tariff level in 2011, the year prior to Russia's WTO accession. The downward sloping fitted line indicates that the industries (i.e., HS 4-digit products) with the highest tariffs prior to WTO accession are the industries experiencing the largest drops in tariffs in the first three years post-accession. Even so, for most industries the fall in import tariffs ranges between 0 and 5 percent, which often represents a modest cut compared to the initial tariff levels.

Even after joining the WTO, Russia has remained reluctant to fully embrace trade liberalization and continues to rely on non-tariff measures to guard foreign trade. Although the imposition of new non-tariff measures (NTMs) has declined after Russia joined the WTO (Figure 3), the rate at which previously imposed non-tariff measures are being lifted has been slow. Thus the average number of NTMs per product has remained fairly constant.

The most notorious non-tariff measure utilized by Russia after its accession to the WTO is the retaliatory embargo imposed in the aftermath of the Crimean conflict in August of 2014. The embargo targets a set of 48 HS 4-digit agricultural products imported from the 38 countries that impose economic sanctions on Russia and is still in place today.[5]

[Insert Figure 3]

3   Estimation Strategy

This section describes the estimating equations for the firm-level extensive and intensive margins, as well as for the frequency of trade shipments. Our micro-level dataset includes information on monthly import and export transactions by firm, by (HS 8-digit) product and by foreign country. This allows us to define the extensive margin in multiple ways, such as the total number of products traded by a firm, or the number of products traded by a firm in a given foreign market, or the total number of countries that a firm trades with, or the number of countries that a firm trades with in a particular product. The intensive margin is defined as the value of a trade transaction for a given product carried out by a firm in a given foreign market. Similarly, the frequency of trade shipments is defined at the firm-product-country level as the number of months within a six-month period that a firm registers positive trade flows.[6]

Our methodological approach to evaluate the response of Russian firms along all these margins following the country's WTO accession is a difference-in-differences estimation strategy. In presenting the estimating equations, we will also discuss the preferred estimation method and any model identification issues.

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[5]For more information on the anti-Russia sanctions and embargo see Miromanova (2019).
[6]The main reason to define trade frequency over a six-month time period is the short length of our panel dataset spanning the period 2011-2015.

3.1 Firm-Level Extensive Margins

Russia joined the WTO in August 2012, so any trade transaction after this date takes place under the new trade policy regime. To evaluate whether Russian firms have changed their behavior post-WTO accession, we construct a treatment variable as an interaction term between an indicator variable equal to 1 for the month-year periods post August 2012 and the WTO membership status of a foreign country j at that time, i.e., $Post0812_t \times WTOmember_{jt}$. This will become our variable of interest. The estimated coefficient will capture the extent to which Russian firms change their trade patterns in relation to WTO member countries (i.e., treatment group) in the post-accession month-year periods relative to the pre-accession periods. This change in trade patterns with WTO members is compared to any potential changes observed in the trade relations with non-WTO member countries (i.e., control group) over the same pre- versus post-WTO accession periods. A significant contrast between changes in trade flows involving WTO versus non-WTO member countries is indicative of the economic impact of Russia's WTO accession.

Starting with the *product* extensive margin, the difference-in-differences estimation equation that we propose takes the following form:

$$Prod_{fjst} = \beta Post0812_t \times WTOmember_{jt} + \delta Embargo_{jst} +$$

$$+ X_{jt}{}'\gamma + \alpha_{fjs} + \alpha_t + \epsilon_{fjst} \tag{1}$$

where f, j, s and t index the firm, foreign country, sector group and month-year period, respectively. The sector group s separates the set of HS 4-digit industries that are subject to the retaliatory embargo from the rest of the traded goods. $Prod_{fjst}$ denotes the number of HS 8-digit products within group s (i.e., embargoed versus non-embargoed goods) that are traded by firm f with country j at time t. The variable $Embargo_{jst}$ is an indicator variable that takes the value of 1 if the foreign country j is one of the sanctioning countries targeted by Russia's retaliatory embargo (which started in August 2014) and if the HS 8-

digit product traded is part of the set s of embargoed goods.[7] Given that many of the WTO member countries happen to be countries targeted by the Russian embargo, it is important to carefully control for the negative consequences of this retaliatory trade policy. The vector X_{jt} of control variables captures a set of time-varying country characteristics that influence trade patterns, such as the GDP level of the foreign country, the existence of a free trade agreement (FTA) or a regional trade agreement (RTA) with Russia in effect at time t, the distance to the foreign country j interacted with oil prices (as proxy for transport costs), and the exchange rate between country j's currency and the Russian rouble.[8] Lastly, α_{fjs} and α_t denote firm-country-sector group fixed effects, respectively month-year fixed effects. Time-invariant gravity variables like distance, common language or common border are captured by the first set of fixed effects, while macroeconomic conditions in Russia that may affect production and trade with all foreign countries, such as its level of GDP, price inflation or the drastic changes in oil prices over the sample period, will all be captured by the period fixed effects.

We estimate equation (1) using Pseudo-Poisson Maximum Likelihood (PPML) with high dimensional fixed effects (Santos Silva & Tenreyro (2006)). In the robustness section we also discuss OLS results for comparisons with the existing literature. To account for correlations between a firm's trade flows across sector groups (s) and time periods (t), we cluster the standard errors at the firm-country level (fj). We carry out the analysis separately for export and for import transactions.

The coefficient of interest in equation (1) is the difference-in-difference estimator β. A key identifying assumption in this type of estimation method is that, conditional on the set

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[7]The variable $Embargo_{sjt}$ is constructed as an interaction term $Embargo_s \times Target_j \times Post0814$, where $Embargo_s$ equals 1 for the group of HS 4-digit industry codes that are embargoed, $Target_j$ equals 1 if foreign country j imposed economic sanctions on Russia thus becoming a target of the retaliatory embargo, and $Post0814_t$ equals 1 for all time periods after August 2014 when the retaliatory embargo entered into effect.

[8]Since our treatment variable of interest varies by country, month and year, we cannot control for foreign country characteristics using standard country-time fixed effects. So, we are forced to include in the estimation equation as many observable time-varying country characteristics as possible. For variables that are available only yearly (e.g., GDP level), we divide their annual level by 4 to get the average quarterly values. For dummy variables that are available annually (e.g., FTA status), we use these variables as is.

of control variables, the trend of the product extensive margin would have followed the same trajectory for the average firm in the sample as that of the control group (i.e., the group of countries that are not part of the WTO). Another important condition that is necessary in order to ensure an unbiased estimate of β is the exogenous timing of Russia's WTO accession such that no firm would alter their trade behavior prior to August 2012. We assume the latter condition is likely to hold given the lengthy and unpredictable behavior of the Russian government in matters of foreign policy. To ensure the first condition, i.e., the parallel trends assumption, we are particularly careful about the interplay between two of Russia's trade policy decisions: the WTO accession and the retaliatory embargo imposed two years later. Since all countries imposing economic sanctions on Russia are WTO members, bilateral trade with these countries may decrease in the post-WTO period for reasons that are not a direct consequence of Russia's accession to the WTO. This decrease is most likely to happen in product categories in which Russia has imposed a retaliatory embargo against the sanctioning countries. For these reasons, it is important that we control in our regression estimations for the subset of sanctioning countries that could be trading in HS 4-digit embargoed goods.

In our analysis, we experiment with variations of equation (1) by aggregating the model across the two sector groups to estimate the changes induced by the WTO accession across all HS-8 product categories traded by firm f with country j. We further aggregate the estimation equation across all countries that are WTO members versus non-WTO members in period t to estimate the change in the number of products traded by a given firm f across the entire set of WTO member countries compared to non-WTO member countries. The motivation to report these more aggregate results is to understand the extent to which the product margin is driven by new products being traded for the very first time with any of the WTO countries (as opposed to existing products already traded in some markets and that are being introduced in new foreign markets, i.e., new product-market pairs). As we will show in the results section, there are no qualitative differences between the various aggregation levels of equation (1), suggesting that Russian firms, on average, begin to trade

in new HS 8-digit products following the WTO accession, as opposed to just trading existing products in new markets.

Next we estimate the *country* extensive margin using the following difference-in-difference specification:

$$Country_{fmkt} = \beta Post0812_t \times WTOmember_{mt} + \delta Embargo_{mkt} +$$

$$+ X_{mt}{}'\gamma + \alpha_{fmk} + \alpha_t + \epsilon_{fmkt} \qquad (2)$$

where f, m, k and t stand for firm, country group, HS 8-digit product code and month-year time period, respectively. The country group m denotes four sets of countries: WTO member countries that later impose sanctions on Russia, WTO member countries that do not impose sanctions on Russia, non-WTO member countries that impose sanctions on Russia as well as non-WTO member countries that do not impose sanctions on Russia. Thus, $Country_{fmkt}$ denotes the number of foreign countries within a given country group m that firm f trades with in product k and time period t. $WTOmember_{mt}$ is equal to 1 if country group m consists of WTO members and 0 otherwise. $Embargo_{mkt}$ equals 1 if product k is subject to the retaliatory embargo at time t and if country group m consists of countries that impose economic sanctions on Russia (thus becoming targets of Russia's retaliatory embargo). The vector X_{mt} controls for a set of time-varying macroeconomic variables that characterize country group m, such as the combined GDP of countries in group m, the (population-weighted) average distance to these countries interacted with oil prices, as well as the fraction of countries within group m that are part of an FTA or RTA with Russia. Lastly, α_{fmk} and α_t denote firm - country group - product fixed effects, respectively month-year fixed effects.

As with the product margin case, we experiment with different levels of sample aggregation to estimate other versions of equation (2). In particular, we aggregate the data across country groups m and keep only the distinction between WTO members versus non-members

to ask whether trade transactions in a given product category are more likely with WTO member countries irrespective of whether these countries are sanctioning or non-sanctioning countries. We then further aggregate the sample across all products k traded by a given firm f to see whether post WTO-accession the firm is more likely to enter new foreign markets (where it has no experience trading any product) which are WTO members as opposed to non-WTO members.

3.2 Firm-Level Intensive Margin

the firm-level intensive margin refers to the average value of an import or export transaction carried out by a firm f in a foreign market j for a product k at time t. The aim here is to characterize any changes in trade values from Russia's WTO accession for firms already active in particular product-country markets. Towards this goal, we estimate the following difference-in-difference specification:

$$Trade_{fjkt} = \beta Post0812_t \times WTOmember_{jt} + \delta Embargo_{jkt} +$$
$$+X_{jt}{}'\gamma + \alpha_{fjk} + \alpha_t + \epsilon_{fjkt} \qquad (3)$$

where f, j, k and t stand for firm, foreign country, HS 8-digit product code and month-year time period, respectively. Thus, $Trade_{fjkt}$ represents the average value of a trade flow in HS 8-digit product k that firm f exports (imports) to (from) country j during period t. Similar to equation (1), the variable of interest that captures the effect of Russia's accession to the WTO on the intensive margin of firm level trade is represented by the interaction term $Post0812_t \times WTOmember_{jt}$. We also control for the impacts of the retaliatory embargo by including the indicator variable $Embargo_{jkt}$ that equals 1 if product k is embargoed at time t and foreign country j is part of the set of targeted countries. Finally, the vector X_{jt} contains a set of time-varying country characteristics that influence trade patterns such as the GDP of the foreign partner, the (population-weighted) bilateral distance interacted with

oil prices (i.e., proxy for transportation costs), the dummy for the presence of an FTA or RTA between Russia and the foreign country j, and the exchange rate between the Russian ruble and the currency of country j. Lastly, α_{fjk} and α_t denote firm-country-product fixed effects, respectively month-year fixed effects.

3.3 Firm-Level Frequency of Trade Transactions

We also investigate the frequency at which Russian firms engage in international transactions. Following the work of Handley & Limao (2017) on trade policy uncertainty, a barrier that can be mitigated by the WTO accession, we hypothesize that one additional channel in which Russian firms may respond to the reduction in trade policy uncertainty is by trading more often. This would be the case if trade policy uncertainty manifests itself as a fixed cost per shipment in the eyes of trading firms. To test this hypothesis, we estimate a similar regression model as before given by the following equation:

$$Freq_{fjkh} = \beta Post0812_h \times WTOmember_{jh} + \delta Embargo_{jkh} +$$

$$+X_{jh}{}'\gamma + \alpha_{fjk} + \alpha_h + \epsilon_{fjkh} \qquad (4)$$

where f, j, k and h index the firm, foreign country, HS 8-digit product code and a half-year time period, respectively. The dependent variable $Freq_{fjkh}$ captures the number of months within a six-month period h during which firm f trades with foreign country j in a given product k. We estimate the trade frequency regression over six-month time intervals because of the short length of our panel dataset spanning the period 2011-2015.[9] All the other variables and fixed effects in equation (4) are defined as before, with the mention that the time dimension for this specification is set to half year intervals (h) instead of month-year periods (t) as defined before.

Similar to our analysis of product and country margins, we experiment with variations

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[9]In unreported results we have also experimented with year-long time periods over which trade frequency is defined and the results are qualitatively similar.

of equation (4) by aggregating the model across all HS 8-digit product codes to estimate the changes induced by the WTO membership to the frequency with which firm f trades with country j across all products. We further aggregate the estimation equation across all countries to estimate the change in foreign trade frequency for a given firm f across the entire set of WTO members versus non-WTO members in time period h. As we will show in the results section, there are no qualitative differences between the estimates obtained from the different aggregation levels of equation (4).

4   Data

4.1   Data Sources

To estimate the regression models described above, we use several data sources, including the novel firm level trade data sourced from the Russian Customs Agency[10], the CEPII Gravity database, and the World Bank Global Economic Monitor database.

The Russian firm level customs dataset provides detailed information on all monthly foreign trade transactions made by Russian exporting and importing firms from 2011 to 2015. Import and export trade flows are recorded at HS 8-digit product code by foreign country and by month-year time period.

The CEPII (Centre d'Etudes Prospectives et d'Informations Internationales) Gravity database provides information on country specific variables such as the (population-weighted) geographic distance from a given country to Russia, presence of a common language or a common border with Russia, regional and free trade agreements in effect, and other bilateral control variables typically used as regressors in gravity equation estimations. Time-varying macroeconomic controls such as the level of oil prices or the exchange rate between Russian ruble and country j's currency are sourced from St. Louis FRED and Investing.com[11],

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[10]The data set is acquired through the Russian analytical agency VedStat, `http://www.ved-stat.ru`.
[11]`https://www.investing.com/currencies/usd-rub-historical-data`

respectively. Finally, the GDP data for Russia and for the foreign countries in the sample are taken from the World Bank Global Economic Monitor database, and are recorded on a yearly basis.

After combining all these data sources, we obtain a panel dataset of Russian firms' import and export transactions by country, HS 8-digit product code, month and year of transaction. The import sample contains 21 million observations, while the exports sample has about 2.5 million observations.

When estimating the product margin of exporting and importing firms we collapse the sample across all products by counting the number of unique HS 8-digit product codes traded by a firm within a foreign country each month during the 2011-2015 sample period. For the country margin analysis, we collapse the dataset by the WTO membership status of the foreign country and count the number of unique partner countries that each firm trades with in a particular HS 8-digit product code each month. When we analyze the intensive margin of firm-level trade, we look within the firm and utilize the sample in its original form with each observation providing information on the value of the firm-country-product trade flow.

4.2   Summary Statistics

There is a total of 214 export destinations for the Russian exporting firms in the sample, 163 of which are WTO members. In terms of trade value, Russia's top five export destinations are China, Netherlands, Germany, Belarus, and the United States. Prior to the WTO accession, Russian exporters exported to 147 WTO member countries, while after the accession this number increased to 162. There are 211 foreign countries that export to Russia, 159 of which are WTO members. Prior to the WTO accession, Russian firms imported from 148 WTO member countries, while after the accession this number increased to 153. The top five import sources for Russia are Germany, Belarus, the United States, Italy, and China.

Prior to Russia's accession to the WTO in 2012, there were 20,225 exporting firms and 62,616 importing firms. One year after Russia joins the WTO, in 2013, the number of

exporters increased to 21,005 and the number of importers increased to 69,314. Figure 4 demonstrates the seasonally adjusted dynamic in the number of Russian firms engaged in foreign trade. The number of exporters exhibits a clear upward trend after Russia joined the WTO (first vertical line on the plot). The plot presents some evidence that more exporters were present in the market after Russia joined the WTO due to the opening of new markets for the domestic firms and for existing exporters. We observe a steady increase in the number of importers prior to the WTO accession, which continues for some time after August 2012. However, after that the number of importers stabilizes and, finally, it decreases once the retaliatory embargo is imposed in August of 2014. The stabilization and the decline in the number of importers prior to the embargo could be due to the macroeconomic shocks that hit the Russian economy after the significant drop in oil prices at the end of 2013 and beginning of 2014.

[Insert Figure 4]

To complement Figure 4, we also plot the entry of Russian firms into foreign trade. We separate firms into purely exporters, purely importers, and firms that both import and export. We then plot the number of firms in each category that begin their operations before Russia joins the WTO and after Russia's accession. This information is presented in Figure 5. The number of firms is weighted by firm size, and the time period ends in February 2014, one month prior to the imposition of economic sanctions on Russia. The entry rate for the importing firms after Russia joins the WTO is higher than for the exporters. Typically, importing involves lower costs, which could explain partly why there are initially more importers than exporters. However, the number of exporters that begin to export after Russia joins the WTO is a little higher than the number of exporters that begin to export prior to the accession. This could be explained by the fact that accession to the WTO opens new markets abroad for domestic producers stimulating export entry, while importers suffer from increased foreign competition, which leads to a decline in the number of firms that

import.

[Insert Figure 5]

Lastly, we provide some information on within-firm dynamics. We calculate summary statistics on the characteristics of foreign trade one year before Russia's accession to the WTO (i.e., year 2011) and one year after Russia joins the WTO (i.e., year 2013). These results are presented in Table 1. Trade frequency, defined as the number of months within a six-month period during which a firm registers a positive trade flow, increases for both importing and exporting firms. On average, firms import (export) in about 2.6 (2.37) months during a six-month period prior to the accession. After Russia joins the WTO, these values increase to 2.77 for imports and 2.54 for exports. Additionally, the WTO membership positively affects the average number of products traded for both importers and exporters and the average number of partner countries to which an average firm exports. An average firm's import flow is significantly lower than an average export flow. This could be explained by a significantly larger number of firms that participate in import activities compared to exports.

[Insert Table 1]

5   Estimation results

This section reports and discusses the results obtained from estimating the impact of Russia's WTO accession on trade patterns at the firm level. The outcome variables of interest are the firm level product and country extensive margins, the intensive margin of firm level trade, as well as the average frequency of a firm's engagement in foreign transactions per product. The underlying hypothesis in all of these estimations is that WTO membership comes with reduced trade policy uncertainty, reduced barriers to trade and an overall increase in foreign market access, all of which should contribute to an increase in Russia's imports and exports.

Product Margin

We begin our analysis by investigating the impact of Russia's WTO membership on the product margin of exporting and importing firms. We define the product margin as the number of unique HS-8 codes a firm exports or imports in a period of time. We use equation (1) to estimate the effect of the WTO on the product margin. The results of these estimations are presented in Table 2. The benchmark specification used for the product margin is Pseudo-Poisson Maximum Likelihood (PPML) due to the count nature of the dependent variable. OLS results are presented in the robustness checks section for comparison.

Each column of Table 2 presents a different version of equation (1). Columns 3 and 6 present the results from estimating the most disaggregated version of equation (1). The dependent variable in columns 3 and 6 is the number of unique HS 8-digit products that a Russian firm f trades with each foreign country j within a given sector group s (i.e., embargoed versus non-embargoed products). Columns 2 and 5 aggregate the estimation model across the two sector groups to estimate the changes induced by the WTO accession across all HS-8 product categories traded by firm f with country j. Columns 1 and 4 further aggregate the estimation equation across all countries that are WTO members, respectively non-WTO members. The dependent variable is the number of unique HS-8 level products that firm f imports (exports) from (to) *all* WTO member countries, respectively all non-WTO partner countries in a given time period t.

From Table 2 it is clear that the exported number of HS 8-digit level products decreases, although this effect is statistically not different from zero. Controlling for the impact of the embargo does not alter the coefficient of interest, which leads us to conclude that the product margin of the exporting firms is not impacted by Russia's accession to the WTO. There could be multiple explanations for this outcome. The insignificant effect could be a consequence of our short run analysis, with Russian firms potentially facing capacity constraints that need more time to relax. Alternatively, Russian exporters may have witnessed fewer improvements to doing business internationally following Russia's WTO accession. Like China, at the time

of WTO accession, Russia was already benefiting from MFN tariff status in most foreign markets (Connolly & Hanson, 2012). Lastly, trade policy uncertainty may have operated differently on Russian exporting firms compared to importing firms (with the latter facing more uncertainty in dealing with a foreign partner).

The opposite effect is observed for importers: the average number of HS 8-digit level products imported from country j increases by 8.6%. Controlling for the embargo does not change the coefficient of interest. This finding could serve as evidence of increased access to foreign markets, and a decrease in import tariffs, which would allow firms to begin importing additional products. Finally, consumers and producers alike generally prefer product variety and importing firms could be attempting to capitalize on this behavior.

Country Margin

Next we explore the impact of Russia's accession to the WTO on the number of partners an average firm exports to or imports from. It is reasonable to check the country margin because WTO membership grants many benefits, including lower tariffs and lowering of the non-tariff barriers. Additionally, the decline in trade uncertainty caused by Russia's accession to the WTO might increase its appeal as a trade partner for other country, increasing the number of partners an average firm can trade with.

In the context of this analysis the country margin is defined as the number of unique partner-countries a firm f exports to or imports from in a period of time. We separate the countries by their WTO membership status. We use equation (2) to estimate the effect of the WTO on the country margin. The results of these estimations are presented in Table 3. Our estimator of choice is Pseudo-Poisson Maximum Likelihood (PPML) because, similar to the product margin, the dependent variable is a count. OLS results are presented in the robustness checks section for comparison.

[Insert Table 2]

In columns 3 and 6 we present the results from estimating equation (2), where the dependent variable is the number of unique partner countries in group m that firm f trades with (import or export) at time t in HS 8-digit product k. The country group m denotes four sets of countries: WTO member countries that later impose sanctions on Russia, WTO member countries that do not impose sanctions on Russia, non-WTO member countries that impose sanctions on Russia as well as non-WTO member countries that do not impose sanctions on Russia. In columns 2 and 5 we get rid of the sanctioning country dimension and keep only the distinction between WTO members versus non-members. The dependent variable in these columns is the number of unique partner countries that are WTO members versus non-WTO members with whom firm f trades with at time t in product k. Finally, in columns 1 and 4 we present the results of the highest level of sample aggregation by getting rid of the product dimension. The dependent variable is the number of unique WTO-member versus non-WTO member partner countries that firm f trades with in a given time period t.

Both exporting and importing firms experience positive and significant effects of joining the WTO on the country margin. An average exporting firm experiences a 5% increase in the number of export destinations per product (columns 2 and 3), while for the importers this effect is under 1% per product (columns 5 and 6). While the embargo has an expected negative impact on the number of trading partners for importers, it has no statistically significant impact on the exporters. These results are indicative of a positive impact accession to the WTO had on some margins of the Russian firms engaged in foreign trade.

[Insert Table 3]

Average Firm-Level Export and Import Flows

We complement the extensive margin analysis with the analysis of the intensive margin of trade, which we define as the average value of an import or export flow within a product-

country pair. Joining the WTO makes foreign trade more accessible and has the potential to increase the size of an average trade flow for both exporters and importers due to a decline in tariffs and non-tariff barriers (including decline in trade policy uncertainty). We use equation (3) to analyze these effects. The results of the intensive margin analysis for both exports and imports are presented in Table 4.

Overall, we do not find significant impacts of Russia's WTO accession on the intensive margin of trade at the firm level. This finding is consistent with the aggregate results found in the literature. Like Dutt et al. (2013), we find a strong effect of WTO membership on the extensive margin but not much of an effect on the intensive margin of trade. The only puzzling outcome in the reported results is the increase in the value of an average export flow of embargoed goods to the sanctioning countries after the imposition of the embargo ($Embargo_{jkt}$ in Table 4 column 1), as it would be difficult to imagine the situation in which the sanctioning countries would begin importing embargoed products from Russia. However, after the imposition of the embargo Russia indeed increased production of certain agricultural products, so this result could be driven by these changes in domestic production.

[Insert Table 4]

Foreign Trade Frequency

Finally we propose a less conventional exercise to analyze the impacts of Russia's accession to the WTO on the exporting and importing firms by analyzing their activity in terms of the frequency with which they engage in international transactions. We define foreign trade frequency as the number of periods (i.e., months) in which a positive export or import flow is observed for a firm f with a country j over half-year periods h. We use estimation equation (4) to analyze the impacts of the WTO membership on foreign trade frequency. These results are presented in Table 5. Columns 3 and 6 present the most disaggregated version of the trade frequency model (equation (4) itself). The dependent variable in this case

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is the number of periods firm f imports (exports) HS 8-digit product k from (to) country j. In columns 2 and 5 we aggregate the model across all HS 8-level products, to estimate the changes induced by the WTO to the frequency of trade of firm f with country j across all products. Finally, the dependent variable in columns 1 and 4 represents the number of periods in which a firm has at least one positive import or export flow from all the WTO countries, respectively all the non-WTO member countries.

Interestingly, we find radically different results for the average frequency of exports, respectively imports. While the frequency of exporting to country j decreases on average by 5% (statistically significant at 1%), the average frequency of importing from country j increases by 6%. These results could be partially explained by the fact that the exporting firms increased their country margin more than the importing firms, which could adversely impact their frequency of trade (export less frequently but to more destinations). Additionally, importing firms will also benefit from the fall in tariffs, which exporting firms are not likely to benefit from, which could lead importers to import more frequently.

[Insert Table 5]

6 Robustness Checks

In this section we report a set of robustness exercises meant to increase the confidence in our estimation results and verify their sensitivity across different subsamples of data.

6.1 Interplay between liberalization and protection

The first exercise that we conduct addresses the worry that our import estimates might be driven by the fact that Russia's accession to the WTO disproportionately impacted agricultural producers. Many agricultural enterprises in Russia rely heavily on state subsidies, which are against the WTO provisions. After Russia joined the WTO, many agricultural

enterprises including producers of grain, dairy, and produce voiced their concerns about the inability to withstand the increased foreign competition. To check whether these concerns are justified, we conduct the extensive and intensive margins analyses for two separate samples. One sample includes enterprises that trade (export, import or both) *only* in non-agricultural products, while the other sample covers enterprises that trade in at least one agricultural product over the duration of our sample. We define the agricultural products as products that are later embargoed by the Russian government. This method also allows us to check whether the selection of embargoed products was driven by protectionist motives intended to benefit the agricultural sector, which has been vulnerable in the face of increased competition after the WTO accession.

We re-estimate equations (1), (2), (3), and (4) for the two separate samples. These results are presented in Tables 6, 7, and 8. It is not straightforward whether the agricultural products are disproportionately impacted by Russia's accession to the WTO, because the impact of the WTO on exports of agricultural and non-agricultural products is qualitatively similar, although the magnitude of the effect is larger for the agricultural exports. However, the agricultural enterprises sample experiences a larger positive impact of the WTO (in terms of magnitude) on the product margin and trade frequency than the non-agricultural firms. At the product margin, agricultural importers benefit the most from the WTO accession: the number of HS 8-digit products increases by 14.5% while for the non-agricultural sector this effect is not statistically significant. The intensive margin results in Table 8 show a significant positive impact of the WTO membership on the average value of an import flow of an agricultural enterprise, while the average export flows of either exporter type or the non-agricultural importers are not affected in a statistically significant manner.

Our findings seems to corroborate the fears of increased competition that some Russian agricultural enterprises share. We find evidence of disproportionate positive impacts of the WTO membership on agricultural imports, i.e., a significant increase in the frequency of imports, an increase in the average number of products imported, and a significant increase

in the average import flow within a firm-product-country group. These findings could serve as evidence that Russia's retaliatory embargo may have been intended as a protectionist policy as it targeted a very specific vulnerable domestic sector (i.e., agriculture) whose imports increased rapidly following the WTO accession. Because protectionist policies are against WTO regulations, the retaliatory embargo was a convenient way to kill two birds with one stone - retaliate against foreign countries sanctioning Russia's foreign policy decisions and at the same time protect domestic agricultural production.

[Insert Table 6]

[Insert Table 7]

[Insert Table 8]

6.2   Role of tariff changes

Another issue we address is whether the impacts we observe are due to the decrease in import tariffs following Russia's accession to the WTO, or due to a decrease in trade policy uncertainty combined with a reduced rate of growth of non-tariff measures. To do this, we bring in the tariff data provided by UNCTAD Trade Analysis Information System (TRAINS) on Russia's tariffs at the HS 4-digit level. We construct a variable that measures the change in average tariff duty imposed on Russian imports between 2010 and 2016, $\Delta Tariff_{HS4}$. Next, we construct a triple interaction term $Post0812_t \times WTOmember_{jt} \times \Delta Tariff_{HS4}$ to capture those changes in trade patterns that are due to changes in import tariffs following Russia's accession to the WTO. We include the newly defined interaction term along with the original variable of interest (i.e., $Post0812_t \times WTOmember_{jt}$) in equations (2), (3), and (4) in order to capture the effects of changes in tariffs and non-tariff trade barriers, respectively.

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The extensive margin results (country margin and frequency) are presented in Table 9, and the intensive margin results are presented in Table 10.[12]

[Insert Table 9]

We do not find any significant impacts of the tariff changes following Russia's accession to the WTO on either the intensive or extensive margins of firm level trade. The coefficients of interest are either statistically insignificant or a statistically significant zero. The baseline results reported previously are driven by the change in non-tariff trade barriers, in which we include the decline in the trade policy uncertainty. This is not surprising given that import tariffs generally take longer time post-accession to change to new equilibrium levels (hence the small change in tariffs observed in our data). Yet changes in non-tariff trade barriers that include the decrease in the trade policy uncertainty can happen immediately after the WTO accession. As for the intensive margin, we do not find any significant impacts of the tariff-induced WTO effect on the average value for both exports and imports.

[Insert Table 10]

6.3 Role of Government Connections

Finally, we check whether the impacts of the WTO varies between firms that have some connection to the government and purely private firms (following Baccini et al. (2017)). One worry could be that firms connected to the state are more likely to benefit from government protection after Russia's WTO accession compared to firms that have no connection to the government. To address this concern, we create an indicator variable $Connected\ firm_f$ that takes the value of 1 if a firm has some connections to the Russian government, and 0 otherwise. A firm is classified as governmentally connected if one of two scenarios is true:

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[12]We do not report estimates for the product margin since the dependent variable in such a regression represents the count of all products traded by a firm in a given market. So, there is no unique tariff line corresponding to this specific unit of analysis.

(1) a firm is owned by the government and is funded from the federal budget (i.e., state universities and hospitals, state producers); (2) a firm is publicly traded and the Russian government owns shares in this firm (i.e., Sberbank, VTB bank, KamAZ, AutoVAZ, etc.). The information on firm's ownership is (1) deduced from firm's name (all state owned enterprises in Russia have some indication of governmental ownership in their name, i.e., *'state'*, *'federal'*, *'government'*) and/or (2) gathered from a list maintained by the Russian government.[13] To conduct this analysis we include in our estimation equations (1), (2), (3), and (4) an interaction term between the WTO treatment variable and the firm-specific dummy variable capturing state connectedness. These results are presented in Tables 11 and 12 for extensive and intensive margins, respectively.

[Insert Table 11]

To find the impact of the government connectedness, we look at the marginal effect of the interaction term between the WTO treatment and the dummy variable for connectedness. The product margin results for the two types of firms are not statistically significantly different from each other. As for the country margin, we find that connectedness to the state increases the number of partner countries a firm trades with significantly more than for regular firms. The effect of connectedness is positive for both exporting and importing firms. We find that connectedness to the state increases the number of countries a firm exports to by about 18% after Russia's accession to the WTO, against 13% for the firms that do not have any government connection. On the imports side, these effects are 8% for the governmentally connected firms and less than 1% for the firms with no government connection. We also uncover that the exporting firms connected to the government increase their frequency of exports more than regular firms. Finally, we find significant differences between the governmentally connected firms and firms not connected to the state for the

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[13]Sources: (1) list maintained by Dmitri Puchkarev, BKS Express `https://bcs-express.ru/novosti-i-analitika/kompanii-s-gosudarstvennym-uchastiem-skol-ko-ikh` and (2) the official Russia's government's list of government enterprises that participate in programs of innovative development `http://old.economy.gov.ru/minec/about/structure/depIno/2015070303540`

average export flow but not for the imports. Our results are indicative that a firm's connectedness to the government impacted certain dimensions of firm-level foreign trade after Russia's accession to the WTO, thus we control for the government connectedness factor in our main specifications.

[Insert Table 12]

6.4 Sensitivity Analyses

We next conduct several exercise to verify the sensitivity of our main findings to changes in the data sample or estimation method. One worry about the exports estimates might be that the large share of Russia's exports are comprised of crude oil and natural gas, and the intensive margin results in Table 4 might be driven by these products. To check if this is the case, we exclude crude oil and gas products from the sample (HS-4 level products 2709 "Petroleum oils, oils from bituminous minerals, crude", 2710 " Oils petroleum, bituminous, distillates, except crude", and 2711 "Petroleum gases and other gaseous hydrocarbons"). The results of this exercise are presented in the appendix Table A1. We do not find that this changes our estimates in any significant way, so the exports results at the intensive margin are not driven by oil and gas products.

We also check the consistency of our estimations when using the Ordinary Least Squares (OLS) estimator as opposed to the Poisson-PseudoMaximum Likelihood (PPML) estimator, which is our preferred estimation method. We re-estimate the estimation equations (1), (2), (3), and (4) using OLS and report the results in the appendix Tables A2, A3, A4, and A5, respectively. For all of our extensive margin estimates including product and country margins, and frequency analysis, we use the logged value for the dependent variables. This is done to smooth out the differences in the estimated coefficients for very large relative changes in these margins (e.g., increasing the number of traded products from 0 to 1) to very small changes (e.g., increasing the number of traded products from 10 to 11). The majority

of extensive margin OLS results for the coefficient of interest $Post0812_t \times WTOmember_{jt}$ have similar significance levels and signs as the PPML results. However, the magnitude of the coefficients varies. The OLS results for the intensive margin estimations (Table A4) overestimate the effect of the accession to the WTO. Following the convention in the trade literature, we prefer to rely on the PPML estimator to measure the intensive margin effects.

Finally, we check whether there are any effects of Russia's WTO accession on trade with the non-WTO member countries. The purpose of this exercise is to understand whether the WTO membership creates any spillover effects for trade with the non-WTO countries. Such a spillover effect would invalidate the difference-in-differences model assumption that requires the control group of non-WTO members to remain unaffected by the policy treatment effect (i.e., Russia's accession). To proceed with this exercise, we re-estimate the equations (1), (2) and (3) using only the subsample of trade flows involving non-WTO member countries. To capture the changes in trade with the non-WTO member countries following Russia's WTO accession, our treatment variable becomes $Post0812_t$ (i.e., a dummy variable that takes the value of 1 after Russia joined the WTO in August 2012). $Post0812_t \times \Delta Tariff_{HS4}$ captures the change in firm-level country margin due to any changes in import tariffs following Russia's WTO membership. To control for seasonality we include month fixed effects. Note that because the variable of interest has only one dimension of variation – which is time variation – we cannot include period (i.e., month - year) fixed effects to control for any macroeconomic shocks as we have done in our main estimations. For this reason, in addition to the usual country-specific controls used in the main model specifications, we also include a vector of time-varying control variables such as Russia's GDP, the level of oil prices and fluctuations in exchange rates in lieu of period fixed effects.[14]

The results from our estimations on the subsample of non-WTO member countries are presented in Tables A6 and A7. We do not find any impacts of the WTO accession on

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[14]We have also experimented with separate month and year fixed effects and obtained qualitatively similar results, which are available upon request. For the results reported in the paper, we decided to leave out the year fixed effects (and replace them with time-varying controls) in order to allow for more data variation for model identification.

imports with the non-WTO member countries, however we identify some positive effects on the product margin of exports. That is, we find that after Russia joins the WTO, exporting firms begin to export, on average, to 7.8% more non-WTO countries, which translates to an increase of about 0.17 partner countries. With the caveat for this robustness exercise is that the treatment variable (i.e., $Post0812_t$) does not correspond exactly to the treatment variable in the main model specifications (i.e., $Post0812_t \times WTOmember_{jt}$), nevertheless a potential explanation for this finding is the possibility that some liberalization benefits from Russia's WTO accession impact all international transactions irrespective of foreign partner.

7   Conclusion

In this paper we estimate the impact of Russia's accession to the WTO on a variety of exporting and importing firms' outcomes. We find that, contrary to the predictions of the seminal Rose (2004) paper, Russian exporters and importers experience significant trade changes as a result of the country's accession to the WTO. These effects are economically small and vary significantly across the trade margins, with the extensive margin of trade being more responsive to trade liberalization than the intensive margin. We also find that imports are more impacted by the WTO membership. These effects include an increase in the average frequency of import shipments, as well as an increase in the number of imported HS 8-digit product codes. Our findings are in line with the aggregate results found in the literature in that, like Dutt et al. (2013), we find a strong effect of WTO membership on the extensive margin but not much of an effect on the intensive margin, and like Liu (2009), we find that these effects are robust to departing from the traditional Ordinary Least Squares (OLS) estimation method and instead using the Pseudo-Poisson Maximum Likelihood (PPML) method.

Our findings also uncover disproportionate positive impacts of the WTO accession on agricultural imports, which could serve as the evidence that the retaliatory embargo targeting

these same products might have been intended as a protectionist policy in order to help a vulnerable domestic industry. Because protectionist policies are against WTO provisions, the embargo was a convenient way for Russia to kill two birds with one stone - retaliate against the countries sanctioning Russia's foreign policy actions and also protect domestic agricultural production.

To conclude, our empirical analysis of Russia's accession to the WTO confirms that this trade liberalization episode impacted several dimensions of the Russian exporting and importing firms' behavior.

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TABLES AND FIGURES

Figure 1: **Evolution of Russia's average MFN tariffs over 2011-2015**
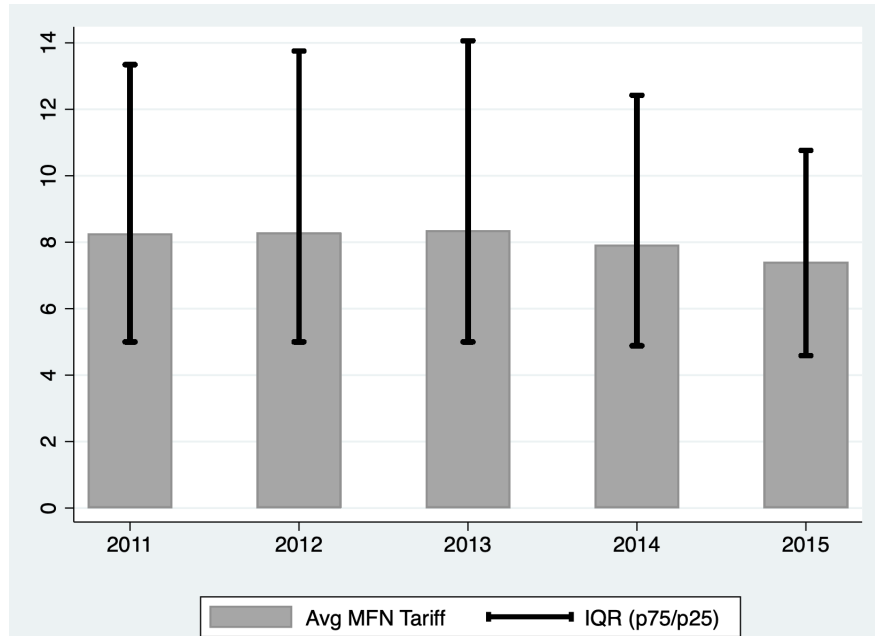
Notes: This Figure uses information collected by the WTO on Russia's ad-valorem MFN tariffs. The grey bars correspond to the (unweighted) average MFN tariff computed across all HS 4-digit products codes. The overlapping dark lines indicate the inter-quartile range (IQR) of ad-valorem MFN tariffs over all HS 4-digit product codes.

Figure 2: **Correlation between initial MFN tariffs and the change in MFN tariffs during 2011-2015**
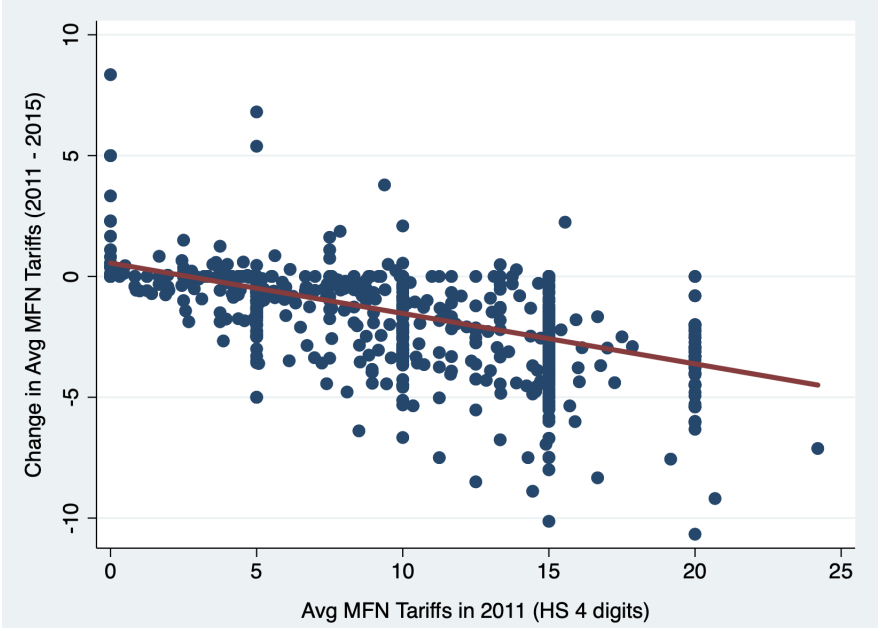
Notes: This Figure illustrates the change in Russia's average MFN tariffs at the HS 4-digit product level over the period 2011-2015. The scatterplot correlates the tariff changes to the initial tariff level in the year prior to Russia's WTO accession. The downward sloping fitted line indicates that the industries (i.e., HS 4-digit products) with the highest tariffs prior to WTO accession are the industries experiencing the largest drops in tariffs in the first three years post-accession.

Figure 3: **Imposition of new NTMs during the 2011 - 2015 period**
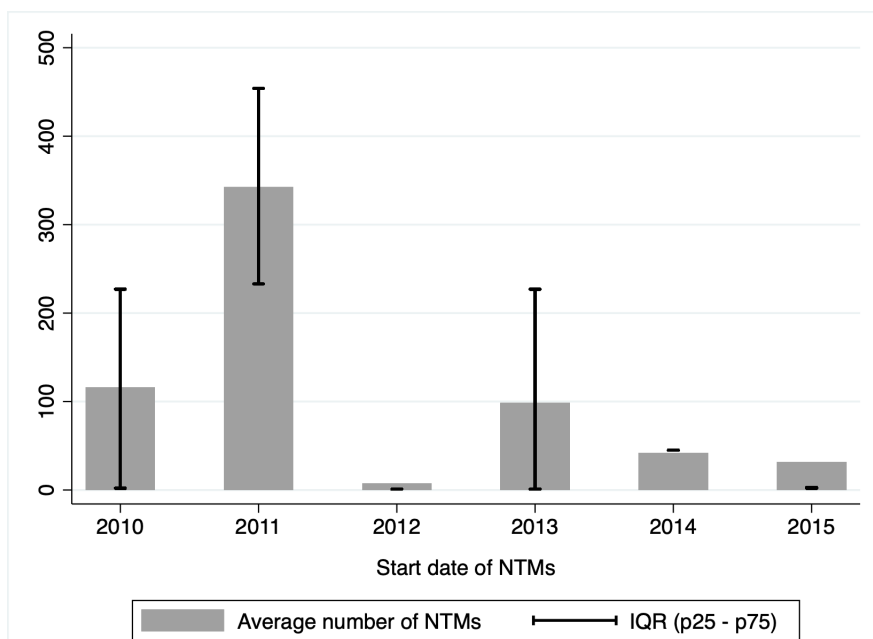
Notes: This figure is constructed from the TRAINS dataset on the non-tariff measures, UNCTAD (2017), TRAINS NTMs: The Global Database on Non-Tariff Measures. The blue bars correspond to the (unweighted) average number of NTMs computed across all HS 6-digit product codes in a given year. The overlapping red lines indicate the inter-quartile range (IQR) of the average number of NTMs over all HS 6-digit product codes. The figure confirms the decline in the number of new NTMs imposed by Russia in the first three years following the WTO accession.

Figure 4: **Number of firms engaged in foreign trade over time**
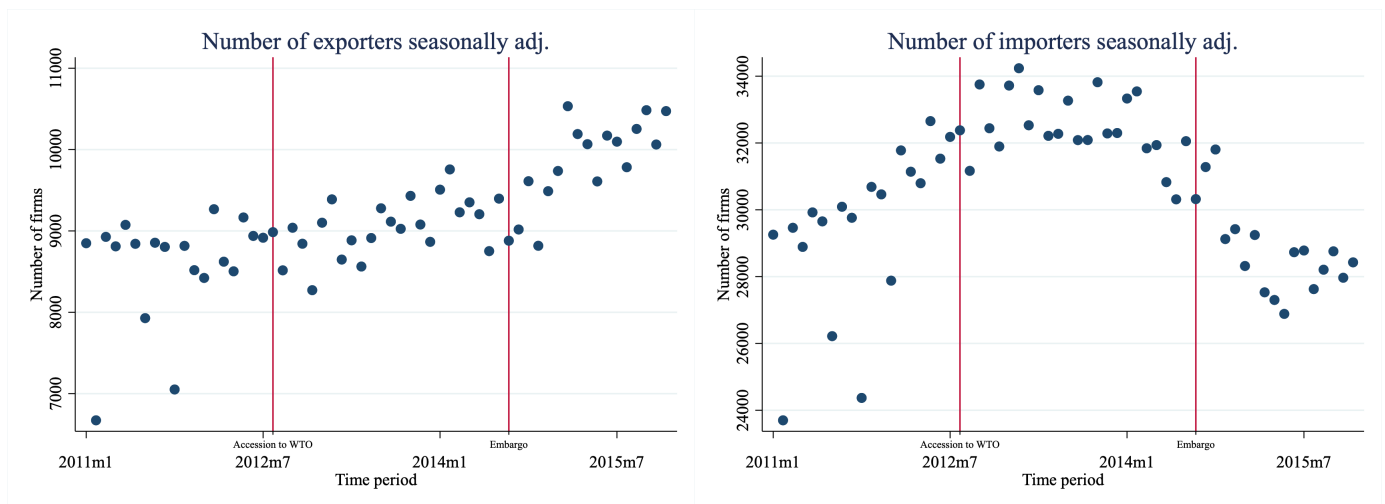
Notes: This Figure plots seasonally adjusted number of unique firms that participate in importing or exporting over time. Data source is the firm-level dataset sourced from the Russian Customs Agency.

Figure 5: **Number of firms that begin foreign trade**
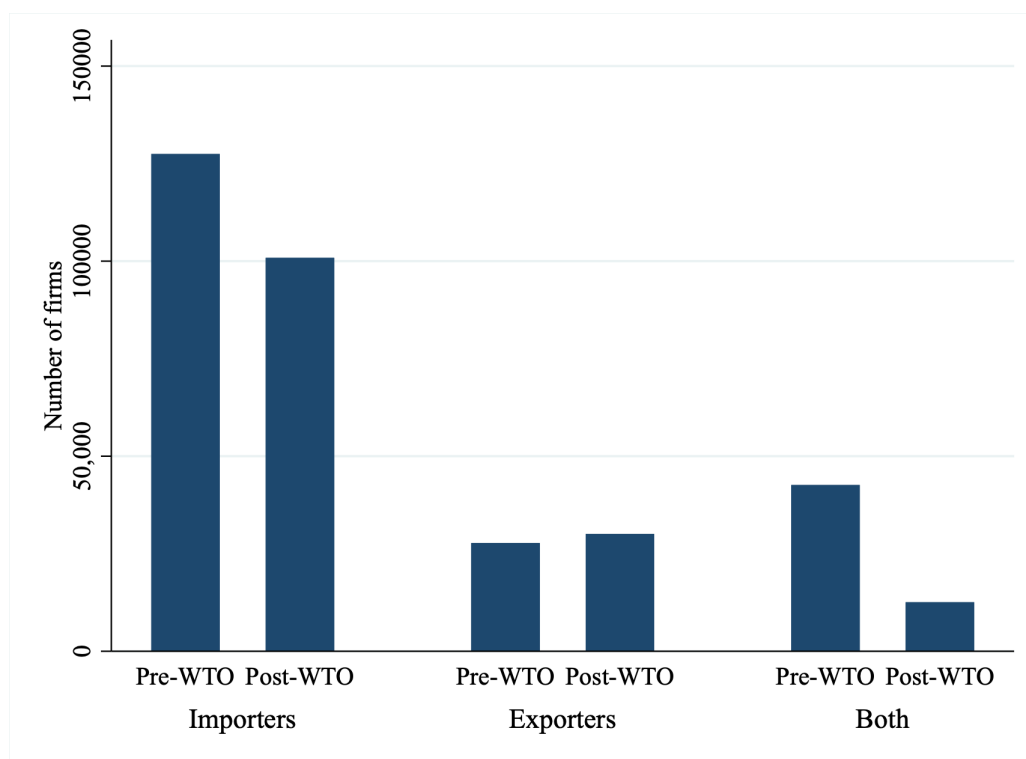
Notes: This Figure plots number of unique Russian firms that beginning exporting, importing or doing both prior and post WTO accession. The number of firms is weighted by firm size (small, medium and large).

Table 1: **Summary statistics**

Variable	IMPORTS		EXPORTS	
	2011	2013	2011	2013
Avg value of a trade flow*	68,174.78	62,096.48	736,158.7	882,147.5
	(1218553)	(870131.9)	(1.67e+07)	(1.94e+07)
Trade frequency	2.60	2.77	2.37	2.54
	(1.75)	(1.86)	(1.67)	(1.81)
Avg number of products traded**	7.76	7.97	3.10	3.13
	(22.60)	(22.60)	(8.28)	(7.29)
Avg number of partner countries	1.09	1.09	1.29	1.31
	(0.39)	(0.41)	(0.99)	(1.10)

Notes: Standard deviations in parentheses.

* Calculated at HS-8 level product-country.

** HS-8 level products traded with one country.

Table 2: **Product margin**

	EXPORTS			IMPORTS		
	(1)	(2)	(3)	(4)	(5)	(6)
$Post0812_t \times WTOmember_{jt}$	-0.056	-0.009	-0.007	0.100***	0.082**	0.081**
	[0.045]	[0.023]	[0.022]	[0.034]	[0.034]	[0.034]
$Embargo_{jst}$			-0.103***			-0.345***
			[0.027]			[0.040]
Month-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm - WTO membership FE	Yes	No	No	Yes	No	No
Firm-country FE	No	Yes	No	No	Yes	No
Firm-country-product type FE	No	No	Yes	No	No	Yes
Country-time macro controls	No	Yes	Yes	No	Yes	Yes
Observations	145,718	782,491	800,780	1,331,375	2,590,748	2,648,460
No. firm-WTO membership gr.	11,765			65,820		
No. firm-country gr.		75,378			213,985	
No. firm-country-product type gr.			77,326			220,644
Standard error clustering	Firm	Firm-country	Firm-country	Firm	Firm-country	Firm-country

Notes: *p<0.1; **p<0.05; ***p<0.01. Estimator used is the Pseudo-Poisson Maximum Likelihood (PPML). In columns 1 and 4 the dependent variable is a number of unique HS-8 level products firm j imports (exports) from (to) all WTO member countries and all non-WTO partner countries in time period t. In columns 2 and 5 the dependent variable is a refinement of columns 1 and 4: number of unique HS-8 level products firm f imports (exports) from (to) each country j. Finally, in columns 3 and 6 the dependent variable in this table is the number of unique embargoed and non-embargoed HS-8 level products firm f trades with each country j. $Embargo_{jst}$ is an indicator variable that takes the value of 1 if the foreign country j is one of the sanctioning countries targeted by Russia's retaliatory embargo (which started in August 2014) and if the HS 8-digit product traded is part of the set s of embargoed goods. Variable of interest is $Post0812_t \times WTOmember_{jt}$ is an interaction term between the month-year periods post August 2012 and the WTO membership status of a foreign country j. The country-time macro controls include the trade cost calculated as an interaction between oil price and the distance between countries weighted by population, dummy for presence of FTA or RTA between Russia and country j at time t, GDP of partner countries, exchange rate between country j's currency and the Russian rouble at time t, and finally the interaction between sanctioning countries and post-embargo time.

Table 3: **Country margin**

	EXPORTS			IMPORTS		
	(1)	(2)	(3)	(4)	(5)	(6)
$Post0812_t \times WTOmember_{mt}$	0.041***	0.047***	0.048***	0.050***	0.011***	0.006***
	[0.014]	[0.004]	[0.003]	[0.004]	[0.001]	[0.001]
$Embargo_{mkt}$			-0.028*			-0.100***
			[0.015]			[0.008]
Month-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-WTO member FE	Yes	No	No	Yes	No	No
Firm-WTO membership-product FE	No	Yes	Yes	No	Yes	Yes
Group m-time macro controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	145,718	1,789,427	1,911,198	1,331,375	16,349,805	16,442,716
No. of firm-WTO membership groups	11,765			65,820		
No. of firm-WTO-product groups		226,590	245,058		2,070,180	2,110,162
Standard error clustering	Firm	Firm-product	Firm-product	Firm	Firm-product	Firm-product

Notes: *p<0.1; **p<0.05; ***p<0.01. Estimator used is the Pseudo-Poisson Maximum Likelihood (PPML). In columns 1 and 4 the dependent variable is a number of unique partner countries that are WTO members and unique non-WTO countries firm f trades with in a given time period t. In columns 2 and 5 the dependent variable is a number of unique partner countries that are WTO members and unique non-WTO countries firm f imports (exports) product k from (to) with in a given time period t. Finally, in columns 3 and 6 the dependent variable is a number of unique partner countries from group m firm f imports (exports) product k from (to) with in a given time period t. The country group m denotes four sets of countries: WTO member countries that later impose sanctions on Russia, WTO member countries that do not impose sanctions on Russia, non-WTO member countries that impose sanctions on Russia as well as non-WTO member countries that do not impose sanctions on Russia. $WTOmember_{mt}$ is equal to 1 if country group m consists of WTO members, and 0 otherwise. $Embargo_{mkt}$ equals 1 if product k is subject to the retaliatory embargo at time t and if country group m consists of countries that impose economic sanctions on Russia (thus becoming targets of Russia's retaliatory embargo). Macroeconomic controls characterize country group m and include the combined GDP of countries in group m, the (population-weighted) average distance to these countries interacted with oil prices, as well as the fraction of countries within group m that are part of a FTA or RTA with Russia.

Table 4: **Intensive margin of firm-level foreign trade**

	EXPORT (1)	IMPORT (2)
$Post0812_t \times WTOmember_{jt}$	0.009	0.050
	[0.113]	[0.047]
$Embargo_{jkt}$	0.224***	-0.148***
	[0.079]	[0.046]
Month-year FE	Yes	Yes
Firm-period-country FE	Yes	Yes
Country-time macro controls	Yes	Yes
Observations	2,269,504	18,868,262
No. of firm-product-country gr.	311,171	2,495,855

Notes: *p<0.1; **p<0.05; ***p<0.01. Estimator used is PPML. Standard errors in brackets are clustered at firm-period-country. Variable of interest is $Post0812_t \times WTOmember_{jt}$ is an interaction term between the month-year periods post August 2012 and the WTO membership status of a foreign country j. $Embargo_{jkt}$ equals 1 if product k is embargoed at time t and foreign country j is part of the set of targeted countries. Country-time macro controls include the GDP of the foreign partner, the (population-weighted) bilateral distance interacted with oil prices (i.e., proxy for transportation costs), the dummy for the presence of FTA or RTA between Russia and the foreign country j at time t, and the exchange rate between the Russian ruble and the currency of country j.

Table 5: **Foreign trade frequency**

	EXPORTS			IMPORTS		
	(1)	(2)	(3)	(4)	(5)	(6)
$Post0812_h \times WTOmember_{jh}$	-0.001	-0.035***	-0.054***	0.022**	0.022**	0.060***
	[0.008]	[0.007]	[0.004]	[0.010]	[0.010]	[0.004]
$Embargo_{jkh}$			-0.012			-0.386***
			[0.017]			[0.007]
Biannual FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm - WTO membership FE	Yes	No	No	Yes	No	No
Country-time specific controls	No	Yes	Yes	No	Yes	Yes
Firm-country FE	No	Yes	No	No	Yes	No
Firm-product-country FE	No	No	Yes	No	No	Yes
Observations	161,020	274,484	933,501	478,910	862,258	7,267,969
No. of firm-WTO membership groups	34,633			94,264		
No. of firm-country groups		63,892			187,878	
No. of firm-country-product groups			252,651			2,011,283
Standard error clustering	Firm	Firm-country	Firm-country	Firm-level	Firm-country	Firm-country

Notes: *p<0.1; **p<0.05; ***p<0.01. Estimator used is the Pseudo-Poisson Maximum Likelihood (PPML). In columns 1 and 4 the dependent variable is a biannual frequency of trade (each 6 months), which is defined as number of periods, in which a firm has at least one positive import or export flow from all WTO countries and all non-WTO member countries. In columns 2 and 5 the dependent variable is the number of periods firm f imports (exports) any/all products from (to) country j. Finally, in columns 3 and 6 the dependent variable is the number of periods firm f imports (exports) product k from (to) country j. Variable of interest is $Post0812_h \times WTOmember_{jh}$ is an interaction term between the half-year periods post August 2012 and the WTO membership status of a foreign country j. $Embargo_{jkh}$ equals 1 if product k is embargoed at time h and foreign country j is part of the set of targeted countries. Country-time specific macro controls include distance between countries weighted by population interacted with oil prices, dummy for presence of FTA or RTA between Russia and country j at time t, and GDP of partner country j.

Table 6: **Agricultural sector: Extensive margin**

	EXPORTS			IMPORTS		
	(1)	(2)	(3)	(4)	(5)	(6)
	Product margin	Country margin	Frequency	Product margin	Country margin	Frequency
$Post0812_t \times WTOmember_{jt}$	-0.040	0.079***	-0.096***	0.145**	-0.001	0.091***
	[0.039]	[0.007]	[0.008]	[0.059]	[0.002]	[0.007]
$Embargo_{jkt}$	-0.125***	-0.054***	-0.045**	-0.317***	-0.102***	-0.361***
	[0.032]	[0.016]	[0.018]	[0.044]	[0.008]	[0.008]
Biannual FE	No	No	Yes	No	No	Yes
Month - year FE	Yes	Yes	No	Yes	Yes	No
Firm - country - emb. product FE	Yes	No	No	Yes	No	No
Firm - WTO - sanctions - product FE	No	Yes	No	No	Yes	No
Firm - country - product FE	No	No	Yes	No	No	Yes
Macroeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	114,863	384,168	185,032	483,695	2,614,482	1,139,043
No. of firm - country - emb. product gr.	10,148			40,253		
No. of firm - country - product gr.			47,897			350,748
No. of firm -WTO - sanctions - product gr.		47,827			380,516	
Standard error clustering	Firm - country	Firm - country - WTO	Firm - product - WTO	Firm-country	Firm - country - WTO	Firm-product - WTO

Notes: *p<0.1; **p<0.05; ***p<0.01. Estimator used is PPML. The sample includes all firms that trade (export, import or both) in at least one embargoed agricultural product. Product margin in columns 1 and 4 refers to a number of unique HS-8 level products that firm f imports from (exports to) country j in a time period t. Country margin in columns 2 and 5 refers to a number of unique countries from group m with which firm f trades in HS 8-level product k. The country group m denotes four sets of countries: WTO member countries that later impose sanctions on Russia, WTO member countries that do not impose sanctions on Russia, non-WTO member countries that impose sanctions on Russia as well as non-WTO member countries that do not impose sanctions on Russia. Finally, frequency in columns 3 and 6 refers to the number of periods (in half-year periods) that firm f imports (exports) HS 8-level product k from (to) country j. Variable of interest is $Post0812_t \times WTOmember_{jt}$ is an interaction term between the month-year time periods (biannual periods for the frequency specifications) post August 2012 and the WTO membership status of a foreign country j at time t. $Embargo_{jkt}$ equals 1 if product k is embargoed at time t and foreign country j is part of the set of targeted countries. The time macro controls include the price of oil, Russia's GDP, and the USD to rouble exchange rate. Macroeconomic controls include distance between countries interacted with oil prices, dummy for presence of FTA or RTA between Russia and country j at time t, GDP of partner country j. For the country margin specification, the vector of macroeconomic controls characterizes country group as defined previously.

Table 7: **Non-agricultural sector: Extensive margin**

	EXPORTS			IMPORTS		
	(1)	(2)	(3)	(4)	(5)	(6)
	Product margin	Country margin	Frequency	Product margin	Country margin	Frequency
$Post0812_t \times WTOmember_{jt}$	0.013	0.041***	-0.047***	0.066	0.008***	0.027***
	[0.026]	[0.004]	[0.005]	[0.041]	[0.001]	[0.005]
Biannual FE	No	No	Yes	No	No	Yes
Month - year FE	Yes	Yes	No	Yes	Yes	No
Firm - country - emb. product FE	Yes	No	No	Yes	No	No
Firm - WTO - sanctions - product FE	No	Yes	No	No	Yes	No
Firm - country - product FE	No	No	Yes	No	No	Yes
Macroeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	687,998	1,527,030	754,706	2,165,171	13,828,234	6,134,435
No. of firm - country - emb. gr.	67,452			180,452		
No. of firm - country - product gr.			206,539			1,661,588
No. of firm -WTO - sanctions - product gr.		197,231			1,729,646	
Standard error clustering	Firm - country	Firm - country - WTO	Firm - product - WTO	Firm-country	Firm - country - WTO	Firm-product - WTO

Notes: *p<0.1; **p<0.05; ***p<0.01. Estimator used is PPML. The sample includes all firms that trade (export, import or both) in only non-agricultural products. Product margin in columns 1 and 4 refers to a number of unique HS-8 level products that firm f imports from (exports to) country j in a time period t. Country margin in columns 2 and 5 refers to a number of unique countries from group m with which firm f trades in HS 8-level product k. The country group m denotes four sets of countries: WTO member countries that later impose sanctions on Russia, WTO member countries that do not impose sanctions on Russia, non-WTO member countries that impose sanctions on Russia as well as non-WTO member countries that do not impose sanctions on Russia. Finally, frequency in columns 3 and 6 refers to the number of periods (in half-year periods) that firm f imports (exports) HS 8-level product k from (to) country j. Variable of interest is $Post0812_t \times WTOmember_{jt}$ is an interaction term between the month-year time periods (biannual periods for the frequency specifications) post August 2012 and the WTO membership status of a foreign country j at time t. Because no non-agricultural products are targeted by the embargo, the $Embargo_{jkt}$ is omitted from this specification. The time macro controls include the price of oil, Russia's GDP, and the USD to rouble exchange rate. Macroeconomic controls include distance between countries interacted with oil prices, dummy for presence of FTA or RTA between Russia and country j at time t, GDP of partner country j. For the country margin specification, the vector of macroeconomic controls characterizes country group as defined previously.

Table 8: **Interplay with the embargo: Intensive margin**

	EXPORTS		IMPORTS	
	(1)	(2)	(3)	(4)
	Agriculture	Non-agriculture	Agriculture	Non-agriculture
$Post0812_t \times WTOmember_{jt}$	0.028	0.009	0.119**	0.035
	[0.085]	[0.117]	[0.052]	[0.060]
$Embargo_{jkt}$	0.009	-	-0.128***	-
	[0.084]		[0.035]	
Firm-product-country FE	Yes	Yes	Yes	Yes
Month-year FE	Yes	Yes	Yes	Yes
Country-time macro controls	Yes	Yes	Yes	Yes
Observations	485,963	1,783,541	3,048,029	15,820,233
No. of firm-product- country gr.	62,431	248,740	457,287	2,038,568

Notes: *p<0.1; **p<0.05; ***p<0.01. Estimator used is PPML. The sample in columns (1) and (3) includes all firms that trade (export, import or both) in at least one embargoed agricultural product. The sample in columns (2) and (4) includes all firms that trade (export, import or both) only in non-agricultural products. Standard errors in brackets are clustered at firm-period-country. Variable of interest is $Post0812_t \times WTOmember_{jt}$ is an interaction term between the month-year periods post August 2012 and the WTO membership status of a foreign country j. $Embargo_{jkt}$ equals 1 if product k is embargoed at time t and foreign country j is part of the set of targeted countries. Macroeconomic controls include the GDP of the foreign partner, the (population-weighted) bilateral distance interacted with oil prices (i.e., proxy for transportation costs), the dummy for the presence of FTA or RTA between Russia and the foreign country j at time t, and the exchange rate between the Russian ruble and the currency of country j.

Table 9: **Tariff and non-tariff WTO impacts: Extensive margin**

	EXPORTS		IMPORTS	
	(1)	(2)	(3)	(4)
	Country	Frequency	Country	Frequency
$Post0812_t \times WTOmember_{jt}$	0.046***	-0.037***	0.007***	0.058***
	[0.004]	[0.005]	[0.001]	[0.005]
$Post0812_t \times WTOmember_{jt} \times \Delta Tariff_{HS4}$	-0.001	0.001*	-0.000**	-0.002***
	[0.001]	[0.001]	[0.000]	[0.000]
$Embargo_{jkt}$	-0.042	-0.027	-0.074***	-0.243***
	[0.027]	[0.027]	[0.016]	[0.013]
Biannual FE	No	Yes	No	Yes
Month - Year FE	Yes	No	Yes	No
Firm - WTO - sanctions - product FE	Yes	No	Yes	No
Firm - country - product FE	No	Yes	No	Yes
Country - time macro controls	Yes	Yes	Yes	Yes
Observations	1,713,227	842,501	14,095,681	6,336,484
No. of firm - country - product gr.		229,059		1,752,354
No. of firm -WTO - sanctions - product gr.	220,757		1,834,558	
Standard error clustering	Firm - product -WTO	Firm - product -country	Firm - product -WTO	Firm - product -country

Notes: *p<0.1; **p<0.05; ***p<0.01. Estimator used is PPML. Country margin in columns 1 and 3 refers to a number of unique countries from group m with which firm f trades in HS 8-level product k. The country group m denotes four sets of countries: WTO member countries that later impose sanctions on Russia, WTO member countries that do not impose sanctions on Russia, non-WTO member countries that impose sanctions on Russia as well as non-WTO member countries that do not impose sanctions on Russia. Frequency in columns 2 and 4 refers to the number of periods in half-year period h firm f imports (exports) HS 8-level product k from (to) country j. Variable of interest is $Post0812_t \times WTOmember_{jt}$ is an interaction term between the month-year periods post August 2012 (biannual periods for frequency) and the WTO membership status of a foreign country j (or by country group m for the country specifications). $\Delta Tariff_{HS4}$ is continuous variable that captures the change in HS-4 product code tariff from year 2010 to 2016. $Embargo_{jkt}$ equals 1 if product k is embargoed at time t and foreign country j is part of the set of targeted countries. Country-time macro controls include distance between countries weighted by population interacted with oil prices, dummy for presence of FTA or RTA between Russia and country j at time t, exchange rates between Russian rouble and currency of country j, and the GDP of the partner countries.

Table 10: **Tariff and non-tariff WTO impacts: Intensive margin**

	EXPORTS	IMPORTS
	(1)	(2)
$Post0812_t \times WTOmember_{jt}$	0.009	0.034
	[0.115]	[0.055]
$Post0812_t \times WTOmember_{jt} \times \Delta Tariff_{HS4}$	-0.001	-0.005
	[0.018]	[0.005]
$Embargo_{jkt}$	0.229***	-0.146**
	[0.088]	[0.059]
Firm-product-country FE	Yes	Yes
Month-year FE	Yes	Yes
Country - time macro controls	Yes	Yes
Observations	2,069,358	16,568,060
No. of firm-product- country gr.	286,316	2,210,790

Notes: *p<0.1; **p<0.05; ***p<0.01. Standard errors clustered at firm-period-country in brackets. Variable of interest is $Post0812_t \times WTOmember_{jt}$ is an interaction term between the month-year periods post August 2012 and the WTO membership status of a foreign country j. $\Delta Tariff_{HS4}$ is continuous variable that captures the change in HS-4 product code tariff from year 2010 to 2016. $Embargo_{jkt}$ equals 1 if product k is embargoed at time t and foreign country j is part of the set of targeted countries. Country - time macro controls include the GDP of the foreign partner, the (population-weighted) bilateral distance interacted with oil prices (i.e., proxy for transportation costs), the dummy for the presence of FTA or RTA between Russia and the foreign country j at time t, and the exchange rate between the Russian ruble and the currency of country j.

Table 11: **Government connectedness of the firm: Extensive margin**

	EXPORTS			IMPORTS		
	(1)	(2)	(3)	(4)	(5)	(6)
	Product margin	Country margin	Frequency	Product margin	Country margin	Frequency
$Post0812_t \times WTOmember_{jt}$	0.002	0.046***	-0.054***	0.083**	0.006***	0.061***
	[0.021]	[0.003]	[0.004]	[0.034]	[0.001]	[0.004]
$Post0812_t \times WTOmember_{jt} \times Connected\ firm_f$	0.073	0.120***	0.098***	0.048	0.075***	0.014*
	[0.108]	[0.019]	[0.012]	[0.093]	[0.009]	[0.008]
$Embargo_{jkt}$	-0.088***	-0.028*	-0.012	-0.339***	-0.100***	-0.377***
	[0.025]	[0.015]	[0.017]	[0.040]	[0.008]	[0.007]
Biannual FE	No	No	Yes	No	No	Yes
Month - year FE	Yes	Yes	No	Yes	Yes	No
Firm-country - emb. product FE	Yes	No	No	Yes	No	No
Firm - WTO - sanctions - product FE	No	Yes	No	No	Yes	No
Firm - country - product FE	No	No	Yes	No	No	Yes
Observations	801,315	1,911,198	933,501	2,648,928	16,442,716	7,267,969
No. of firm - country - emb. product gr.	77,389			220,713		
No. of firm - WTO - sanctions - product gr.		245,058			2,110,162	
No. of firm - country - product gr.			252,651			2,011,283
Standard error clustering	Firm - country	Firm - country - WTO	Firm - product - WTO	Firm - country	Firm - country - WTO	Firm - product - WTO

Notes: *p<0.1; **p<0.05; ***p<0.01. Estimator used is PPML. The sample includes all firms that trade (export, import or both) in at least one embargoed agricultural product. Product margin in columns 1 and 4 refers to a number of unique HS-8 level products that firm f imports from (exports to) country j in a time period t. Country margin in columns 2 and 5 refers to a number of unique countries from group m with which firm f trades in HS 8-level product k. The country group m denotes four sets of countries: WTO member countries that later impose sanctions on Russia, WTO member countries that do not impose sanctions on Russia, non-WTO member countries that impose sanctions on Russia as well as non-WTO member countries that do not impose sanctions on Russia. Finally, frequency in columns 3 and 6 refers to the number of periods (in half-year periods) that firm f imports (exports) HS 8-level product k from (to) country j. Variable of interest is $Post0812_t \times WTOmember_{jt}$ is an interaction term between the month-year time periods (biannual periods for the frequency specifications) post August 2012 and the WTO membership status of a foreign country j at time t. $Connected\ firm_f$ is a dummy variable, which takes value of 1 if a firm has any connection to the government (either it's a governmentally owned enterprise, or the government owns shares of a publicly traded company), and 0 otherwise. $Embargo_{jkt}$ equals 1 if product k is embargoed at time t and foreign country j is part of the set of targeted countries. The time macro controls include the price of oil, Russia's GDP, and the USD to rouble exchange rate. Macroeconomic controls include distance between countries interacted with oil prices, dummy for presence of FTA or RTA between Russia and country j at time t, GDP of partner country j. For the country margin specification, the vector of macroeconomic controls characterizes country group as defined previously.

Table 12: **Government connectedness of the firm: Intensive margin**

	EXPORTS (1)	IMPORTS (2)
$Post0812_t \times WTOmember_{jt}$	-0.058	0.051
	[0.111]	[0.047]
$Post0812_t \times WTOmember_{jt} \times Connected\ firm_f$	0.301**	-0.021
	[0.130]	[0.074]
$Embargo_{jkt}$	0.234***	-0.148***
	[0.085]	[0.046]
Firm-product-country FE	Yes	Yes
Month-year FE	Yes	Yes
Country - time macro controls	Yes	Yes
Observations	2,269,504	18,868,262
No. of firm-product- country gr.	311,171	2,495,855

Notes: *p<0.1; **p<0.05; ***p<0.01. Standard errors clustered at firm-period-country in brackets. *Connected firm_f* is a dummy variable, which takes value of 1 if a firm has any connection to the government (either it's a governmentally owned enterprise, or the government owns shares of a publicly traded company), and 0 otherwise. $Embargo_k$ equals 1 if HS 8-digit product is embargoed starting from August 2014, while $Target_{jt}$ equals 1 if foreign country j imposed economic sanctions on Russia in period t. Variable of interest is $Post0812_t \times WTOmember_{jt}$ is an interaction term between the month-year periods post August 2012 and the WTO membership status of a foreign country j. Estimator used is the Pseudo-Poisson Maximum Likelihood (PPML). Variable of interest is $Post0812_t \times WTOmember_{jt}$ is an interaction term between the month-year periods post August 2012 and the WTO membership status of a foreign country j. $Embargo_{jkt}$ equals 1 if product k is embargoed at time t and foreign country j is part of the set of targeted countries. Macroeconomic controls include the GDP of the foreign partner, the (population-weighted) bilateral distance interacted with oil prices (i.e., proxy for transportation costs), the dummy for the presence of FTA or RTA between Russia and the foreign country j at time t, and the exchange rate between the Russian ruble and the currency of country j.

APPENDIX

Table A1: **Intensive margin: Exports sample excluding oil and gas products**

	(1)
$Post0812_t \times WTOmember_{jt}$	-0.100
	[0.127]
Month-year FE	Yes
Firm-product-country FE	Yes
Country-time macro controls	Yes
Observations	2,221,187
Number of firm-product-country groups	306,393

Notes: *p<0.1; **p<0.05; ***p<0.01. Estimator used is PPML. Standard errors in brackets are clustered at firm-period-country. The sample excludes post-embargo time and all crude oil and gas products (HS 4-digit codes 2709, 2710, and 2711). Variable of interest is $Post0812_t \times WTOmember_{jt}$ is an interaction term between the month-year periods post August 2012 and the WTO membership status of a foreign country j. $Embargo_{jkt}$ equals 1 if product k is embargoed at time t and foreign country j is part of the set of targeted countries. Country-time macro controls include the GDP of the foreign partner, the (population-weighted) bilateral distance interacted with oil prices (i.e., proxy for transportation costs), the dummy for the presence of FTA or RTA between Russia and the foreign country j at time t, and the exchange rate between the Russian ruble and the currency of country j.

Table A2: **Product margin**

	EXPORTS			IMPORTS		
	(1)	(2)	(3)	(4)	(5)	(6)
$Post0812_t \times WTOmember_j$	0.016*	-0.017**	-0.016**	0.059***	0.046***	0.045***
	[0.010]	[0.007]	[0.007]	[0.014]	[0.013]	[0.013]
$Embargo_{jst}$			-0.040***			-0.168***
			[0.014]			[0.016]
Month-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm - WTO membership FE	Yes	No	No	Yes	No	No
Firm-country FE	No	Yes	No	No	Yes	No
Firm-country-product type FE	No	No	Yes	No	No	Yes
Time-specific macro controls	Yes	Yes	Yes	Yes	Yes	Yes
Country-time specific macro controls	No	Yes	Yes	No	Yes	Yes
Observations	528,141	831,040	850,532	1,691,051	2,696,903	2,758,336
R-squared	0.010	0.005	0.005	0.018	0.011	0.011
No. of firm-WTO membership groups	60,742			145,818		
No. of firm-country-product type groups			127,078			330,520
No. of firm-country groups		123,927			320,140	
Standard error clustering	Firm	Firm-country	Firm-country	Firm	Firm-country	Firm-country

Notes: *p<0.1; **p<0.05; ***p<0.01. Estimator used is the Ordinary Least Squares (OLS). In columns 1 and 4 the dependent variable is a number of unique HS-8 level products firm j imports (exports) from (to) all WTO member countries and all non-WTO partner countries in time period t. In columns 2 and 5 the dependent variable is a refinement of columns 1 and 4: number of unique HS-8 level products firm f imports (exports) from (to) each country j. Finally, in columns 3 and 6 the dependent variable in this table is the number of unique embargoed and non-embargoed HS-8 level products firm f trades with each country j. $Embargo_{jst}$ is an indicator variable that takes the value of 1 if the foreign country j is one of the sanctioning countries targeted by Russia's retaliatory embargo (which started in August 2014) and if the HS 8-digit product traded is part of the set s of embargoed goods. Variable of interest is $Post0812_t \times WTOmember_{jt}$ is an interaction term between the month-year periods post August 2012 and the WTO membership status of a foreign country j. The country-time macro controls include the trade cost calculated as an interaction between oil price and the distance between countries weighted by population, dummy for presence of FTA or RTA between Russia and country j at time t, GDP of partner countries, exchange rate between country j's currency and the Russian rouble at time t, and finally the interaction between sanctioning countries and post-embargo time.

Table A3: **Country margin**

	EXPORT			IMPORT		
	(1)	(2)	(3)	(4)	(5)	(6)
$Post0812_t \times WTOmember_j$	0.021**	0.030***	0.030***	0.026***	0.006***	0.004***
	[0.008]	[0.002]	[0.002]	[0.002]	[0.000]	[0.000]
$Embargo_{mkt}$			-0.013			-0.061***
			[0.010]			[0.004]
Month-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-WTO member FE	Yes	No	No	Yes	No	No
Firm-WTO membership-product FE	No	Yes	Yes	No	Yes	Yes
Macroeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	151,629	2,055,712	2,200,721	1,346,467	18,160,774	18,337,706
R-squared	0.008	0.007	0.006	0.013	0.002	0.002
No. of firm-WTO membership groups	17,676			80,912		
No. of firm-product-country type groups			534,581			4,005,152
No. of firm-WTO-product groups		492,875			3,881,077	
Standard error clustering	Firm	Firm-product	Firm-product	Firm	Firm-product	Firm-product

Notes: *p<0.1; **p<0.05; ***p<0.01. Estimator used is OLS. In columns 1 and 4 the dependent variable is a number of unique partner countries that are WTO members and unique non-WTO countries firm f trades with in a given time period t. In columns 2 and 5 the dependent variable is a number of unique partner countries that are WTO members and unique non-WTO countries firm f imports (exports) product k from (to) with in a given time period t. Finally, in columns 3 and 6 the dependent variable is a number of unique partner countries from group m firm f imports (exports) product k from (to) with in a given time period t. The country group m denotes four sets of countries: WTO member countries that later impose sanctions on Russia, WTO member countries that do not impose sanctions on Russia, non-WTO member countries that impose sanctions on Russia as well as non-WTO member countries that do not impose sanctions on Russia. $WTOmember_{mt}$ is equal to 1 if country group m consists of WTO members, and 0 otherwise. $Embargo_{mkt}$ equals 1 if product k is subject to the retaliatory embargo at time t and if country group m consists of countries that impose economic sanctions on Russia (thus becoming targets of Russia's retaliatory embargo). Macroeconomic controls characterize country group m and include the combined GDP of countries in group m, the (population-weighted) average distance to these countries interacted with oil prices, as well as the fraction of countries within group m that are part of a FTA or RTA with Russia.

Table A4: **Intensive margin of firm-level foreign trade**

	EXPORT (1)	IMPORT (2)
$Post0812_t \times WTOmember_{jt}$	-0.062***	0.094***
	[0.008]	[0.009]
$Embargo_{jkt}$	-0.013	-0.244***
	[0.034]	[0.023]
Month-year FE	Yes	Yes
Firm-product-country FE	Yes	Yes
Country-time macro controls	Yes	Yes
Observations	2,269,397	17,028,490
R-squared	0.899	0.815

Notes: *p<0.1; **p<0.05; ***p<0.01. Estimator used is OLS. Variable of interest is $Post0812_t \times WTOmember_{jt}$ is an interaction term between the month-year periods post August 2012 and the WTO membership status of a foreign country j. $Embargo_{jkt}$ equals 1 if product k is embargoed at time t and foreign country j is part of the set of targeted countries. Macroeconomic controls include the GDP of the foreign partner, the (population-weighted) bilateral distance interacted with oil prices (i.e., proxy for transportation costs), the dummy for the presence of FTA or RTA between Russia and the foreign country j at time t, and the exchange rate between the Russian ruble and the currency of country j.

Table A5: **Frequency of foreign trade**

	EXPORT			IMPORT		
	(1)	(2)	(3)	(4)	(5)	(6)
$Post0812_h \times WTOmember_{jh}$	0.008	-0.025***	-0.047***	0.028**	0.032***	0.063***
	[0.009]	[0.008]	[0.004]	[0.012]	[0.011]	[0.004]
$Embargo_{jkh}$			-0.009			-0.368***
			[0.018]			[0.007]
Biannual FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm - WTO membership FE	Yes	No	No	Yes	No	No
Time-specific macro controls	Yes	Yes	Yes	Yes	Yes	Yes
Country-time specific controls	No	Yes	Yes	No	Yes	Yes
Firm-country FE	No	Yes	No	No	Yes	No
Firm-product-country FE	No	No	Yes	No	No	Yes
Observations	187,129	334,936	1,369,553	530,464	994,657	10,117,186
R-squared	0.006	0.056	0.040	0.013	0.074	0.050
No. of firm-WTO membership groups	60,742			145,818		
No. of firm-country-product groups			688,703			4,860,500
No. of firm-country groups		124,518			320,425	
Standard error clustering	Firm	Firm-country	Firm-country	Firm-level	Firm-country	Firm-country

Notes: *p<0.1; **p<0.05; ***p<0.01. Estimator used is OLS. In columns 1 and 4 the dependent variable is a biannual frequency of trade (each 6 months), which is defined as number of periods, in which a firm has at least one positive import or export flow from all WTO countries and all non-WTO member countries. In columns 2 and 5 the dependent variable is the number of periods firm f imports (exports) any/all products from (to) country j. Finally, in columns 3 and 6 the dependent variable is the number of periods firm f imports (exports) product k from (to) country j. Variable of interest is $Post0812_h \times WTOmember_{jh}$ is an interaction term between the half-year periods post August 2012 and the WTO membership status of a foreign country j. $Embargo_{jkh}$ equals 1 if product k is embargoed at time h and foreign country j is part of the set of targeted countries. Country-time specific macro controls include distance between countries weighted by population interacted with oil prices, dummy for presence of FTA or RTA between Russia and country j at time t, and GDP of partner country j.

Table A6: **Extensive margin of trade with non-WTO members**

	EXPORTS		IMPORTS	
	(1)	(2)	(3)	(4)
	Product margin	Country margin	Product margin	Country margin
$Post0812_t$	0.076***	-0.008*	-0.038	0.001
	[0.019]	[0.003]	[0.047]	[0.001]
$Post0812_t \times \Delta Tariff_{HS4}$		0.006***		0.000
		[0.001]		[0.000]
$Post0814_t \times Embargoed\ product_k$	0.037	-0.002	-0.002	-0.001
	[0.025]	[0.003]	[0.051]	[0.002]
Month FE	Yes	Yes	Yes	Yes
Firm - country - emb. product FE	Yes	No	Yes	No
Firm - WTO - sanc. - product FE	No	Yes	No	Yes
Macroeconomic controls	Yes	Yes	Yes	Yes
Observations	129,797	322,867	66,590	263,816
Number of firm - country - emb. product gr.	13,089		6,548	
Number of firm - WTO - sanc. - product gr.		45,073		47,792
Standard error clustering	Firm - country	Firm - country - WTO	Firm - country	Firm - country - WTO

Notes: *p<0.1; **p<0.05; ***p<0.01. Estimator used is PPML. Product margin in columns 1 and 4 refers to a number of unique HS-8 level products separated by embargo status (s) firm f imports (exports) from (to) country j in a time period t. Country margin in columns 2 and 5 refers to a number of unique countries from group m with which firm f trades in HS 8-level product k. The country group m denotes four sets of countries: WTO member countries that later impose sanctions on Russia, WTO member countries that do not impose sanctions on Russia, non-WTO member countries that impose sanctions on Russia as well as non-WTO member countries that do not impose sanctions on Russia. The sample consists of firm's trade with non-WTO countries. The treatment variable is $Post0812_t$ is a dummy variable that takes value of 1 after August 2012, when Russia joined the WTO. This variable captures the change in trade due to the non-tariff trade barriers after Russia joins the WTO. $Post0812_t \times \Delta Tariff_{HS4}$ captures the change in firm-level country margin due to change in tariffs after Russia joins the WTO. Finally, we control for the imposition of the embargo by including the dummy variable $Post0814_t \times Embargoed\ product_k$, which takes the value of 1 if the observation is recorded in or after August 2014 (when Russia retaliated with the agricultural embargo) and the product traded is targeted by the embargo. None of the sanctioning countries are non-WTO members, so the previously defined control for the embargo $Embargo_{jkt}$ loses the country dimension. To control for seasonality we include month fixed effects. The vector of macroeconomic controls includes the GDP of partner country j (or group m for country margin) in year y, (population-weighted) average distance (within group m for country margin) interacted with oil prices, exchange rates with country j, as well as the dummy for countries that have FTA or RTA with Russia (or fraction of countries with a FTA or RTA with Russia in group m). We also include Russia's GDP, price of Brent oil as a macroeconomic controls.

Table A7: **Intensive margin of trade with Non-WTO members**

	EXPORTS (1)	IMPORTS (2)
$Post0812_t$	-0.047	-0.040
	[0.103]	[0.047]
$Post0812_t \times \Delta Tariff_{HS4}$	0.021	0.007
	[0.064]	[0.017]
$Post0814_t \times Embargoed\ product_k$	-0.002	-0.026
	[0.113]	[0.055]
Month FE	Yes	Yes
Country-time macro controls	Yes	Yes
Firm-product-country FE	Yes	Yes
Observations	357,979	331,318
Number of firm-product-country groups	53,276	59,255

Notes: *p<0.1; **p<0.05; ***p<0.01. Estimator used is PPML. Standard errors clustered at firm-period-country in brackets. This table records impacts of Russia's WTO accession on firm's trade with non-WTO member countries. The sample consists of firm's trade with non-WTO countries. Our treatment variable is $Post0812_t$, which is a dummy variable that takes value of 1 after August 2012, when Russia joined the WTO. This variable captures the change in trade due to the non-tariff trade barriers after Russia joins the WTO. $Post0812_t \times \Delta Tariff_{HS4}$ captures the change in firm-level trade due to change in tariffs after Russia joins the WTO. Finally, we control for the imposition of the embargo by including the dummy variable $Post0814_t \times Embargoed\ product_k$, which takes the value of 1 if the observation is recorded in or after August 2014 (when Russia retaliated with the agricultural embargo) and the product traded is targeted by the embargo. None of the sanctioning countries are non-WTO members, so the previously defined control for the embargo $Embargo_{jkt}$ loses the country dimension. To control for seasonality we include month fixed effects. Additionally, to control for macroeconomic characteristics that could impact our estimates we include a vector of country-time macro controls, such as partner country's GDP and population, Russia's GDP, price of Brent oil, presence of FTAs and RTAs with country j, and currency exchange rate between the Russian rouble and currency of partner country j.