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## Can import promotion increase export performance in times of global value chains? Firm-level evidence from Russia

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### Abstract

This paper analyzes whether access to imported intermediate goods can raise export performance of Russian firms. We employ an instrumental variable strategy which exploits variation in firm-specific input tariffs to identify the effect of imported intermediates on firm exports during the period 2007-2013, utilizing a unique firm-level database on firm characteristics and customs declarations. We find that input tariff reductions can raise firm exports significantly, as can other measures aimed at increasing imports of intermediate goods of exporting firms in Russia. Import promotion targeted at exporting firms in high-tech sectors can be up to three times more effective. Better access to imports can also help increase the currently low share of exporting firms within the Russian enterprise landscape. Our results suggest that with the rising globalization and fragmentation of production processes, countries interested in raising exports need to think strategically of promoting imports as well. We propose and discuss several policy measures for Russia in the areas of tariff regulation, non-tariff measures, trade facilitation and trade integration.

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# 1 Introduction

World trade in the 21st century is characterized by global value chains (GVCs), where firms locate different stages of production across different countries through a network of independent suppliers and their own affiliates (OECD (2013)). This allows firms to source intermediates wherever cost and quality are most competitive and specialize in the part of the production process they are best at, instead of having to build an entire value chain on their own. These new realities of internationalization and fragmentation of production have important implications for trade policy: In the interconnected economies of today, strong performance in international markets depends not only on the capacity to export, but also on the capacity to import high-quality inputs. Tariffs and other trade barriers can no longer solely be seen as a means to protect producers from fierce international competition. Instead they can install painful impediments for domestic firms to gain or maintain competitiveness, by raising the cost of imported inputs and acting de facto as a tax on exports (Tokarick, 2007). Any country interested in raising exports today therefore needs to think of promoting imports as well.

Increasing non-oil export performance is an important policy objective in Russia and a key component of several Russian strategic documents, including the *Government Program “Development of Foreign Economic Activity”* and the *Strategy for Russia’s Innovative Development 2020*. The high dependence on oil and other natural resources harm the competitiveness of the manufacturing sector, leading to export concentration and macroeconomic volatilities.<sup>1</sup> Known as symptoms of the so-called “Dutch Disease”, these characteristics are common for resource-rich countries and have been studied vastly within the academic literature (e.g. Krugman 1987, Sachs & Warner 1995, Caselli et al. 2015). In this light, the focus of Russian policy-makers on increasing the role of the manufacturing sector within the Russian export structure is a promising path to promote and stabilize economic growth.

Against this backdrop, this paper examines whether Russia can further strengthen its export performance by improving access to imported intermediate inputs, given the new opportunities to offshore production in times of GVCs. Building on Bas and Strauss-Kahn (2013), Feng et al. (2016) and Edwards et al. (2018), who have conducted similar studies for France, China and South Africa, respectively, we use firm-level data from company income tax and customs declarations to analyze empirically whether an increase in imported intermediate goods raises firm exports in the Russian manufacturing industry. Our identification strategy exploits variation in input tariffs levied on firm-specific imported products as a viable instrument to capture the relationship between firm-level imports and exports. We conduct our analysis for both, all manufacturing firms, as well as a selected sample of firms active in high-tech sectors.

With the creation of the Customs Union in 2010 and WTO accession in 2012 Russia has recently undertaken important steps to remove barriers to international trade and lower costs of imports. Yet this paper finds that lowering input tariffs even further could significantly increase firms’ exports. Concretely our results show that decreasing tariffs by one percentage point would increase firm exports by approximately one percent. More generally, increases in imported intermediate inputs raises firm exports by 0.11 to 0.14 percent, depending on the exact model specification. For high-tech firms, import promotion can be up to three times more effective. Our results are robust to different definitions of intermediate inputs as well as various estimation techniques that tackle sample selection bias and problems related to zero-inflated data, which are common in empirical applications in international trade.

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<sup>1</sup>In 2017, natural resources represented 49.39 percent of total exports (UN COMTRADE). The total export value dropped from USD 527 billion in 2013 to USD 285 billion in 2016, i.e. by 46 percent, predominantly due to the decrease in oil prices.

Our paper also confirms a well-established result from the international trade and heterogeneous firms literature pioneered by Melitz (2003), finding that firms who engage in trade in Russia are more productive than domestic firms. Moreover, besides analyzing the intensive margins, we further find that firms who imported in the past have a higher probability to become exporters (extensive margin). This result supports import promotion as an effective tool to raise the currently low share of exporters within the Russian firm landscape.

Our findings aim to enrich the trade policy debate in Russia as well as in other countries interested in raising export performance in various ways. First of all we point out that tariff regulations in the Eurasian Economic Union (EAEU) Russia is a member of should exploit remaining room for liberalization and target specifically products that are imported as intermediate inputs by exporting firms. This argument gains even further weight when considering that at any tariff rate, costs of importing inputs accumulate with each time a good crosses an international border. Moreover, other import barriers besides input tariffs matter as well. Specifically, Russian policy-makers should consider to decrease non-tariff measures to trade, particularly concerning technical regulation, which could hinder exporters from accessing intermediate inputs at international markets. Russia could also further facilitate trade in various ways, most importantly with regard to tackling excessive documentation and lengthy customs procedures. We also point out the importance for Russia to strengthen participation in regional trade agreements as a way to further improve firms access to imported intermediate goods. Finally, to avoid harm for domestic producers, Russia should restrain from increasing import restrictions in response to economic sanctions that were recently imposed by the international community.

The remainder of this paper is structured as follows: Section 2 provides more detailed information about Russia's recent history of trade liberalization; Section 3 summarizes relevant literature on heterogeneous firms, intermediate inputs and international trade; Section 4 presents our data sources and empirical strategy; Section 5 shows some stylized facts and reports regression results; Section 6 defends the robustness of our analysis; Section 7 discusses important policy implications and a way forward for Russia. In section 8 we draw general conclusions.

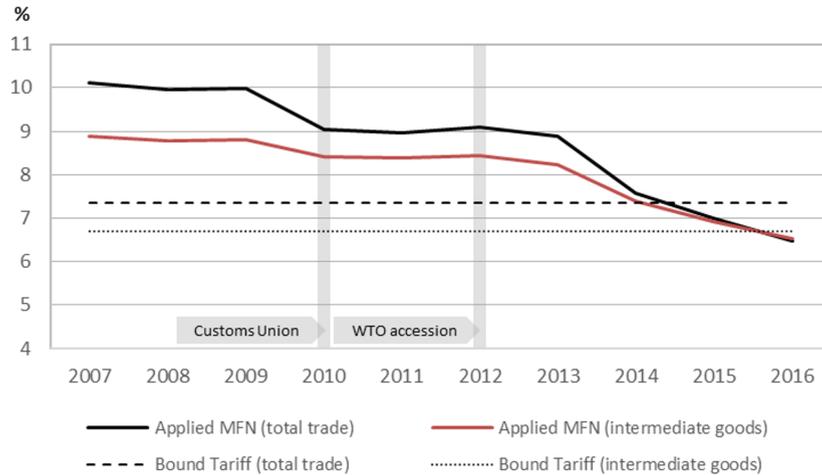
## 2 Recent trade liberalization in Russia

Over the last decade Russia has participated in important processes of trade integration at the regional and multilateral level. On 1 January 2010, together with Belarus and Kazakhstan, Russia established the Customs Union by eliminating intra-regional tariffs and establishing a common external tariff policy. To further deepen regional economic integration, the members of the Customs Union created in 2012 the Eurasian Economic Space (EES) to set up a single market that allows free movement of labor, goods, services and capital. Moreover, the Eurasian Economic Commission was set up as the regulatory agency for the customs union and the EES. In 2015, the Eurasian Economic Union (EAEU) came into force, which incorporated the Customs Union and the EES. The EAEU was further enlarged in 2015 to include Armenia and Kyrgyzstan. At the multilateral level, Russia signed on 22 August 2012 its Accession Protocol to become the 156th member of the WTO and committed to lower tariffs and non-tariff barriers to trade as part of the accession agreements.

As depicted in Figure 1, tariff rates fell substantially in the process of establishing the Customs Union and following Russia's WTO accession. The average applied Most Favored Nation (MFN) tariff for all goods fell from 10.1 percent in 2007 to 6.47 percent in 2016. MFN tariffs applied on the import of intermediate goods were decreased less significantly, from an average of 8.88 percent in 2007 to 6.52 percent in 2016. By now, the average applied MFN tariff for both, total trade and intermediate goods,

has reached a level lower than the respective bound tariff rate, indicating that Russia has overall met its WTO commitments regarding tariff reductions. Despite this important progress, Russia has still room to apply tariff reductions beyond the bound tariff rate, which was negotiated during the WTO accession process. As we argue in this paper, further decreases in input tariffs would benefit exporting firms who import intermediate goods and could strengthen Russia’s export performance, considering that additional costs of 6.52 percent on intermediate goods still imply a substantial burden for importers.

Figure 1: Evolution of MFN Tariff Rates in Russia 2007-2016



Note: Intermediate goods are classified by WITS

Source: WITS database

### 3 Literature review

Over the past two decades, firm heterogeneity has become a noteworthy attribute for building theories in the field of international trade and macroeconomics. The diffusion of micro-datasets in empirical studies of these fields enabled economists to explore a number of features that affect producers’ behavior at a granular level and develop relevant policies.

Recent research suggests that firm heterogeneity can surface from different sources, including production efficiency, product quality, markups, fixed costs and variety of products. The seminal work by Melitz (2003) explains firm heterogeneity as a result of differences in productivity, based on analysis performed at a disaggregated firm level. Extending Krugman (1980) workhorse model on scale economies, product differentiation and patterns of trade with firm heterogeneity, Melitz shows that only the most productive firms tend to become exporters, while the least productive firms are forced out of the industry. Hence trade induced reallocations are directed towards more productive firms. Similar ideas were developed by Bernard & Bradford Jensen (1999), who find that exporting firms are bigger in size, more productive, more capital intensive, more skills intensive, and pay higher wages than non-exporting firms within the same industry.

Building on these models, a substantial amount of studies has shown that firms who import share similar characteristics with firms who export, with one of the shared characteristics being a so-called

productivity premium (Bernard et al 2007). Similar as in Melitz' model, the presence of a "sunk cost" in the import and export market acts as a pseudo trade barrier that allows only the most productive firms to self-select themselves into trade activities. According to Kasahara & Lapham (2008), sunk costs for importers are lower than for exporters, which is why importing firms are more likely to become two-way traders. By first engaging in import activities, a firm can raise its productivity, which subsequently enables it to bear the additional costs to become an exporter as well. Hence there exists a direct positive effect of past productivity and imports in determining exports.

Besides trade status intermediate inputs have been recognized as important determinants of firm productivity within a wide array of theoretical literature (e.g., Ethier, (1979, 1982), Markusen (1989), Romer(1990), Grossman & Helpman (1991)). Bringing this insight into the context of international trade, a few empirical studies have investigated how trade liberalization can lead to a fall of prices of imported intermediate goods. This, in turn, leads to better access of firms to cheaper and higher quality inputs, resulting in higher firm productivity (Schor (2004), Amiti and Konings (2007), and Topalova (2011)). This idea has been further investigated empirically by Bas & Strauss-Kahn (2013), who estimate direct and indirect channels through which imports of intermediate goods can lead to higher productivity and better export performance of firms in France. The authors find that the main channels for the link between imported inputs and firm performance lie in access to better quality and technology embedded in intermediates produced abroad.

Lawrence et al. (2016) produce similar results as Bas and Strauss-Kahn, based on analysis of firm-level data from company tax declarations for South Africa. The authors confirm that importers of intermediate goods consistently exhibit higher productivity than firms who are not involved in trade, have a higher likelihood of becoming an exporter, and have a greater scope, scale, and value of exports. Another study on the link between imported inputs and firms' export performance was conducted by Feng et al. (2016), who use firm-level trade and operational data of Chinese manufacturing firms. To deal with the potential reverse causality between imports of inputs and export scope the paper exploits China's tariff changes as an instrument for firm-level import decisions and finds a strong positive effect of intermediate imports on firm exports. A similar strategy was employed by Bas and Strauss-Kahn in dealing with the endogeneity problem.

At the macro level, Tokarick (2007) studied how a country's import tariff can act de facto as a tax on its exports through various channels. The main argument made in the study is that increases in import tariffs lead to a rise in the domestic price of imports, which directly pushes up the cost of intermediate inputs. This, again, can cause an additional increase in the cost of production, resulting from rising costs of factor inputs like wages and rental rates. The combination of these two channels amplifies reductions in firm output and encourages firms to shift their production towards non-tradable goods when prices for imports are high, diminishing a country's export potential. The author uses extensive datasets for 26 developing countries to quantify the extend to which tariffs act as a tax on exports. The estimated export tax are on average 12.5 percent across countries and can be as high as 30 percent for some countries. As a result, countries cannot simultaneously protect their import-competing sectors if they aim to promote their export sectors. Instead governments should strategically exploit tariff reductions as an effective tool to increase exports.

## 4 Data and methodology

### 4.1 Data description

In order to assess the effect of import liberalization on the export performance of Russian firms we use a rich product-level import/export dataset from Russian customs authorities spanning the period from 2001 to 2016. The dataset contains values and origins of firms' imports as well as destination of firms' exports disaggregated at the 10-digit Harmonized System (HS10) level, which we translate into HS6 level. We exclude members of the EAEU (Armenia, Belarus, Kazakhstan Kyrgyzstan) from our analysis, as we no longer observe bilateral trade flows between Russia and these countries after 2010. To obtain our data for tariffs on imported goods we match imported products with their corresponding applied simple average tariffs rates at HS6 level, which we obtain from the World Bank's WITS database. Based on our compiled data we calculate annual total imports and exports for each firm and a measure of firm-level input tariffs, which we compute as a weighted average of tariffs on imported products.

We complement the firm-level trade dataset with data on firm characteristics from the Ruslana database. This unique database on more than 9.7 million companies in Russia is administered by the Bureau van Dijk and combines information from the CreditInform. The variables of our interest are those commonly used in firm-level studies, precisely turnover, number of employees, fixed assets and cost of goods sold. For each firm we calculate a measure of productivity defined as the ratio of turnover to the number of employees. We also use information on firms' current assets and shareholder funds. We restrict the sample to manufacturing firms based on NACE Rev. 1 classification to focus the analysis on exports outside the natural resource sector. The restriction to manufacturing also eliminates carry-along behavior of firms operating in retail and wholesale sectors.

We combine the firm and import/export databases by using a common and unique firm identifier. We start our analysis in 2007 because tariff data for Russia is incomplete before and finish in 2013 due to the trade sanctions imposed on Russia afterwards. We further limit our sample to ensure that our empirical results are not driven by outliers. Firstly, we drop firms who import more than 100 varieties. We make this choice because our dataset has only information on a firm's core activity and does not allow us to identify firms who are active in more than one sector. By excluding firms whose number of imported varieties deviates significantly from the sample mean we aim to eliminate firms who have sizable activity in wholesale (i.e. firms who import on behalf of other firms).<sup>2</sup> Secondly we eliminate firms whose value of imported goods exceeds the costs of goods sold. This allows us to minimize the effects which may be caused by the purchase of capital goods. Finally, to avoid making our results sensitive to disproportionately high firm-specific tariffs we also eliminate observations with weighted average tariff rates greater than 20 percent.<sup>3</sup> Our final dataset consists of 552,237 observations which represents on average 78,891 firms per year. Table A.1 in the Appendix provides summary statistics for the main variables we employ in our analysis.

### 4.2 Empirical strategy

We exploit the panel data structure of our firm-level database and perform a series of fixed effects (FE) regressions to explore the link between imports of intermediate goods and firm exports. Applying fixed effects helps us to control for unobserved time invariant heterogeneity that may bias the results.

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<sup>2</sup>The number of imported varieties has the mean of 38 and the standard deviation of 111.

<sup>3</sup>All in all we drop around ten percent of observations. Tables A.4 and A.5 in the Appendix present regression results including tariff rates higher than 20, which leads to only 36 more observations for our first baseline regression.

To deal with potential endogeneity that may arise from reverse causality - i.e. the fact that higher firm exports may induce higher firm imports - we implement an instrumental variable (IV) approach, using firm-specific input tariffs as an instrument for the value of firm imports. Input tariffs, at the firm level, are computed as weighted average tariffs on intermediate goods imported from a foreign country and used in the production of final firm output. The formula is specified as:

$$Lagged.Tariff_{it} = \sum_{j=1}^J \omega_{ij,t} \tau_{j,t-1} \quad (1)$$

where  $\omega_{ij,t}$  represents the share of a variety  $j$  in total imports of a firm  $i$  in year  $t$ ,  $\tau_{j,t-1}$  denotes the lagged applied tariff rate specific to a variety.<sup>4</sup> The rationale for using lagged tariffs is that firms engaged in international trade enter long-term supplier contracts, thus it takes time for firms to adjust their import structure in response to changes in tariff rates.<sup>5</sup> The baseline IV regression is specified as follows:

$$\ln Exports_{it} = \beta_1 \ln \widehat{Imports}_{it} + \beta_2 Controls_{it} + \eta_t + \mu_i + \varepsilon_{it} \quad (2)$$

with the first stage:

$$\ln Imports_{it} = \alpha_1 Lagged.Tariff_{it} + \alpha_2 Controls_{it} + \eta_t + \mu_i + u_{it} \quad (3)$$

where exports and imports are measured in values and the vector of controls contains measures of productivity, fixed assets per employee, number of employees, current assets, shareholder funds (all in natural logs) and a dummy indicating whether a firm exported in previous years or not (export experience).  $\mu_i$  and  $\eta_t$  represent firm and time-year fixed effects,  $\varepsilon_{it}$  and  $u_{it}$  are idiosyncratic error terms. We are also interested in the regression of exports on input tariffs (reduced form) in the context of our policy discussion.

In order to introduce a correct identification strategy, our instrument must satisfy the relevance and validity properties. To show the relevance of our instrument, we present the results of the first stage in table A.3 in the Appendix, which confirms that firm-specific input tariffs are negatively correlated with firm imports. The instrument's validity would be threatened if changes in tariffs were subject to industry lobbying. To explore whether we face this issue we apply a procedure similar to Topalova & Khandelwal (2011) and examine the correlation of tariff changes over the sample period with initial firm performance. If firms were in a position to influence trade liberalization in their favor we would expect a positive relationship between initial firm size or other firm characteristics and changes in firm-specific input tariffs over time. We do not find any evidence of endogeneity of input tariff changes (see table A.2 in the Appendix).

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<sup>4</sup>We define a variety as a country-product pair, where product corresponds to HS6 category and a variety to the import of a particular good from a particular country.

<sup>5</sup>It is also plausible that firms anticipate changes in tariffs, therefore we repeat our regressions with contemporaneous tariffs. Results do not change significantly.

## 5 Results

### 5.1 Stylized facts

As in many other economies, only a relatively small fraction of firms engages in international trade in Russia. On average, 87.34 percent of firms were only active in the domestic market during the period 2007-2013. 6.83 percent of firms were exporters, either exporting only or engaging in both, exporting and importing activity. However, as shown in table 1, firms that export were also slightly more likely to import. Exporting-importing firms, i.e. firms that both export and import in the same year, represented 3.79 percent of total firms on average and make up the main segment of interest in our analysis. Interestingly, the share of exporting-importing firms in other studies following a similar approach to ours was higher. The selected sample in a comparable study for South Africa conducted by Edwards et al. (n.d) represented 17 percent of total firms, and Bas and Strauss-Kahn (2013) report a share of 59 percent of exporting-importing firms in France. The relatively low share of exporting-importing firms in Russia motivates our analysis on whether firms that imported in the past have a higher propensity to become exporters, which we will present in section 5.4.

Table 1: Average number of firms and total observations by trade status, 2007-2013

	Total		Only Importers		Only Exporters		Exporters-Importers		Domestic	
	N	N	Share	N	Share	N	Share	N	Share	
<b>Average N of firms per year</b>	78,891	4,600	5.83%	2,396	3.04%	2,989	3.79%	68,906	87.34%	
<b>Total N of observations</b>	552,237	32,199		16,773		20,924		482,341		

Note: Total importing firms is the sum of only importers and exporters-importers (representing 9.62% of total firms/observations) and total exporting firms is the sum of only exporters and exporters-importers (representing 6.83% of total firms/observations).

It has been widely recognized by the academic literature that firms which engage in trade have different characteristics than domestic firms (see e.g. Bernard & Bradford Jensen 1999 , De Loecker 2007). To begin our empirical analysis, we highlight these differences for Russian firms by exploring the relationship between trade status and productivity. Table 2 presents the results of a series of regressions of firm productivity on firm characteristics. We then add for each regression separately a trade status dummy as the main explanatory variable of interest. It should be noted, however, that these simple regressions do not allow us to establish a causal link between trade status and firm productivity, given the possibility of reverse causality in the sense that productivity might influence the importing/exporting decision of a firm. Yet they help us to explore whether Russian firms engaged in trade benefit from a “trade premium”, which significantly distinguishes them from domestic firms.

The results show that importing firms are on average 6.64 percent more productive than firms that do not import goods from abroad (column 1). A possible explanation is related to technology transfer, provoked by the diffusion of modern technologies embodied in imported intermediate inputs (see e.g. Coe & Helpman (1995)). The “trade premium” effect is slightly smaller but still highly significant for exporting firms, whose productivity is on average 4.58 percent higher than for non-exporters (column 2). This result is supported by recent trade theory, which claims that the productivity premium of importers is usually larger than the one for exporters (Bernard et al. (2007); Wagner (2012)). The results also concord with Melitz’ firm heterogeneity and international trade model (2003), which shows that only highly productive firms can bear additional costs related to trade, such as transportation.

Table 2 also shows that importing-exporting firms exhibit a 5.6 percent higher productivity (column 3), while firms that only import are still 3.78 percent more productive than other firms

(column 4). Firms that only export, in contrast, are not significantly more productive (column 5). The latter observation already points at the importance of imports in raising the performance of exporting firms, which is our main research topic. We shall now turn to exploring this relationship in detail.

Table 2: Trade premium

	(1)	(2)	(3)	(4)	(5)
Dependent variable: firm productivity					
Importing status	0.0664*** (0.00556)				
Exporting status		0.0458*** (0.00612)			
Importing-exporting status			0.0560*** (0.00662)		
Importing only				0.0378*** (0.00558)	
Exporting only					0.00878 (0.00570)
Capital intensity	0.0489*** (0.00145)	0.0486*** (0.00145)	0.0489*** (0.00145)	0.0489*** (0.00145)	0.0487*** (0.00145)
Cost per employee	0.508*** (0.00545)	0.508*** (0.00545)	0.508*** (0.00545)	0.508*** (0.00545)	0.508*** (0.00545)
Current assets	0.0975*** (0.00340)	0.0972*** (0.00339)	0.0976*** (0.00339)	0.0977*** (0.00340)	0.0976*** (0.00339)
Shareholderfunds	0.0271*** (0.00231)	0.0268*** (0.00231)	0.0272*** (0.00231)	0.0273*** (0.00231)	0.0272*** (0.00231)
Constant	3.568*** (0.0528)	3.576*** (0.0528)	3.568*** (0.0528)	3.566*** (0.0528)	3.570*** (0.0528)
Observations	352,263	352,263	352,263	352,263	352,263
R-squared	0.624	0.624	0.624	0.624	0.624
Number of firms	129,729	129,729	129,729	129,729	129,729
Firm FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

Robust standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 5.2 Imported inputs and export performance

We now investigate the impact of an increased import of intermediate inputs on firm exports, first by exploring the general relationship between firm imports and exports and subsequently by looking more specifically at the importance of imported inputs for firms operating in high-tech sectors as well as the probability for a firm becoming an exporter. Our baseline regressions treat all imports as intermediate inputs, but as part of our robustness checks we will relax this assumption.

Table 3 reports our baseline results. Column 1 presents the results of the reduced form regression from our IV specification, which provides insights in the effects of firm-specific input tariff changes on total firm exports. Accordingly, a 1-percentage point increase in tariffs leads to a 0.9 percent decrease in firm exports on average, with the direction of the effect being negative as expected. The main control variables also have the expected signs: An increase in productivity, employment and current assets all provoke a significant increase in firm exports. The effect of shareholder funds and capital

intensity on firm exports are not significant, but we keep them nevertheless in our regressions as they represent important firm characteristics.

Table 3: Import of intermediates and export performance

Dependent variable: Exports	(1) FE	(2) IV	(3) FE	(4) IV
Lagged Tariff	-0.00940** (0.00439)		-0.00948** (0.00446)	
Imports		0.138** (0.0654)		0.134** (0.0648)
Productivity	0.787*** (0.0548)	0.674*** (0.0751)	0.694*** (0.0562)	0.577*** (0.0782)
Employment	0.830*** (0.0885)	0.693*** (0.107)	0.742*** (0.0950)	0.604*** (0.115)
Capital Intensity	-0.00555 (0.0253)	-0.0220 (0.0273)	-0.00794 (0.0260)	-0.0252 (0.0277)
Current Assets	0.0728** (0.0340)	0.0580* (0.0318)	0.0802** (0.0390)	0.0676* (0.0359)
Shareholder Funds	0.00493 (0.0254)	-0.000286 (0.0257)	-0.0181 (0.0247)	-0.0229 (0.0249)
Export Experience			0.283*** (0.0529)	0.264*** (0.0546)
Observations	11,710	11,710	10,825	10,825
R-squared (Within)	0.074		0.080	
F-stat (first stage)		89.33		69.83
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Column 2 presents the results of our IV specification, which captures the effect of changes in total firm imports on total firm exports. As explained above, we use lagged tariffs calculated as a weighted average of tariffs levied on a firm's imported products as an instrument to deal with the endogeneity of firm imports. Table A.3 in the annex confirms the relevance of this instrument as increases in lagged tariffs are strongly negatively correlated with firm imports. The F-stat of the first stage is nearly 90.<sup>6</sup> The coefficient in our IV regression has the expected positive sign – a 1 percent increase in imports leads to a 0.13 percent increase in exports. The control variables behave similarly as in the first specification.

As a next step we add export experience as an additional control variable to our baseline regression, whereby we define export experience as a dummy equal to one if the firm exported in the previous year. This choice is driven by the assumption that firms with export experience are likely to export more than non-experienced firms, as they may have built stronger networks with distributors in destination countries or are more familiar with trade regulations. The results confirm our findings from the first specification, helping us to establish a positive link between firm imports and exports as well as tariff reductions and exports. Although export experience is correlated with imports, it does not act as a confounder in our baseline specification, as the standard errors are very similar to our first

<sup>6</sup>The coefficient of lagged tariffs is highly significant for all first stage regressions that we apply throughout this paper (including robustness checks) and the F-stat always is greater than 12.

specification for *Lagged\_Tariff* and *Imports*, respectively. For our three main control variables (productivity, employment and current assets), however, the standard errors increase slightly, yet without affecting the previous levels of significance. The coefficient for export experience is highly significant, which justifies our choice to include this variable as a control.

The results from our baseline regression confirm our main hypothesis: A firm’s export performance is significantly dependent on whether it manages to import intermediate inputs from abroad. Moreover, tariff reductions have a significant positive effect on firm exports. Before we discuss the robustness of our results, we will look at the effects on high-tech exporting firms as well as the extensive margin to gain more insights in the relationship between imported intermediate inputs and firm exports.

### 5.3 Imported inputs and high-tech exporters

As established above, Russian firms that import more intermediate inputs are also stronger exporters. We now look at this relationship for firms who mainly operate in high-tech sectors to see whether policies targeted at high-tech exporters can be more effective. For this purpose we identify high-tech sectors based on Eurostat’s high-tech classification of manufacturing industries at the 2-digit level and assign a dummy equal to one for firms in these sectors.<sup>7</sup> We then conduct our analysis in two different ways: In our first approach we use our whole sample of importing-exporting firms and complement our baseline regression with an interaction term of firm imports with high-tech status, using our IV specification.<sup>8</sup> Formally our model takes the following form:

$$\ln Exports_{it} = \beta_1 \ln \widehat{Imports}_{it} + \beta_2 \ln \widehat{Imports}_{it} * High\_Tech_{it} + \beta_3 Controls_{it} + \eta_t + \mu_i + \varepsilon_{it}, \quad (4)$$

where  $\beta_1$  measures the effect of changes in imported intermediates on exports for all importing-exporting firms and the interaction term  $\beta_2$  captures the differential effect for firms operating in high-tech sectors. The vector of controls includes the same variables as before. As a second approach we use a selected sample which includes only high-tech importers-exporters and repeat our baseline regression as specified in equation (2). As in our baseline approach we conduct the analysis with and without controlling for export experience.

Our results show that imports play an important role in explaining export performance of high-tech exporters (table 4). Columns 1 to 4 report the results for our first approach, where the interaction of imports and high-tech status represents our main variable of interest in our IV specification. The coefficient represents the differential effect for high-tech firms compared to non-high-tech firms and is significant, indicating that a 1 percent increase in imports raises exports by 0.25-0.33 percent additionally. Interestingly, the coefficient for the *Imports* variable is no longer significant, which shows that high-tech firms are the main drivers of our baseline results. This finding is further emphasized when looking at the IV results for our selected sample of high-tech importing-exporting firms, which are presented in columns 5 and 7. The coefficients are significant and between 2.5 and three times larger than in our baseline regressions, irrespective of whether we control for export experience or not (see columns 2 and 4 in table 3 for comparison).

Our results from the reduced form specification show that a one percentage point increase in tariffs on goods imported by high-tech firms leads to an additional decrease of exports between 1.5 percent (column 2) and almost 2 percent (column 6), compared to non-high-tech firms. However, these results lack robustness, as the coefficient for the interaction between lagged tariff and high-tech status

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<sup>7</sup>For Eurostat’s definition of high-tech sectors see [www.ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:High-tech\\_classification\\_of\\_manufacturing\\_industries](http://www.ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:High-tech_classification_of_manufacturing_industries)

<sup>8</sup>We instrument imports of high-tech firms with the interaction of the firm-specific tariff with its high-tech status.

is not significant when controlling for export experience (see column 4). In other words, conditional on experience we find no evidence that tariffs play a larger role in explaining exports of high-tech firms compared to other firms. Yet, since our results are significant and strong in terms of magnitude for the IV stage, we conclude that it is access to intermediate goods what matters for high-tech firm, and more so than for other firms. A possible explanation for this finding is the deeper integration of high-tech firms in GVCs.

Table 4: Import of intermediates and export performance in high-tech sectors

Dependent variable - Exports	(1) IV	(2) FE	(3) IV	(4) FE	(5) IV	(6) FE	(7) IV	(8) FE
Lagged Tariff		-0.00343 (0.00569)		-0.00429 (0.00579)		-0.0197*** (0.00692)		-0.0175** (0.00708)
Imports	0.0452 (0.0695)		0.0552 (0.0705)		0.424** (0.174)		0.335** (0.151)	
Lagged Tariff x H-tech		-0.0153* (0.00897)		-0.0129 (0.00918)				
Imports x H-tech	0.326** (0.165)		0.250* (0.150)					
Productivity	0.586*** (0.0973)	0.784*** (0.0549)	0.512*** (0.0953)	0.692*** (0.0563)	0.333* (0.192)	0.748*** (0.0819)	0.349** (0.175)	0.686*** (0.0794)
Employment	0.614*** (0.125)	0.829*** (0.0884)	0.543*** (0.127)	0.741*** (0.0950)	0.427* (0.227)	0.892*** (0.107)	0.453** (0.206)	0.830*** (0.110)
Capital Intesity	-0.0254 (0.0286)	-0.00511 (0.0253)	-0.0285 (0.0282)	-0.00738 (0.0260)	-0.0703 (0.0494)	-0.0291 (0.0406)	-0.106** (0.0482)	-0.0627 (0.0431)
Current Assets	0.0561* (0.0323)	0.0732** (0.0341)	0.0639* (0.0358)	0.0803** (0.0390)	0.0250 (0.0585)	0.0740 (0.0508)	0.0763 (0.0572)	0.115** (0.0521)
Shareholder Funds	0.00133 (0.0259)	0.00601 (0.0253)	-0.0212 (0.0252)	-0.0171 (0.0247)	0.0269 (0.0381)	0.0186 (0.0352)	-0.00952 (0.0367)	-0.0139 (0.0342)
Export Experience			0.275*** (0.0555)	0.284*** (0.0529)			0.225*** (0.0868)	0.247*** (0.0829)
Observations	11,710	11,710	10,825	10,825	5,460	5,460	5,056	5,056
R-squared		0.074		0.079		0.077		0.088
F-stat (first stage, imports)	82.94		65.03		57.02		42.64	
F-stat (first stage, imports x h-tech)	40.54		32.18					
Sample	All	All	All	All	H-tech	H-tech	H-tech	H-tech
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

All in all, a 1 percent increase in imports leads to an additional increase of exports between 0.25-0.42 percent for high-tech firms, depending on the exact model specification. These results provide a strong policy rationale to lower trade barriers for intermediate inputs imported by high-tech firms, which would not only be highly effective in increasing overall exports of manufacturing goods, but also help strengthening the role of high-value added production in Russia. We will propose and discuss possible policy approaches in this area in section 7.

## 5.4 Propensity to export

As discussed in section 5.1, the share of importing-exporting firms in Russia is lower than in other countries. Moreover, exporters only make up 6.83 percent of total firms compared to a slightly higher share of importers (9.62 percent). Turning our focus from intensive to extensive margins, we are now interested in whether firms that imported in the past have a higher probability to become exporters.

If this is true, policies that help firms become importers could help raise the share of two-way traders and thereby increase the relevance of exporting firms in the Russian economy.

To analyze the extensive margin, we perform a random effects probit regression, which is specified as follows:

$$Pr(Exporting\_Status)_{it} = \beta_1 Importing\_Status_{it-1} + \beta_2 Controls_{it} + \tau_t + \varepsilon_{it} \quad (5)$$

where *Exporting\_Status* and *Importing\_Status* are dummies equal to one if a firm is an exporter or importer. The results show that previous importing experience is indeed associated with a higher probability of becoming an exporter.<sup>9</sup> Table 5 reports the marginal effects: Switching from non-importing to importing status in the previous year raises the probability of becoming an exporter by 3.2 percent, holding all control variables at mean. The results of the probit estimation are presented in table A.6 in the Appendix A.

Table 5: Marginal Effects (Probit)

	Effect	Std. Err.	z	P> z	[95% CI]
Importer (t-1)	0.032	0.001	28.9	0.000	0.029 0.034

There are many possible explanations of this strong effect, one of them being foreign quality or technology embedded in imported goods and transferred to products produced by Russian firms in the form of inputs. As emphasized before, technology transfer through trade relationships can be an important determinant of firm productivity and therefore be decisive in making firms competitive enough to start activity in international markets, by raising the extensive margin. However, it should be noted that we cannot identify a causal relationship based on this simple regression, as our specification may be subject to omitted variable bias or reverse causality.

## 6 Robustness checks

In the baseline specification we assume that all firm-level imports are intermediate goods. If this assumption is not valid, one would expect that our results might be driven by re-exports. We therefore check our results by narrowing the definition of imported intermediate goods. To approximate the value of imported intermediate goods, we rely on a strategy commonly used in the literature (Feenstra & Hanson (1996), Bass and Strauss-Kahn (2013), Biscourp & Kramarz (2007)). In particular, we consider imports that fall under the same HS4 category as a firm’s exports to be final goods, whereas imports from any other HS4 category are defined as intermediate inputs.

Another problem arising from our empirical analysis is that we focus on a selected sample of firms that import and export in a given year. This approach might cause a two-level sample-selection bias. The first level of selection emerges from the standard differentiation between trading and domestic firms. The second level of selection arises from the fact that some exporting-importing firms do not export every year in the sample. In our baseline analysis we only work with the selected exporting-importing firms, which means that we do not observe them in years where they did not import and export. As a robustness check we will increase the sample and focus on firms that exported at least three times during the sample period. This approach, however, causes zero-inflated data, because many of these firms did not export during the whole period (Figure A.1).<sup>10</sup> To deal with this problem

<sup>9</sup>Note that we use the same control variables as before.

<sup>10</sup>We exclude firms that we observe less than 2 years in order to apply FE procedure

we employ the Heckman selection procedure on the reduced form specification and a panel data sample selection method developed by Wooldridge (1995), which can also be applied to the IV estimation. These procedures are explained in detail in Appendix B.

As shown in table 6, the results for our narrow definition of imports are in line with the baseline specification. A one percentage point reduction in import tariffs levied on intermediate inputs leads to a 0.9 percent increase in firm exports (Column 1). The elasticity of exports to imports reaches 0.11 which is similar in terms of magnitude to the baseline. These results support the notion that a re-export bias is not present in our analysis and does not affect our initial findings significantly.

Table 6: The results for narrow definition of intermediate inputs

Dependent variable: Export	(1) FE	(2) IV	(3) FE	(4) IV
Lagged Tariff	-0.00944** (0.00455)		-0.00905* (0.00465)	
Imports		0.117** (0.0576)		0.109* (0.0572)
Productivity	0.806*** (0.0563)	0.723*** (0.0680)	0.703*** (0.0575)	0.620*** (0.0709)
Employment	0.865*** (0.0913)	0.765*** (0.102)	0.770*** (0.0980)	0.670*** (0.111)
Capital intensity	0.00259 (0.0260)	-0.0129 (0.0282)	-0.00600 (0.0267)	-0.0227 (0.0287)
Current Assets	0.0721** (0.0348)	0.0563* (0.0329)	0.0818** (0.0401)	0.0695* (0.0375)
Shareholder Funds	0.00180 (0.0258)	-0.00155 (0.0262)	-0.0212 (0.0252)	-0.0231 (0.0254)
Export Experience			0.307*** (0.0558)	0.298*** (0.0570)
Observations	11,264	11,264	10,423	10,423
R-squared (within)	0.074		0.08	
F-stat (first stage)		63.56		49.50
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Moving on to the sample selection procedures we show that our results are also robust to different estimation techniques. Taking into account the zero-inflated nature of our data we apply standard sample selection models and show that our results remain stable. Column 2 in table 7 presents the results for estimating the probability of a firm exporting in a particular year.<sup>11</sup> Column 1 shows the effects of tariffs on exports controlling for the probability of exporting, i.e. the selection process. Column 3 and 4 report the results for the second stage of the Wooldridge procedure for both, the reduced form and the IV estimation. The results produced by both procedures do not change in terms of significance and magnitude vis-à-vis the baseline specification.

<sup>11</sup>The results of the selection equation supports that more productive, larger and richer firms tend to export in a particular year.

Table 7: Sample selection

VARIABLES	(1) 2nd stage	(2) Selection	(3) WLDRG	(4) WLDRG IV
Lagged Tariff	-0.011** (0.00449)		-0.00882** (0.00385)	
Imports				0.127** (0.0562)
Prouctivity	0.768*** (0.0231)	0.049** (0.0239)	0.773*** (0.0449)	0.656*** (0.0671)
Employment	0.980*** (0.0162)	0.149*** (0.0254)	0.718*** (0.0721)	0.569*** (0.0955)
Capital intensity	0.0578*** (0.0139)	0.00822 (0.0107)	-0.0180 (0.021)	-0.0360 (0.0231)
Export experience	-0.186** (0.0772)			
IMR			-2.077*** (0.344)	-2.209*** (0.358)
Current assets		-0.0311 (0.0220)		
Shareholder funds		0.0191 (0.0131)		
Constant	-0.917*** (0.270)	-0.0760 (0.188)	0.164*** (0.028)	0.176*** (0.0290)
Observations	12,826	12,826	11,882	11,882
R-squared			0.07	
F-stat (first stage)				154.86
Year FE	YES	YES	YES	YES

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 7 Policy discussion

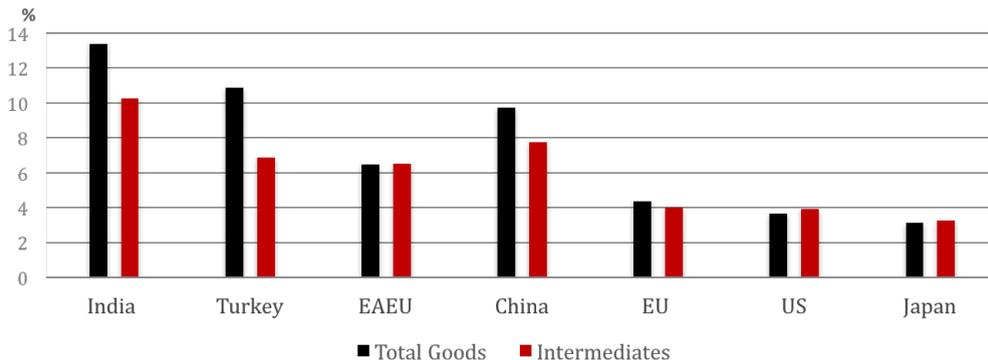
Tariff reductions can have a significant impact on firm exports, as shown by our reduced form results. More generally, our IV estimations suggest that ensuring better access to imports can serve as an effective policy instrument for the promotion of Russian exports. At the same time, a high level of import protection, especially with respect to goods that serve as intermediates for Russian firms, may prevent them from exporting and integrating more deeply into regional and global value chains. These findings allow us to draw a range of policy implications regarding tariff and non-tariff regulation, trade facilitation, and regional and plurilateral trade integration which we discuss in the following sections.

### 7.1 Tariff regulation

Throughout the past decades, Russia has gone through important stages of trade liberalization. Import tariffs, including those applied to intermediate goods, have been strongly reduced following the creation of the customs union with Belarus and Kazakhstan in 2010 and its successive transformation into the EAEU, as well as the country's accession to the WTO in 2012. As shown in figure 2, the average MFN tariff rates currently applied by the EAEU, both with respect to total imports

and imported intermediates, are lower than those of other emerging economies, such as China, India and Turkey. However, compared to developed countries, the level of tariff protection for such goods remains relatively high, leaving room for further liberalization.

Figure 2: MFN tariff rates applied by the EAEU compared to other countries (2016)



Note: Intermediate goods are classified by WITS

Source: WITS Database

The recent literature on GVC emphasizes the increased role of tariffs in a world characterized by international fragmentation of production. As first noted by Yi (2003), the occurrence of international vertical specialization led to a significant increase of the trade elasticity with respect to import tariffs. Indeed, with goods crossing borders multiple times throughout the supply chain, even low import tariff rates may in the end sum up to a substantial level. This effect is further amplified by the fact that each time goods cross borders, import tariffs are levied on the gross value rather than a value added of a good, leading to a sizable increase of the costs for firms that rely on imported intermediates. This amplifying effect is well illustrated in a paper by Koopman et al. (2014), in which estimates the magnification of trade costs on exports of final goods arising from vertical specialization for a range of countries, including Russia. According to the authors' calculations, if tariffs were the only factor augmenting the trading costs and given the existing level of import protection, one additional stage of production would increase trade costs of Russia's merchandise production by 30 percent of its standard tariff.

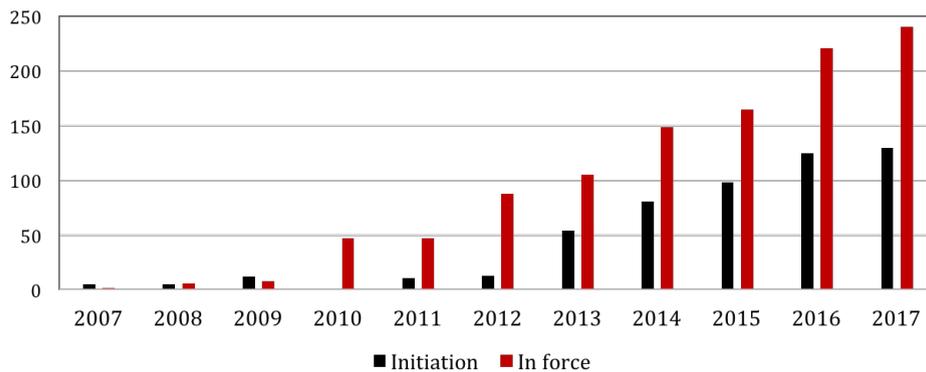
Using our firm-level trade dataset, we calculate that more than 40 percent of the intermediate goods imported by Russian manufacturing exporting firms and more than 30 percent of inputs imported by exporters in high-tech sectors entered the EAEU at a tariff rate exceeding 5 percent in 2015. The still relatively high tariff rates for a number of products can mean a heavy burden for exporters as our regression results suggest. We therefore recommend to consider further reductions in import tariffs for intermediates as part of the export promotion agenda of Russian authorities.

It should be pointed out in this context that after the creation of the customs union, the competence over import tariff regulation was transferred to the supra-national level. At the same time, export promotion remains an exclusive competence of the EAEU member-states themselves. Given that tariff policy can be an important aspect of export promotion, it is important to strengthen the coordination between the Eurasian Economic Commission and the governments of member-states to ensure alignment of national and supra-national policy objectives within an integrated economic area.

## 7.2 Non-tariff regulation

Tariffs are not the only source of increased firms expenditures on imported inputs. In fact the use of non-tariff measures (NTMs) has been on the rise all over the world alongside with tariff liberalization, and Russia is no exception to this trend. Indeed, as can be seen from Figure 3, the number of NTMs applied by Russia has sharply increased over the past decade. Although the prior aim of NTMs is to ensure high quality standards of imported goods rather than serving as an instrument of protectionist policies, they may still significantly restrict trade flows due to their high heterogeneity and complexity. According to UNCTAD (2012), non-tariff measures may even play a larger role than tariffs in restricting access to foreign markets. The Organization estimates that NTMs add on average between 3 and 6 percentage points to the average tariff applied by countries in the manufacturing sector.

Figure 3: Number of Non-Tariff Measures Applied by Russia



Note: "Initiation" refers to the number of NTMs initiated within a year, while "in force" – the number of all applied NTMs accrued as of December, 31.

Source: WTO I-TIP Database

In the context of global value chains, technical regulation plays an important role. Nowadays, in many countries NTMs arising from technical regulation have become more common than traditional NTMs, such as quantitative restrictions and automatic licensing according to the World Trade Organization (2013). In Russia, technical regulation measures accounted for more than half of all NTMs that were in force in 2017. Though there are quite a number of papers investigating the negative effects of technical barriers to trade (TBT) applied by foreign countries on the exports to those countries, the implication of TBTs on the exports by firms in the countries that maintain such measures remain understudied. However, a recent paper by Singh (2017) reveals that the incidence of restrictive TBT measures with respect to intermediates is associated with a statistically significant decrease in productivity of importing firms in India, no matter whether they sell their goods domestically or export them to foreign markets.

Although data on trade costs associated with NTMs applied by Russia with respect to the rest of the world is not available, there are estimates of such costs with respect to the members of the Eurasian Economic Union (Vinokurov (2017)). Depending on the sector, the ad valorem equivalent of Russian NTMs faced by firms from Belarus and Kazakhstan vary between 5 and 20 percent, with the highest barriers in chemical production, manufacturing of leather, leather products and footwear (up to 20 percent), as well as in the manufacturing of rubber and plastic products (up to 16 percent). Taking into account that Russia together with other member-countries of the EAEU has already taken steps

to decrease NTMs in intra-regional trade, it is possible that NTMs applied to non-member countries are even higher than these estimates.

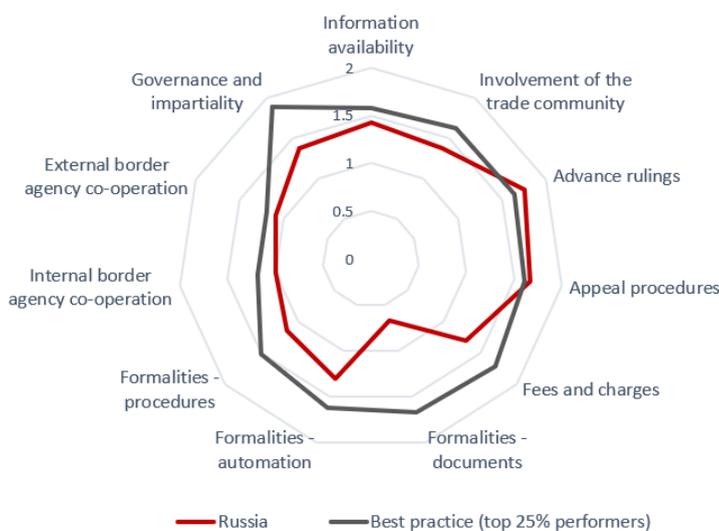
Decreasing NTMs applied to imported inputs can be a crucial factor in raising the productivity of those exporting firms that rely on such intermediates, as well as for promoting their exports and GVC integration. This can be achieved, for instance, through the use of best international practice in technical regulation, further harmonization of existing technical standards with international standards and through participation in mutual recognition arrangements with foreign countries.<sup>12</sup>

### 7.3 Trade facilitation

Excessive bureaucracy, official rules and formalities may constitute high barriers to trade activities. According to a 2015 study by the World Trade Organization, trade costs can be equivalent to 134 percent ad valorem tariff on an imported good in high income countries and 219 percent in developing countries. Therefore, trade facilitation aimed at simplification, modernization and harmonization of import procedures, among other objectives, can contribute to better access of firms to imported intermediates.

In February 2017, the WTO Trade Facilitation Agreement (TFA) came into force after it was ratified by almost two-thirds of WTO members, including Russia. The agreement aims to promote the simplification and unification of customs procedures, increase their transparency, and accelerate the process of goods crossing the borders. The WTO expects that the implementation of the TFA should reduce total trade costs by more than 13 percent for countries with a higher than average level of income, which includes Russia.

Figure 4: Trade facilitation performance of Russia



Note: 2=best performance that can be achieved

Source: OECD Trade Facilitation Indicators

<sup>12</sup>Mutual recognition arrangements acknowledge a partner country's regulations as affording equivalent levels of protection to those achieved by domestic regulation

According to the OECD Trade Facilitation Indicators that which were designed to monitor the progress of implementing the provisions of the WTO agreement in the member countries, Russia could improve its performance with respect to the level of restrictiveness of its border procedures and associated trade costs. Reforms with the greatest benefits are in the areas of formalities, governance and impartiality and information availability (figure 4). Albeit a significant part of the TFA provisions are not binding, it is expected that the maximum possible effects in terms of decreasing barriers to trade can be achieved through their full incorporation into national and supra-national legislation.

## 7.4 Trade integration

There are several other policy areas in which our findings may be of practical use. First of all, despite the important steps taken by Russia in the direction of trade liberalization over the past several decades, the degree of Russia's involvement in the global trade integration processes remains rather limited. Until recently Russia did not actively participate in regional trade agreements, which have become a prominent feature of the international trade system. At the moment, Russia has free trade arrangements in force with twelve countries which are predominantly former Soviet Union states<sup>13</sup>. Currently, only about 10 percent of the value of goods is imported by Russia under a preferential trade regime.

In 2016, the Eurasian Economic Commission decided to start negotiating free trade agreements with Egypt, India, Iran, Israel, Serbia and Singapore.<sup>14</sup> In the context of improving access of Russian firms to imported intermediates, this decision can be considered as a step into the right direction. While negotiating these particular or any other trade agreement it should be kept in mind, however, to focus not only on securing favorable conditions in terms of access of Russian exporters to foreign markets, but also to take into account additional gains that may be obtained by Russian firms through better access to imported intermediates. As free trade arrangements usually imply the elimination of tariffs on most tariff lines, particular attention should be devoted to the negotiation of so-called "new generation" trade agreements that go far beyond tariff liberalization. This can be done by including into such agreements those provisions that aim to decrease NTMs for imports of intermediate goods, in particular through harmonization of technical regulation with international standards and mutual recognition procedures, as well as advanced trade facilitation clauses.

## 7.5 Economic sanctions

In the context of current economic and political tensions between Russia and western countries, raising import restrictions are again on the agenda of Russian policy makers. A new act signed by President Putin on 4 June 2018<sup>15</sup> allows the Russian government to introduce a ban or restriction on the imports of goods and raw materials originating from "unfriendly foreign states". The act does not specify the goods subject to a potential ban, reserving the right to determine this list to public officials. In fact, the only categories that are exempted from the provisions of the act are vital goods that are not produced in Russia, as well as goods brought into the country for personal use. In light of the findings of this paper, Russia should consider carefully any increase in import restrictions on intermediates imported by the manufacturing sector, as this could harm domestic exporters significantly.

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<sup>13</sup>For comparison, the European Union has trade agreements in place with 35 countries, China with 24, the United States with 20.

<sup>14</sup>The Eurasian Economic Commission has an exclusive competence over negotiating free trade agreements with respect to provisions covering trade in goods.

<sup>15</sup>Federal Law "On the measures of influence (counteraction) on unfriendly actions of the United States of America and other foreign states".

## 8 Conclusion

Using a comprehensive firm-level dataset which combines information on Russian company characteristics, involvement in trade and input tariff rates, we reveal a strong positive impact of intermediate imports on firm exports in the manufacturing sector. These results imply that improved access to intermediate goods at the international market can serve as a means to raise Russia's export performance outside the natural resource sector. Import promotion policies targeted at intermediate goods imported by firms in high-tech sectors can be especially effective and raise exports by up to three times more than in other sectors. Better access to imports can also help increase the currently low share of exporting firms within the Russian enterprise landscape.

Our estimation results indicate that a one percentage point decrease in input tariffs would raise firm exports by approximately one percent. Even though tariffs have been significantly decreased over the past decade in the context of regional integration and Russia's WTO accession, there is still ample room to lower input tariffs in order to promote exports. More than 40 percent of intermediate goods imported by Russian exporting manufacturing firms and more than 30 percent of goods imported by exporting firms in high-tech manufacturing sectors still entered the customs union at a tariff rate above 5 percent in 2015. Besides tariff reductions, Russia could consider lowering NTMs and enhancing trade facilitation, which can also contribute to better access to intermediate goods of exporting firms, as suggested by our IV results. It should be pointed out, however, that trade policies aimed at promoting imports of intermediate goods alone will not be sufficient to boost non-oil export growth and export competitiveness of Russian firms. To bring the desired success, they need to be combined with a range of other important policies, including improving access of Russian exporters to foreign markets and simplifying the existing export regulation, as well as comprehensive structural reforms and measures to improve the business environment.

All in all we believe our estimation results are somewhat conservative, given that we do not estimate the indirect effect of imported goods on export performance when purchased domestically from third parties. Another shortcoming of our approach is that we cannot exclude the possibility that part of the variation in firms' exports resulting from changes in tariffs may arise from potential retaliation against tariff changes in trade-partners, which would be legitimate under the WTO rules in certain circumstances. An adequate way to tackle this issue would be to control for tariff rates that Russian firms face in foreign markets. Moreover, given the increasing importance of NTMs in global trade, our analysis could be further enriched by investigating the impact of product-specific non-tariff measures applied to imported intermediates on firm exports. We recommend for future research to explore these propositions.

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# Appendices

## A Tables and Figures

Table A.1: Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Exports (USD mln)	552,237	1.29	57.94	0	17,950
Imports (USD mln)	552,237	0.69	20.67	0	5,515
Simple average tariffs (%)	52,142	5.99	4.78	0	53
Weighted average tariffs (%)	52,142	5.18	5.34	0	53
Turnover (USD mln)	552,237	7.78	127.68	0	30,457
Number of employees	504,884	87.05	414.25	1	33,780
Productivity (mln)	504,884	0.07	1.31	0	808
Capital intensity (USD mln)	504,884	0.05	7.52	0	5,088
Current assets (USD mln)	552,237	4.25	131.45	0	83,699
Shareholder funds (USD mln)	552,237	2.97	93.58	-659	21,821

Note: the minimum turnover is 5 and minimum productivity is 0.044

Table A.2: Exogeneity of tariffs

Dependent variable: change in tariffs	(1)	(2)	(3)	(4)
Productivity	0.0860 (0.136)	0.0956 (0.142)		
Employment	0.142 (0.141)	0.169 (0.144)	0.0549 (0.0785)	0.0721 (0.0802)
Curr. assets	-0.0109 (0.129)	-0.0750 (0.137)	-0.00991 (0.129)	-0.0742 (0.137)
Share. funds	-0.0792 (0.0704)	-0.0669 (0.0730)	-0.0792 (0.0704)	-0.0669 (0.0730)
Turnover			0.0848 (0.136)	0.0947 (0.143)
Constant	-0.387 (0.996)	0.198 (1.174)	-0.380 (0.996)	0.205 (1.172)
Observations	2,065	2,065	2,065	2,065
R-squared	0.001	0.009	0.001	0.009
Sector FE	NO	YES	NO	YES

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table A.3: IV regressions - 1st stage

Dependent variable: Import	(1) Baseline	(2) Baseline	(3) High Tech	(4) High Tech
Lagged tariff	-0.0683*** (0.00638)	-0.0705*** (0.00682)	-0.0465*** (0.0102)	-0.0523*** (0.0109)
Productivity	0.823*** (0.0598)	0.872*** (0.0640)	0.980*** (0.0816)	1.007*** (0.0883)
Employment	0.991*** (0.0837)	1.030*** (0.0920)	1.095*** (0.114)	1.127*** (0.121)
Capital intensity	0.120*** (0.0274)	0.128*** (0.0300)	0.0973** (0.0394)	0.128*** (0.0434)
Current assets	0.108* (0.0584)	0.0935 (0.0603)	0.116 (0.0894)	0.117 (0.0914)
Shareholder funds	0.0379 (0.0280)	0.0358 (0.0288)	-0.0194 (0.0363)	-0.0132 (0.0386)
Export experience		0.144** (0.0562)		0.0647 (0.0815)
Observations	11,710	10,825	5,460	5,056
R-squared	0.13	0.13	0.16	0.15
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table A.4: Imports of intermediates and export performance (including tariff outliers)

Dependent variable: Exports	(1) FE	(2) IV	(3) FE	(4) IV
Lagged tariff	-0.00857** (0.00433)		-0.00901** (0.00438)	
Imports		0.128* (0.0655)		0.131** (0.0653)
Productivity	0.788*** (0.0548)	0.683*** (0.0751)	0.693*** (0.0562)	0.579*** (0.0784)
Employment	0.832*** (0.0884)	0.706*** (0.107)	0.740*** (0.0949)	0.605*** (0.115)
Capital intensity	-0.00507 (0.0253)	-0.0205 (0.0272)	-0.00607 (0.0260)	-0.0231 (0.0277)
Current assets	0.0743** (0.0342)	0.0605* (0.0321)	0.0812** (0.0392)	0.0690* (0.0361)
Shareholder funds	0.00170 (0.0255)	-0.00311 (0.0258)	-0.0153 (0.0246)	-0.0201 (0.0248)
Export experience			0.279*** (0.0527)	0.261*** (0.0544)
Observations	11,746	11,746	10,859	10,859
R-squared	0.0742		0.0802	
F-stat (first stage)		89.39		69.73
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Notes: The p-value for Imports in column (2) is 0.051

Table A.5: Imports of intermediates and export performance in high-tech sectors (including tariff outliers)

Dependent variable: Exports	(1) IV	(2) FE	(3) IV	(4) FE	(5) IV	(6) FE	(7) IV	(8) FE
Laged Tariff		-0.00263 (0.00559)		-0.00416 (0.00563)		-0.0191*** (0.00689)		-0.0167** (0.00706)
Imports	0.0347 (0.0700)		0.0544 (0.0712)		0.419** (0.175)		0.326** (0.152)	
Lagged Tariff x H-tech		-0.0155* (0.00888)		-0.0122 (0.00906)				
Imports x H-tech	0.329** (0.167)		0.242 (0.151)					
Productivity	0.594*** (0.0972)	0.785*** (0.0549)	0.516*** (0.0954)	0.691*** (0.0563)	0.337* (0.193)	0.747*** (0.0820)	0.357** (0.176)	0.685*** (0.0795)
Employment	0.626*** (0.125)	0.831*** (0.0883)	0.546*** (0.127)	0.738*** (0.0948)	0.431* (0.229)	0.888*** (0.107)	0.460** (0.207)	0.825*** (0.110)
Capital Intensity	-0.0238 (0.0285)	-0.00465 (0.0253)	-0.0262 (0.0281)	-0.00559 (0.0260)	-0.0698 (0.0494)	-0.0290 (0.0406)	-0.105** (0.0482)	-0.0627 (0.0431)
Current Assets	0.0585* (0.0325)	0.0748** (0.0343)	0.0654* (0.0360)	0.0814** (0.0392)	0.0257 (0.0584)	0.0746 (0.0509)	0.0778 (0.0570)	0.116** (0.0522)
Shareholder funds	-0.00129 (0.0260)	0.00269 (0.0255)	-0.0183 (0.0251)	-0.0145 (0.0246)	0.0269 (0.0381)	0.0189 (0.0352)	-0.00948 (0.0366)	-0.0136 (0.0343)
Export Experience			0.271*** (0.0552)	0.280*** (0.0527)			0.223*** (0.0864)	0.243*** (0.0828)
Observations	11,746	11,746	10,859	10,859	5,461	5,461	5,057	5,057
R-squared		0.073		0.08		0.077		0.088
F-stat (first stage, imports)	83.06		64.98		54.98		42.56	
F-stat (first stage, imports x h-tech)	40.51		32.12					
Sample	All	All	All	All	H-tech	H-tech	H-tech	H-tech
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

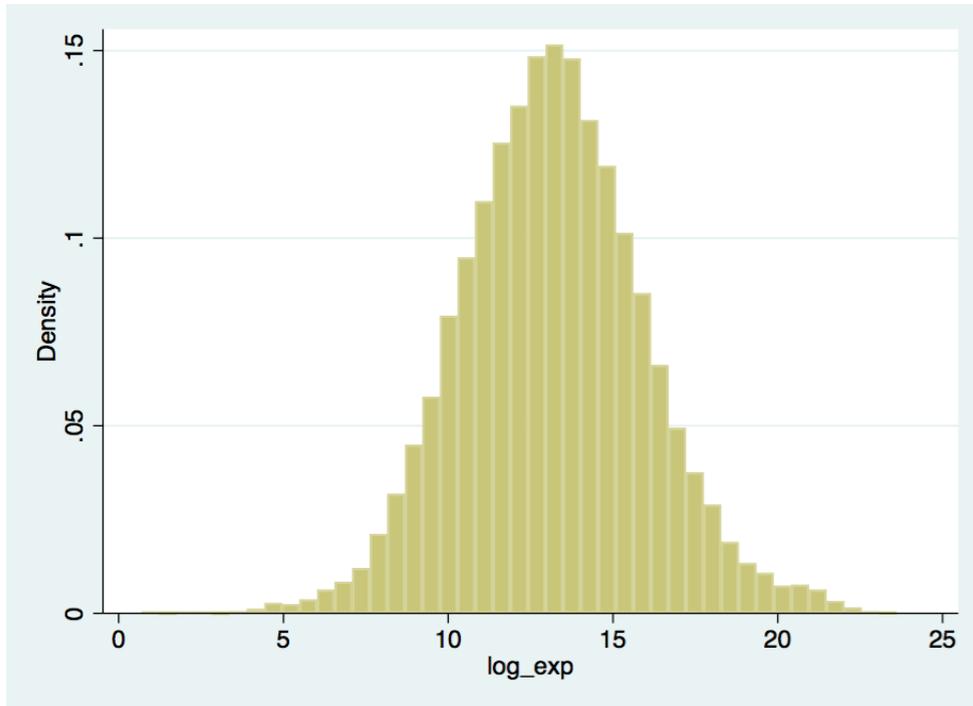
Table A.6: Propensity to Export

Dependent variable: Export Status	(1) Probit
Importer(t-1)	0.975*** (0.0283)
Productivity	0.247*** (0.0141)
Employment	0.575*** (0.0194)
Current Assets	0.217*** (0.0143)
Capital Intensity	0.0720*** (0.00583)
Shareholder Funds	0.0894*** (0.00947)
Constant	-12.68*** (0.180)
Observations	276,377
Year FE	YES

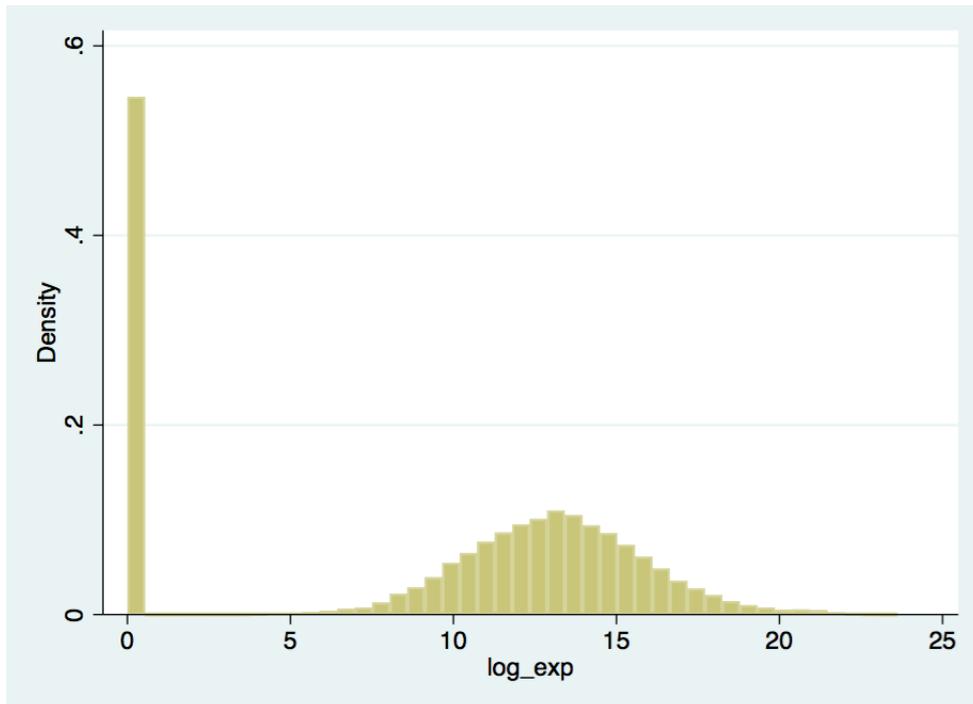
Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Figure A.1: Distribution of exports



(a) Firms that exported in a particular year



(b) Firms that exported at least three times during the sample period

## B Sample selection models

The Heckman selection procedure is a 2-step regression analysis. The first step consists of a probit regression run on the non-selected sample to analyze which firm characteristics affect the decision to export in particular year (extensive margin). The second stage, is an OLS regression performed conditional on whether a firm actually exported in a particular year controlling for the selection process (intensive margin). The procedure is implemented as follows:

1. Estimate a probit model for whether the dependent variable is observed or not (selection equation). In our case  $Exp_i$  represents a dummy variable equal to 1 if a firm exported in a given year and 0 otherwise.  $X_{1i}$  contains selected firm characteristics that may determine a firm's decision to export.

$$pr(Exp = 1|X) = \phi(X_{1i}^T\beta)$$

2. Use these estimates to calculate the inverse Mills ratio for every observation in the sample, i.e. compute:

$$\lambda(i) = \frac{\phi(X_{1i}^T\beta_1)}{\Phi(X_{1i}^T\beta_1)}$$

3. Run the regression:

$$Y_{2i} = X_{2i}^T\beta_2 + \sigma_{12}\lambda(X_{1i}^T\beta_1) + \vartheta_i$$

Where in our case  $Y_{2i}$  represents logarithm of firm exports and  $X_{2i}$  firm characteristics. In practice the estimation of sample selection models require that at least one regressor in the selection equation is excluded from the outcome equation (an exclusion restriction).

Since the Heckman procedure is more suitable for a cross-section of observations we also apply a panel data sample selection method proposed by Wooldridge (1995). The procedure is very similar to the one proposed by Heckman and can be summarized by the following steps:

1. Run probit selection regression for every year separately.
2. For every year calculate the Inverse Mills Ratio for every firm.
3. Demean all observations including the Inverse Mills ratio during the years when the firms actually exported.
4. Run Pooled OLS regression with the demeaned variables only for the years when the firms exported.