Policy Research Working Paper 9801

Non-Tariff Measures, Import Competition, and Exports

Massimiliano Cali
Angella Faith Montfaucon

WORLD BANK GROUP
Macroeconomics, Trade and Investment Global Practice
October 2021

Abstract

The empirical evidence on the impact of import competition on economic performance relies mainly on import tariff liberalization as the source of changes to competition. This paper extends this evidence by focusing on non-tariff measures, an increasingly important trade policy tool globally. The analysis examines the competition effect of four specific non-tariff measures on the exporting activity of the universe of Indonesian firms. The focus is on measures that do not clearly address any negative externalities of imports—the supposed objective of non-tariff measures—and hence appear to be protectionist in nature. The results suggest that by restricting import competition, these measures reduce the survival of firms in export markets as well as the intensive and extensive margins of their exports. Non-tariff measures have a more negative effect than import tariffs in most cases and these results are robust to various checks. The analysis provides suggestive evidence that markups are an important channel through which these effects are mediated.

This paper is a product of the Macroeconomics, Trade and Investment Global Practice. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at http://www.worldbank.org/prwp. The authors may be contacted at amontfaucon@worldbank.org and mcali@worldbank.org.

Non-Tariff Measures, Import Competition, and Exports*

Massimiliano Cali[†] and Angella Faith Montfaucon[‡]

World Bank

JEL Classification : F10; F13; F14; L25

Keywords: Non-tariff measures, import competition, export performance, firms, Indonesia

*The findings in this paper are entirely those of the authors and do not necessarily represent the views of the World Bank and its affiliated organizations. The authors are grateful to the Indonesia's Directorate General of Customs for the cooperation - particularly Rudy Rahmaddi - including also through the provision of customs data; participants of EAP Chief Economist KL Seminar, Aufa Doarest, Doan Thi Thanh Ha and Samuel Kaspar Rosenow for helpful comments; Ana Fernandes for technical guidance on the survival analysis; Nabil Rizky Ryandiansyah for excellent research assistance and together with Agnesia Adhissa Hasmand and Bayu Agnimaruto, for their help in assembling NTM dataset. All errors are our responsibility.

[†] mcali@worldbank.org

[‡] amontfaucon@worldbank.org, corresponding author

1 Introduction

One of the key ideas in economics is that increased competition is associated with enhanced performance of firms. More intense competition may induce firms to invest in productivity-enhancing activities in order to stay in the market (Bustos (2011), Bloom et al. (2016), Bloom et al. (2019)). Competition may also drive less productive firms out of the market, thus raising the average productivity in the industry (Bernard et al., 2006).

A large share of these empirical results comes from studies using reductions in import tariffs as the source of increased competition. The global wave of trade liberalization in the 1980s and 1990s induced increased competition from imports for domestic incumbents (Amiti and Konings (2007), Topalova and Khandelwal (2011)). Given the existing web of multilateral and pluri-lateral trade agreements, governments have now considerably less room to affect competition at home by changing import tariffs. At the same time, non-tariff measures (NTMs) have become a more prominent trade policy tool. Governments typically use these measures to achieve desirable non-trade objectives, such as protection of consumers' health and safety. However some NTMs appear to be protectionist in nature, and hence their impact is potentially more akin to import tariffs (Cali, Le Moglie, et al., 2021). To the extent that this is the case their introduction should reduce import competition.

In spite of their increased policy relevance, little evidence exists on the import competition impact of NTMs. This paper starts to fill this gap by providing novel evidence on the competition effects of four specific import NTMs on Indonesian exporters. The focus on NTMs allows us to examine the impact of changes in trade policy towards a more protectionist rather than more liberal stance, as typical of the literature focusing on the tariff liberalization episodes. To the extent that there may be asymmetric effects of changes in import competition, this is an important complement to existing studies on trade liberalization.

Indonesia provides a suitable context for this analysis for a number of reasons. The Indonesian government has been increasing the use of import NTMs over the past decades through relatively frequent changes in their application across HS-10 digit products. In addition, exports span a multitude of products, allowing for a large variation in exposure to NTM changes across firms. At the same time, Indonesia has weak performance of manufacturing exports relative to comparators in South-east Asia. The deterioration of Indonesia's manufacturing competitiveness has led to a decreasing share of manufacturing as a share of GDP. While this trend is common among countries that migrate from middle-income to high-income status, Indonesia is deindustrializing at an unusually low-income level (Calì et al., 2019). This process of premature deindustrialization (Rodrik, 2012) is undermining employment creation and slowing productivity growth, which are typically faster in manufacturing than in other sectors.

Besides being an important outcome in its own right, exporting activity is also inherently linked to the productivity of the firm.[1] As such it is a useful dimension to capture the impact of import competition on firms.

Porter (1990) advanced the hypothesis that the degree of competition in domestic markets is positively related to performance in international markets. We argue that ex ante the relation is in fact theoretically ambiguous. That is because import competition can work through different mechanisms whose impacts on international competitiveness may go in different directions. Specifically we consider three main mechanisms.

The first is the productivity channel. Lower import competition can reduce exports by stifling productivity-enhancing investments which become less necessary to survive in the domestic markets (Bustos (2011); Bloom et al. (2016)).

The second channel is mark-ups. To the extent that reduced import competition increases domestic markups (relative to markups in export markets), this could induce firms to start supplying the domestic market at the expense of their exporting activities.

The final channel - returns to scale - goes in the opposite direction to the first two. If joint economies of scale/scope between export and domestic sales exist, increased import

[1]In standard trade models with heterogeneous firms for instance, only firms with productivity above a certain threshold are able to export (Melitz, 2003).

competition may negatively affect exporting activities. Clougherty and Zhang (2009) model this channel theoretically and Autor et al. (2020) provide some indirect support for it.[2]

We focus on four measures that are widely applied in Indonesia. We argue that they have a protectionist flavor as they do not address potential externalities from imports, or they try to do so by imposing an unnecessarily large burden on trade. This is a key principle that should not be breached according to WTO rules. These NTMs are pre-shipment inspections (PSI), restrictions on port of entry of imports, mandatory certification with Indonesian product standards (*Standar Nasional Indonesia*, SNI) and import approval requirements. Our contention is that each of them aims to achieve a non-trade objective which is already fulfilled or could be fulfilled through other less burdensome measures. As a result, they unnecessarily restrict domestic competition.

In order to examine the competition impact of NTMs, we match two unique datasets. The first consists of monthly data on the universe of Indonesian exporters which includes information on exports, destination, and Harmonized System (HS) 10-digit products. The second is a novel monthly dataset on the specific NTMs applied by Indonesia on its imports at the same level of product disaggregation. The data allows us to observe in each month and for each exporter which products are covered by individual NTMs. We use these datasets to construct a measure of firm-level competition exposure to specific NTMs (classified at the MAST 3-digit). We do this using a weighted share of products exported by a firm that are subject to import NTMs. To the best of our knowledge, such a measure is novel in the literature. A higher value in this exposure signals lower import competition for that firm, in the products they export.

We investigate the reduced form impacts of NTMs on various margins of exports at the firm-level, including survival in the export market, as well as the extensive and intensive margin of exports. The extensive set of product, firm and time-varying controls help relieve the endogeneity concerns of the NTM policies. In addition working with exporter-level data

[2]This is also the type of argument supporting "infant industry" protection (Chang, 2002).

strengthens the assumption that the treatment (NTM) may be exogenous to the treated unit (exporting firm). To examine the impact on export survival we apply an accelerated failure time (AFT) model that provides a better alternative to the commonly used proportional hazards models in survival analysis. We employ fixed effects panel regressions on firm-level outcomes for the extensive and intensive margin regressions.

Our results show that an increase in firm exposure to each of the four NTMs leads to a decrease in the survival of firms in the export market through a reduction in import competition. On the extensive margin, higher exposure also leads to lower number of firm-level distinct products exported, decreased number of export destinations and a lower number of product-destination combinations. On the intensive margin, a higher exposure to each of the four NTMs also reduces firm-level export values and quantities. In most cases, the negative effect of NTMs exceeds that of import tariffs, consistent with several studies (on imports) such as World Bank and UNCTAD (2018) and those listed in Ederington and Ruta (2016). These findings are robust to a variety of checks.

We provide some suggestive evidence on the mechanisms driving these results. We find some evidence for the mark-up channel. The impact of NTMs is generally less negative for firms with higher mark-ups, as measured by the relative unit values of their exports.

This paper relates to the literature on the impact of import policy on exports. Most empirical work has been on tariffs, and have used data that is substantially more aggregated than the categories to which trade policy is applied. For instance, Hayakawa et al. (2020) find that a tariff reduction by a country tends to increase the country's exports indicating a new mechanism through which reductions in import restrictions lead to export expansions. On the other hand, Fitzgerald and Haller (2018) find that tariffs only have modest effect on aggregate export for a country, meaning that reduction in tariffs will not trigger more firms to export. Unlike these studies, Bramati et al. (2015) look at the impact of import competition on exports using a firm-level approach. Our analysis expands on these studies by combining the highest level of product disaggregation available with particularly relevant trade policy changes, which have not been modelled before.

Our results also speak to the broader literature on trade policy on firm performance, including the pro-competitive effect of trade liberalization (Goldberg and Pavcnik (2016), Amiti and Konings (2007), Bustos (2011), Feliciano and Doytch (2020), Epifani (2003), Fontagné and Orefice (2018)). Within this literature only a few studies focus on NTMs, such as Fontagné and Orefice (2018) and Asprilla et al. (2019), with the latter also recognizing that NTMs are also a competition-policy issue. However, they typically use aggregate measures of NTMs, despite the heterogeneous nature of individual regulations and the policy relevance in communicating specific regulations. Further, within each disaggregated regulation, there are usually hundreds of individual regulations.

Finally, this paper relates to broader challenges in the literature with measuring trade policy and identifying its effects. This is especially crucial as the inability to precisely measure non-tariff barriers that have replaced tariffs as the tools of trade policy is even more relevant (Goldberg & Pavcnik, 2016). One of the main reasons behind this is the difficulty in collecting sufficiently comprehensive and detailed data on NTMs and further linking that to firms that trade in the products affected by the NTMs. Our novel NTM dataset allows us to largely overcome this limitation. In this way, our paper is most closely related to Cali, Le Moglie, et al. (2021). Our paper complements it by focusing on exporting activity and by covering a wider range of protectionist NTMs.

The rest of this paper is organized as follows. Section 2 provides the Indonesia trade policy context. Section 3 details the data. Section 4 describes the methodology; Section 5 presents the results. Finally, Section 6 concludes.

2 NTMs in Indonesia

2.1 Institutional Context

Various government institutions are responsible to determine NTMs for specific products in Indonesia. Although the overall responsibility lies with the Ministry of Trade (MoT), NTM-related regulations have been spread out among a total of 13 government institutions (ministries and agencies) during our period of analysis (2014-2018). As each has its own mandate, this makes monitoring NTMs difficult, especially since there is no dedicated government institution to carry out NTM regulatory review and stocktaking Munadi (2019). As explained below, we rely on comprehensive NTM data over time that allows to overcome these issues.

It is useful to classify NTMs in groups/types as they comprise a large variety of different measures enacted by different parts of government. To that end we follow the international classification developed by the Multi-Agency Support Team (MAST), an inter-organization group chaired by UNCTAD. This classification includes broad groupings, comprising different NTMs according to their typology, e.g. Sanitary and Phyto-Sanitary Standards (SPS), Technical Barriers to Trade (TBT) and pre-shipment inspection and other formalities (INSP). It also includes more refined measures, classified at the 2- and 3-digit level, which typically match specific measures introduced by the individual regulations.[3] This level of classification is therefore the appropriate one for policy advice and that is what we use in the analysis below.

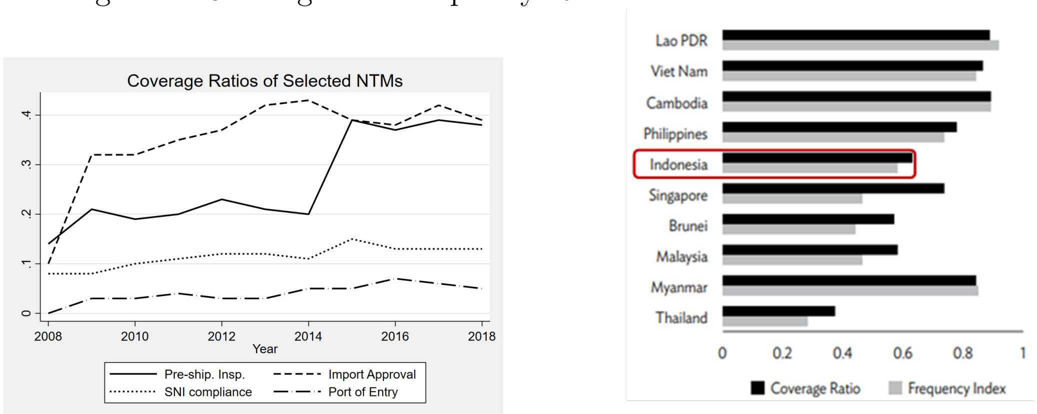
In line with global trends, the incidence of NTMs has been increasing in Indonesia in the past decade. This increase applies to almost all the different categories of NTMs, both in terms of frequency and coverage ratios (Figure 1a).[4] In 2018, Indonesia had a higher NTM

[3] In fact each ministerial or agency regulation can introduce or modify more than 1 NTM (at the 3-digit level).

[4] The frequency index is the percentage of HS-10 codes affected by at least one NTM. The Coverage Ratio is the share of import value subject to NTMs.

coverage than other comparators such as Malaysia and Thailand (Figure 1b).[5] Around two thirds of Indonesian imports were subject to at least 1 NTM against less than 50 percent in Malaysia, Thailand and Vietnam. TBT are the most widely applied while the INSP type has increased more than other NTMs in recent years (Figure 1b).

Figure 1: Coverage and Frequency Ratios of Broad NTMs in Indonesia



a. Evolution of Broad NTMs b. Coverage, Frequency Ratios: 2018

Source: World Bank Staff Calculations and ERIA: Non-Tarif Measures in ASEAN - An Update

2.2 Protectionist NTMs

Our interest is to study the impact of changes in import competition from NTMs on firms' exporting activities in Indonesia. The ideal measures for this purpose are NTMs which fulfill the three conditions underlying the breach of a key principle of WTO rules, i.e. measures should not impose an unnecessary burden on trade: (i) they discriminate against imports; (ii) they are not necessary to achieve a non-trade objective; and (iii) they are likely to impose significant costs on imports. Among those measures we focus on those that are widely applied, i.e. to products exported by at least a quarter of Indonesian exporters in the period of analysis.

On the basis of these conditions, we identify a set of four NTMs, which include: PSI (MAST classification: C1), restrictions on port of entry of imports (C3), mandatory certifi-

[5]As explained below, the cross-country NTM data from WITS is likely more subject to measurement error than our Indonesia data, which has been extensively curated. For comparability purposes we have used the Indonesia data directly from WITS in the Figure.

cation with SNI (B7) and import approval requirements (B14). Our contention is that each of them aims to achieve a non-trade objective which is already fulfilled or could be fulfilled through other less burdensome measures. As a result they unnecessarily restrict domestic competition.

PSI, which is imposed on around 40 percent of Indonesian imports, requires shipments to be inspected at the port of departure before leaving for Indonesia. The objective is to ensure that the import declaration lists the correct classification of the goods to be imported as a way of detecting improper importing activities. This measure appears redundant in a country like Indonesia, where the customs agency applies a risk management system aiming to detect suspicious shipment at the border. Indeed, Indonesian Customs do not take into account the outcome of the PSI in their assessment of the risk of the shipment at the border. While arguably not necessary, this measure also significantly increases compliance costs for imports.

In Indonesia only two State-Owned Enterprises have the authority (granted by the MoT) to perform PSI for the Indonesian government. Anecdotal evidence suggests that such limited supply of inspection agencies increases the uncertainty around the time it takes to comply with such procedure. Thus, PSI can increase the cost of trade not only through the monetary costs of compliance for the importer, but also by increasing the uncertainty of the import process. Cali, Le Moglie, et al. (2021) find that this measure reduces productivity and increases domestic markups in the manufacturing product markets to which it is applied.

Indonesian regulations mandate that certain goods must go through designated ports. For example, horticulture goods must enter through four designated entry points, which are Tanjung Perak Port (Surabaya), Balawan Port (Medan), Makassar Port (Makassar), and Soekarno-Hatta Airport (Jakarta). This requirement is intended to ensure the safety of imported products by directing imports to ports that possess adequate screening facilities. However, ensuring the safety of imported goods does not require such port restrictions. Introducing appropriate facilities (for example quarantine in the case of horticultural products) in Indonesia's seaports and airports is more cost-effective than restricting port of entry. The latter raises trade costs and increases prices in product markets as goods are not able to enter through their natural entry port according to market demand. Cali, Pasha, et al. (2021) show that eliminating this restriction on agricultural imports would reduce the domestic price of the products subject to the measure by 12 percent.

Compliance with national standards SNI is mandatory in Indonesia for thousands of goods, including also domestically produced ones. As certification requires a visit to the factory premises by an Indonesian certifying agency, the cost is considerably higher for imported goods. The monetary cost is compounded by the uncertain duration of the process. Only a few agencies, mandated by the Ministry of Industry, can certify a specific product, so producers in need of certification must often wait a long time to find an agency available for certification. Interviews with firms suggest that the certification process for an imported good may require up to 5 months.

This is also a recurrent cost as the certification must be renewed every year against a fee and the certification process must be carried out again every 3 or 4 years depending on the product. Cali, Doarest, et al. (2021) find that SNI certification costs Indonesian importers equivalent to a tariff of up to 58 cents per dollar of imported good. At the same time, compulsory certification does not appear necessary to ensure the safety of consumers for those products which do not carry significant health and safety risks. These are the bulk of the products subject to compulsory certification, from water bottles to light bulbs, from bicycles to tires. For such products voluntary certification or self-certification are less trade distorting and equally protective options.[6]

Over 40 percent of Indonesian imports are subject to special approvals issued by the MoT. Obtaining this approval is cumbersome and its duration often unpredictable thus raising the costs of importing. The main hurdle in the process is the requirement of recommendation letters from sectoral ministries. These letters aim to fulfill non trade objectives,

[6] For example in the EU, producers self-certify compliance with EU standards but are still liable for any non-conformity of the products with those standards.

which are often related to the protection of domestic producers in the sector. Ministries have relatively high discretion in deciding on the recommendation, including whether or not to grant it, how long it takes them to respond and on the quantity allowed for the specific approval, which can differ from what the producer requested. When the import approval aims to protect producers, this NTM does not seem to comply with the WTO principle that "any person fulfilling the legal requirements should be equally eligible to apply for and obtain import licenses" (WTO GATT, Article 2.1).

The four NTMs we focus on were issued by 11 different ministries between 2008 and 2018 and some by government regulations. For instance, SNI (B7) regulations were issued by 8 different ministries. As of December 2018 however, the regulations coded within the MAST classifications of the four NTMs in this paper were mainly issued by 3 ministries.

3 Data

We use two main sources of data, both of which are novel: a dataset on the universe of Indonesian exporters in the period 2014-18 and a time-varying dataset of NTMs applied on Indonesian imports.

For the trade data, we use customs-level data covering the universe of Indonesian exporters from 2014 to 2018 in a monthly series. The data are collected by Indonesian customs and record values exported by each firm at the 10-digit level of the Harmonized System (HS). The data also has information on the country of destination, the value of export, the quantities and status of the exporting firm (for example whether it is a producer and/or an importing firm). Although our data excludes export zones, the export values covered by the data represent over 90 percent of all export values for Indonesia in the period.

We combine this data with monthly data on NTMs applied by Indonesia on imports at a highly disaggregated sectoral level (HS-10 digit). This is a novel dataset built by the

World Bank on the basis of data collected by the Economic Research Institute for ASEAN and East Asia (ERIA) in collaboration with UNCTAD. The UNCTAD/ERIA data identifies the stock of NTMs applied by Indonesia as of 2015. The World Bank team has cleaned this data extensively addressing several coding and interpretation errors. It has also extended the data tracking the individual NTMs applied to each product before and after 2015, effectively making this a time-varying dataset.[7]

To the best of our knowledge, this is the first comprehensive dataset on time-varying NTM, at this level of disaggregation and frequency. A total of over 60 3-digit NTMs are available in the dataset, each with values coded between 0 and 1 to signify when they were in effect at in that month-product pair. Figure A1 in the Appendix provides more details on our data compilations and compares the data with the ERIA/UNCTAD. This comparison shows the large discrepancy between the data used in this paper and the UNCTAD/ERIA data.

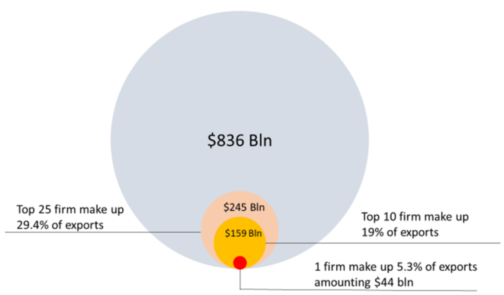
We observe a total of 22,915 individual exporting firms in the 2014-18 period. The number of firms exporting has been increasing in the time period from 13,361 in 2014 to 17,738 in 2018. The top 10 firms accounted for 20 percent of export value and the top 25 firms make up 30 percent of the export value, with the highest firm accounting for 5 percent of all export value in the period (Figure 2). About 9365 firms are in the 90th percentile in terms of total export value. Only about 44 firms have above average export value, consistent with stylized fact in the literature that exporting is concentrated and dominated by a few large firms (Bernard et al., 2007).

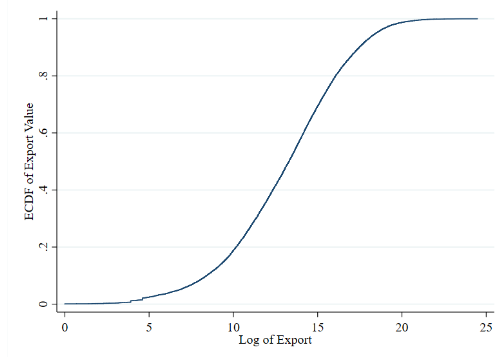
Exporters that sell to only one destination represent over 77 percent of exporting firms in our sample, but only 12 percent of the export value. The average number of destinations per firm in our time period is 2 countries. On the other hand, 66 percent of export value is generated by exporters with at least 5 destinations (Figure 3). A similar pattern is observed

[7] Appendix A1 details the process and the dissimilarities and coding errors corrected by our data. Further, Cali, Le Moglie, et al. (2021) and Cali, Doarest, et al. (2021) also provide more details on the construction of the data.

with products. Single product firms generate 23 percent of export value whilst those with more than 5 products make up 43 percent. Over 70 percent of firms sell one product to one destination.

Figure 2: Export Concentration in Indonesia

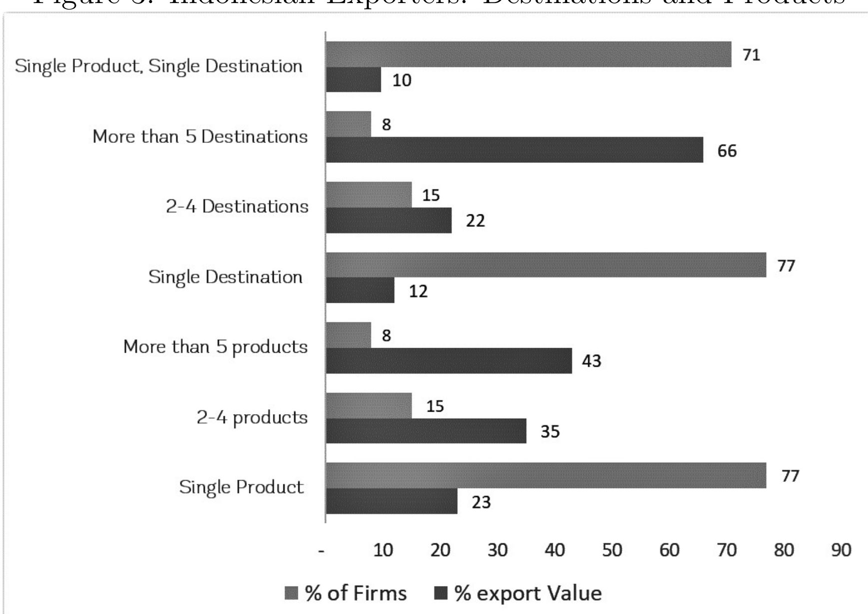




a. Distribution of Export Value b. Cumm. Dist Function

Source: IDN Customs Data and Author Calculations

Figure 3: Indonesian Exporters: Destinations and Products



Source: ID Customs and Author Calculations from Authors' NTM dataset

Large firms (with average export values above the median) also mostly fall in the category of those in industries having increasing returns to scale. These firms may need exports to achieve scale. About 11 percent of firms fit this criterion and we will test this mechanism in the empirical analysis below. In general, a higher share of large firms have higher average unit values, higher product and higher market diversity. On the other hand, a higher share of small exporters export more frequently.

We use the coverage ratio (CR) and the frequency ratio (FR) to measure the regulatory intensity of NTMs across products. The incidence of the specific NTMs we focus on - as measured by either CR or FR - increased during the period of analysis (Figure A1). At any point in the period, at least one of these 4 NTMs is applied to imports of HS-10 digit products that are exported by over 80 percent of Indonesian exporters. Table 1 shows the share of exporting firms that export HS-10 products which are subject to import restrictions in Indonesia through each of the four NTMs. Note that this applies to all exporters, regardless of whether they themselves import.

Specifically, between 2014 and 2018, an average of 47% of exporters were exporting products subject to pre-shipment inspections (C1) and port of entry restrictions (C3), 56% to import approvals (B14) and 27% to SNI (B7). For all NTMs, the number of firms affected has increased.

Table 1: Firms Exposed Based on whether the affected product is Exported (Competition)

	PSI (C1)	Port of Entry (C3)	SNI (B7)	Imp. Appr(B14)
	% Share of Firms Affected			
2014	48.4	48.0	27.8	57.0
2015	48.2	47.6	27.5	56.8
2016	48.2	47.9	27.3	57.0
2017	45.1	45.0	25.4	53.3
2018	45.4	45.7	25.3	53.5

Note: Affected in based on dummy on whether the NTM affecting the product exported by the firm is in effect in that year

Source: Authors' estimations based on Indonesia customs data.

4 Empirical Framework

Our aim is to examine the impact of these NTMs on the exports of Indonesian firms through the changes in import competition brought about by the introduction of these measures. As long as their exporting product is among those subjected to any of the regulations when it is being imported, it affects the concentration of that product in the market.

As explained above, given the data available, we focus on the reduced form impact by relating the application of NTMs on HS-10 digit imports to the same products exported by the firms.

To identify the effects, we construct a firm-level measure of competition exposure to each of the universe of all NTMs applied to all products in Indonesia. This exposure measure is our key variable of interest. Specifically, for each exporter i, we compute the share of exports of HS-10 products subject to each NTM. To minimize the endogeneity of these shares, we consider only the first two years when we observe the firm (usually 2014-2015):

$$\text{NTM Exposure}_{it}^{n} = \sum_{j} \left(\frac{EXP_{ij}}{\sum_j EXP_i} \right) * NTM_{jt}^{n} \tag{1}$$

where $n = 1.....60$ represents each of the 60 3-digit level MAST NTMs in our data, thus we have an exposure for each NTM n, though we focus on the four NTMs in our results. j is the HS product, $EXP_{ij} = \sum_{t=2014}^{t=2015} Exports_{ijt}$, and is the invariant weight of export value product j in exporter i exports in the years 2014 and 2015, $NTM_{jt}^{n} = 1$ if an NTM n on product j was in effect in month t and 0 otherwise. NTM_{jt}^{n} is what gives out NTM exposure variable its time-variant nature.

This variable measures the exposure of each firm to the monthly changes in the NTM application on the basis of its initial exported products. A higher value in this exposure signals lower import competition for that firm in the products that the firm exports due to import NTMs being applied to those products. This is our key measure to identify the reduced form of the import competition channel of NTMs via exports. A similar exposure is constructed for tariff, where NTM_{jt}^{n} is replaced by Tariff_{jt}. The descriptive statistics of this key variable are provided in Table 2. In line with the statistics above, import approval covers on average the highest share of exports (25 percent), followed by PSI (24 percent).[8]

[8]Note that the statistics in the previous section included the entire export value of each exporter if at

Table 2: Descriptive Statistics of Firm-Level Exposure Variables

Variable	Obs	Mean	Median	Std. Dev.	Min	Max
Tariff	1,144,186	0.078	0.050	0.113	0.000	5.179
C1 (PSI)	1,144,186	0.239	0.000	0.398	0.000	1.000
C3 (Port of Entry)	1,144,186	0.093	0.000	0.280	0.000	1.000
B7 (SNI)	1,144,186	0.076	0.000	0.234	0.000	1.000
B14 (Imp. App)	1,144,186	0.251	0.000	0.400	0.000	1.000

Note: This covers the full sample period, 2014-2018Source: ID Customs and Author Calculations

Finally, in all estimations we control for all the import NTMs that the firm is also exposed to via its exporting activity besides the specific NTM n of focus. This variable is simply Other NTM Exposure$_{it}^{all-n}$. For example if we are regressing the effect of exposure to port of entry requirements, this variable would capture all other NTMs (the remaining 59) the firm is exposed to via its exporting activity. This control is important to help address possible omitted variable bias.

We employ these NTM variables to analyze their reduced form effect on exports through the competition channel. We focus on three sets of dependent variables to account for the various margins of exports. The first is export survival, i.e. the likelihood that an export relationship stays active for a specific period of time. This is the extensive margin at the firm level. The second set measures the extensive margins conditional on the exporting activity including changes in the number of exported products and destinations. The final dependent variable measures the intensive margin through changes in export flows of existing trade ties (Besedes & Prusa, 2011).

4.1 Survival Analysis

We consider hazard or duration models to assess export survival, as it is commonly the case in the literature (Besedeš & Prusa, 2006; Fernandes & Paunov, 2015; Stirbat et al., 2015). Within this class of models, we use the accelerated failure-time (AFT) model. We

least 1 product was subject to NTM. As a result the shares above are higher than those computed on the basis of equation 1.

prefer this to the multiplicative or proportional hazards (PH) model as the latter imposes the assumption that the effect of firm characteristics on the hazard rate does not depend on time duration, which may fail due to unobserved heterogeneity. It is common for this assumption not to hold and the validity of the PH model has been questioned (Paul Brenton, 2011).

Under AFT models, we measure the direct effect of the explanatory variables on the dependent variable, which is the natural logarithm of the survival time, log T. This is expressed as a linear function of the covariates allowing for an easier interpretation of the results. The regression parameter estimates from the AFT models are also robust to omitted covariates. We also test the robustness of the estimates to using the Cox proportional hazard models for comparability.

For a given survival time T and a vector of covariates X, the accelerated failure time model can be formulated as:

$$\begin{gathered} Y_i = log(t_i) = \beta_1 \text{NTM Exposure}_{it}^{n} + \beta_2 \text{Tariff}_{it} + \\ \beta_3 \text{Other NTM Exposure}_{it}^{all-n} + \Delta_4 MS_{it} * \gamma_t + \gamma_t + \epsilon_i \end{gathered} \tag{2}$$

Where $MS_{it} * \gamma_t$ is a series of interaction terms between the firm's market share in an HS-10 product in the first 12 months of exporting and year dummies. These controls should help address the possible endogenous introduction of NTMs with respect to the initial size or past performance of the exporter. We also control for time fixed effects (γ_t), while ϵ_i is a random error term. For our estimation, we employ the loglogistic model where ϵ follows a logistic distribution.[9]

In order to define exit, we take the last month of known exporting activity by the firm in the data. Then, we need to know if it is the last export because it is at the edge of the dataset or if it is because the exporting activity effectively "died". To determine this, we

[9]The fitted survival function for the ith firm is: $S_i(t) = \left(\frac{1}{1+t^{\frac{1}{\sigma}} \exp(\boldsymbol{x}_i \boldsymbol{\beta})^{\frac{1}{\sigma}}} \right)$ where σ is a scale parameter which scales ϵ.

calculate the average number of months it normally takes the firm to export. If the time between the last known activity of the firm and the edge of the dataset is at least 3 times its normal duration between exporting activities, then we consider the firm's exporting activity dead. We code a dummy equal to one for the firm having *died* in the current month. By definition, we look only at the chronologically latest observation on each entity, whether they failed then or not. The time difference between that observation and the first observation is the period of survival. Those which never fail are still in the analysis, and are treated, appropriately, as censored observations.

We acknowledge the shortcomings of non-linear models, including that the maximum likelihood estimator tends to be inconsistent the if length of the panel is fixed, among other concerns (Greene, 2008). We address this issue by also estimating survival using equation 3 in our robustness checks.

4.2 Extensive Margins and Market Entry

We then assess the effect of NTMs on the extensive margin of trade: new export products, new destinations and new product-destination pairs. The extensive margin is key to understanding aggregate trade flows (Bernard et al., 2006) and the impact of import competition on the incentives to explore new market opportunities. We estimate the impacts by using the fixed effects Poisson estimator with robust standard errors, which is appropriate for dependent variables which are non negative count variables (Correia et al., 2019). The Poisson regression models the log of the expected count as a function of the predictor variables:

$$\begin{gathered} Pr(Y_{it} = y_{it} | \beta_1 \text{NTM Exposure}_{it}^{n} + \beta_2 \text{Tariff}_{it} + \\ \beta_3 \text{Other NTM Exposure}_{it}^{all-n} + \beta_4 MS_{it} * \gamma_t + \alpha_i + \gamma_t + v_{jt} + \epsilon_{it}) \end{gathered} \tag{3}$$

where Y_{it} is a variable measuring the extensive margins of exports, including through the number of distinct products the firm exports (product diversity), the number of distinct countries the firm exports to (market diversity) and the number of product-market pairs. α_i are exporter fixed effects, γ_t are time fixed effects, v_{jt} captures industry j (at the HS-2 level) and time varying characteristics and u_{it} is the idiosyncratic error.

4.3 Intensive Margins: Export Values and Quantities

Finally, we assess the effect of NTM exposure on firms' intensive margins. To measure the impact on the intensive margin of export, we estimate the following fixed effects panel regression:

$$\begin{aligned} Y_{it} = \beta_1 \text{NTM Exposure}^{n}_{it} + \beta_2 \text{Tariff}_{it} + \beta_3 \text{Other NTM Exposure}^{all-n}_{it} \\ + \beta_4 MS_{it} * \gamma_t + \alpha_i + \gamma_t + v_{jt} + \epsilon_{it} \end{aligned} \tag{4}$$

where Y$_{it}$ represents the dependent variables of export value and export quantities for firm i time t level.

4.4 Endogeneity

The estimation relies on the critical assumption that conditional on all the controls, changes in NTM application are independent of firm-level exporting activity. There are a number of threats to this assumption. The first is reverse causality, as NTMs may be changed precisely in response to firms' export trajectory. For example to the extent that increasing exports of a product may signal increased domestic competitiveness in the industry, the government may want to reduce its protection through NTMs. Alternatively, increased exports may provide greater resources for firms to lobby the government for protection (Bombardini & Trebbi, 2012). Whatever the direction of influence, this reverse causality may bias the estimated parameter on $NTM\ Exposure_{it}$. Moreover, unobservable variables may also bias the coefficient if they are related with both firms' exports and NTM application. For example an able manager may improve firm's exports and also be effective at lobbying the government for protection.

To the extent that these sources of bias are time invariant or are common across all exporters, the set of fixed effects (at the firm and time level) will address them. We address the remaining concerns for the time-varying sources of bias in three ways. First, in all regressions we include 2-digit HS industry-year fixed effects which should also capture eventual changes in lobbying activity over time. The 2-digit industry classification is suitable for that objective as it roughly matches the classification around which sectoral business associations are organized (e.g. textile, garments, processed food, etc.). It could also be the case that lobbying may occur at a finer level of sectoral disaggregation than 2-digit industry. To control for such a possibility, we control for initial market share of the firm in an HS 10-digit export product interacted by time effects. This is also a reflection of initial firm size or past firm performance referred to in most literature (See for example Fernandes and Paunov (2015)).

Finally, we check the robustness of the findings to excluding the largest 1 percent of firms by export values. As the largest exporters these could be particularly influential firms in the government decision to introduce NTMs. We also present other robustness checks related to the estimation methods and definition of entry in the results section.

In all cases, we report standardize coefficients of the variables of NTMs and tariffs by normalizing the regressors to have mean zero and unit standard deviation.

5 Results

5.1 Export Market Survival

We start by providing some stylized facts on export survival that motivate some of the empirical analyses below. We have 22,915 firms observed over 60 months (Jan 2014 to Dec 2018) and 1,077,509 observations. We first present Kaplan–Meier (KM) estimates of the time distribution of the Indonesia exporter survival in international markets and report $\widehat{S(t)}$ across firms based on their characteristics. This provides initial evidence on the survival rates.[10] The KM curve allows us to estimate percentiles of the survival distribution. The mean survival time is calculated as the area under the Kaplan–Meier survivor function. The graph is a series of declining steps showing declining hazard rate (or increasing survival) as export spells grow older.

The results show that between 2014-2018, 22 percent of Indonesian exporting firms (5,046) exited the export market, an average of just over 1,000 firms a year or 85 firms a month. Figure 4 a shows the overall survival function. These figures suggest that a firm exporting at the beginning of the period has an average 20% probability to exit the market by midway through our sample period. The 25th percentile of completed survival times (meaning that 25% have failed and 75% have yet to fail) occurs where F(t) = .25, and that is t=40 months.

Exporting firms that are larger and have higher unit values have higher survival rates (Figure 4 b and d). This result could be explained by greater economies of scale that larger firms enjoy (Krugman, 1980).

We also observe higher survival rates among firms that export less frequently (Figure 4 c). This finding may be contrary to what we expect a priori, as frequent exporters may have higher sunk costs and thus have longer survival time in the market. However, less frequent exporters may have higher valued shipments, making any changes take longer. Again, we check for this mechanism in the empirical analysis of export survival.

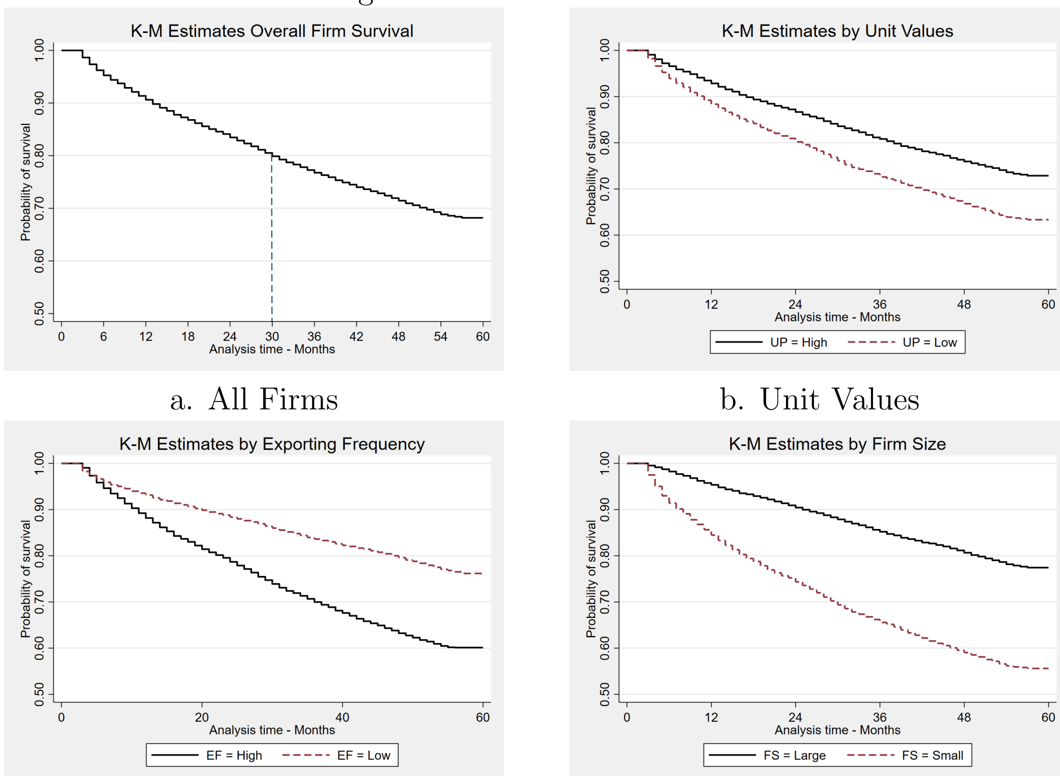
In table A1, we show results of the AFT model in equation 2. Negative coefficients imply the survival time is shortened; hence, the hazard rate is increasing, and vice versa.

The baseline results show that an increase in NTM exposure leads to a reduction in the export survival time for the average Indonesian exporter. This effect is statistically significant for all the NTMs of interest except for SNI, whose coefficient is negative but not significant. Import tariff exposure has also a negative and significant impact on exporters' survival and

[10] It is not feasible to calculate a Kaplan-Meier curve for continuous predictors since there would be a curve for each level of the predictor and a continuous predictor simply has too many different levels.

the effect is larger in magnitude than that of NTMs except for import approvals.[11]

Figure 4: K-M Survival Estimates



a. All Firms

b. Unit Values

c. Exporting Frequency

d. Firm Size

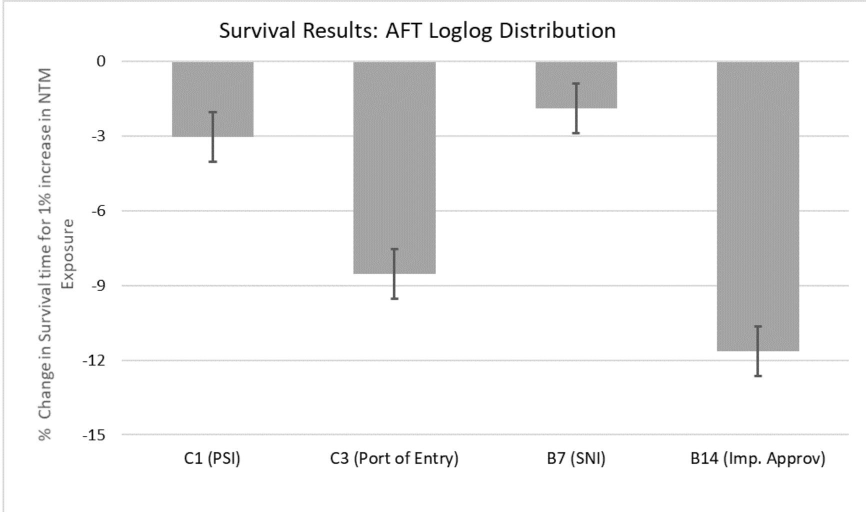
Note: The y-axis is in probability scale; x-axis contains the duration of trade. For the NTM graphs, estimates control for tariff and other NTMs and are computed by declaring NTMs as time varying.

We translate these results into elasticities in Figure 5 which shows the percentage change in survival time associated with a percentage change in exposure. A 1 percent increase in exposure to PSI is expected to reduce the firm's average survival time by 3 percent, while import approvals reduce it by 12 percent.[12] The latter translates into a decrease in survival time for the average firm by 12 months.

[11]Since we use standardized values of the coefficients, a 1 unit increase in exposure is an increase in a standard deviation for each variable of interest. For instance, the percentage change in survival time for a 1 standard deviation increase in a firm's exposure to PSI is 121 percent (see Table 2).

[12]This is calculated as follows: The standard deviation of PSI is 0.398. The 121% decrease in survival time for a 1 standard deviation increase translates to 121% decrease for a 39.8% increase in exposure, i.e 121/39.8. All others are calculated the same way.

Figure 5: % change in survival time for a 1% increase in NTM exposures



Note: lines show standard errors.
Source: ID Customs and Author Calculations from estimates in Table A1

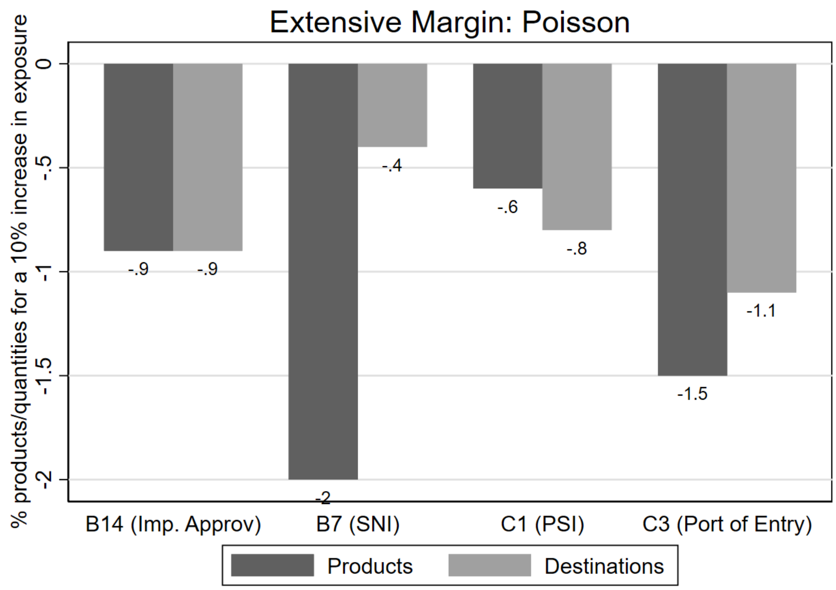
5.2 Extensive Margins of Trade

Next we present the results of the Poisson regressions on NTMs and the impact on the firm's extensive margins.

We find that all four NTMs negatively affect the number of new products exported by firms in Indonesia. Again the negative effect also applies to import tariffs (Table A2, top panel). In this case, SNI has the largest effect in magnitude and is also the only NTM with a coefficient larger than tariffs (at the 5% level of significance). Figure 6 reports the elasticities derived from the estimated standardized coefficients. A 10 percent increase in exposure to port of entry restrictions leads to a 1.5 percent decline in the number of distinct products, while the value for SNI is 2 percent, and for import approval and PSI below 1 percent.

We also find a negative effect of NTMs on the number of destination markets per firm (Table A2, bottom panel). In this case, all NTMs are larger than tariff except SNI. Import approval followed by port of entry requirements have the larger effects, similar to the results on firm survival. A 10 percent increase in exposure to import approval for instance leads to a 1.1 percent decline in the number of distinct destinations (Figure 6). This has implications as the literature shows that there is a positive relationship between the productivity of firms and the number of export destinations (Muûls & Pisu, 2009).

Figure 6: % change in products/destination time for a 10 % increase in NTM exposures



Source: ID Customs and Author Calculations from Authors' NTM dataset

5.3 NTMs and the Intensive Margin

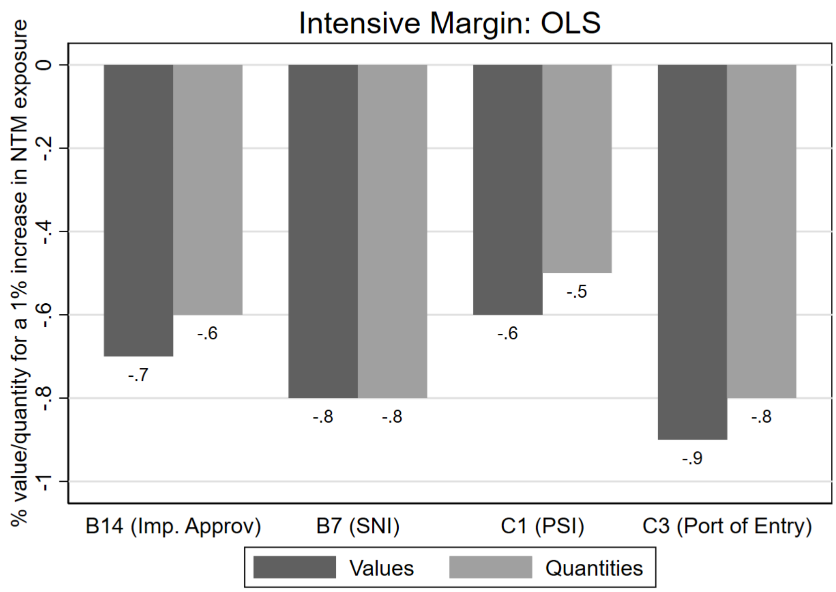
The results suggest that NTMs have also a negative impact on the intensive margins of trade. Table A3 show the effect on firms' export values and quantities . In all cases, the negative effect of each of the NTMs is larger in absolute magnitude than that of tariffs. Import approval again appears to have the most negative impacts, similar to results on firm survival and the number of export destinations per firm. A 28 percent increase in a firm's exposure to port of entry requirements (i.e. 1 standard deviation of port of entry variable, see Table 2) leads to 24 (22) percent decline in a firms' export values (quantities).[13] Figure 6 shows the elasticities.

A 1 percent increase in exposure to port of entry leads to a decline of 0.9 percent in values and -0.8 percent in quantity. The tariff on the other hand has about 20 percent

[13]The interpretation is that a 1 standard deviation increase in NTM exposure leads to the coefficient value change in the log of exports and/or just 100*coefficients.

pass-through.

Figure 7: % change for a 1% increase in NTM exposure



Source: ID Customs and Author Calculations from Authors' NTM dataset

5.4 Robustness

We check the robustness of our results to different methods and assumptions. For the survival analysis, we test how robust empirical results are to changes in model specification and functional forms.

First we estimate the survival probability using a Weibull distribution, which the literature has shown to yield consistent results with the loglog specification. The main results are robust to this alternative estimation: a one standard deviation increase in exposure to these NTMs raises the hazard of exit increases by 20 to 44 percent (Table A4). For instance, a standard deviation increase in exposure to PSI, increases the probability of exit by 44 percent, almost double the impact of tariffs (24 percent).

We also estimate the survival using the Poisson regression with multiple fixed effects and code 1 for the month when the firm exits. This too yields consistent results. We find that all four NTMs positively predict firm exist, as does tariffs (Table 3). We include time fixed effects and industry*time fixed effects as in other extensive margin analysis presented.

Table 3: Effect of NTMs on the Hazard of Exit- Poisson fixed effects Model

	PSI (C1)	Port of Entry (C3)	SNI (B7)	Import Approval (B14)
NTM Exposure	0.1686***	0.1780***	0.0947***	0.1439***
	(0.0032)	(0.0038)	(0.0024)	(0.0030)
Other NTMs Exposure	0.4326***	0.3932***	0.4284***	0.5066***
	(0.0078)	(0.0067)	(0.0067)	(0.0077)
Tariff Exposure	0.0402***	0.0413***	0.0404***	0.0404***
	(0.0027)	(0.0027)	(0.0027)	(0.0027)
Observations	786000	786000	786000	786000

Note: Results with Poisson regression with multiple fixed effects. We include all controls. Standard errors clustered at the firm level. Firm FE and Time *Industry FE included. Source: Authors' estimations.

For the extensive margin, we test the robustness of the results to employing a log-linear regression instead of the Poisson estimation. All the results with the three dependent variables are also consistent in both magnitude and coefficient signs (Table A5).

To check that our results are not driven by influential observations, we re-run the specifications excluding the top one percent of exporters in value. All our results for the extensive margins (Table A6) and intensive margins (Table A7) are robust to this change, including also that NTMs have a larger effect (in absolute terms) than tariffs on firm exports.

5.5 Mechanism- Markups

The analysis shows that NTMs that shelter domestically operating firms from import competition have a negative impact on their exports. If interpreted in light of the mechanisms hypothesized above, the results suggest that the productivity and/or the mark-up effects dominate the economies of scale effect. In this section we test more explicitly the mark-up mechanism. We focus in particular on the survival analysis as that captures the export margin most clearly affected through these channels. In other words, whether to export or not is likely to be the key decision affected by changes in import competition.

To the extent that decreased import competition from NTMs drive up domestic markups (which is a possibility in models with variable markups), this could reduce domestic firms' incentives to export, assuming that markups on exports do not change. In turn, this would lead to a positive relation between import competition and the probability to export.

The key assumption to test for this channel with the data available is that firms with higher mark-ups in export markets may be less responsive to changes in domestic mark-ups. This is because other things being equal, the higher the markup in the export market, the greater would be the gap between export and domestic markups. Further, the Indonesian domestic market is sufficiently large to enable firms to achieve some economies of scale by focusing only on it. This is likely to make the markup channel potentially more salient. Hence, we expect NTMs to have a less negative effect on export survival for high markup firms.

As we cannot compute export markup with our export data, we use unit values to construct a proxy for markup. In particular we consider high markup exporters those with unit values of HS-10 digit exports higher than the median unit value across all exporters of that product. To check whether the impact of NTMs on the various export margins is less negative for high markup firms, we run equation 2 and interact the NTM variable with a dummy representing high unit values (HUV) as follows: NTM $\text{Exposure}^n_{it} * HUV$.

The coefficient of the interaction between NTMs and unit values is positive for two of the four NTMs in the survival analysis while the other two are not significant (Table 4, top panel). That is, the impact of NTM exposure to pre-shipment inspection and port of entry on survival time is less negative for firms with higher unit prices. This result is in line with what is expected for the markup channel.

Table 4: Effect of NTMs on Firm Survival Time: Mechanism

	C1 (PSI)	C3(Entry Port)	B7(SNI)	B14(Imp.Appr)
	Exporters with higher unit values (HUV)			
Low Unit Values	-2.1652***	-3.3662***	-0.6082	-5.2618***
	(0.5188)	(0.4428)	(0.4863)	(0.5617)
High Unit Values	-0.1892	-1.4804***	0.0453	-4.0972***
	(0.6175)	(0.5204)	(0.6105)	(0.6279)
Observations	687647	687647	687647	687647

Note: Results with loglogistic distribution model with time fixes effects. Results based on interactions terms from stata's lincom. Standard errors clustered at the firm level. Source: Authors' estimations.

6 Conclusions

This paper extends the evidence on the impact of import competition on firms' performance by using NTMs as the source of changes in competition and by focusing on exporting activity. To that end it matches two unique datasets on Indonesia: a transaction-level dataset from customs covering the universe of Indonesian exporters and a novel time-varying dataset on NTMs and tariffs at a highly disaggregated product level.

The analysis suggests that an increase in exposure to four protectionist NTMs, which unnecessarily burden trade, significantly reduces the survival probability of firms in the export markets. For three of the four NTMs the magnitude of the effect is larger in absolute term than for import tariffs. The effect is less acute for firms with higher markups in export markets, consistent with one of the key mechanisms linking import competition and exports. The four NTMs generally also negatively affect exporters' extensive and intensive margins. The NTM effects on the various margins of firms' exports are larger in absolute terms than tariffs.

This has implications, not only for the growth of exports at the macro level, but also for the performance of firms at the micro level. As the literature has shown, firms that export are exposed to higher levels of competition in the global market, incentivizing them to innovate and are more productive than non-exporters (Biesebroeck (2005), De Loecker (2007)).

The evidence in this paper contributes to call into question import protectionism, particularly by governments that are interested in improving their external balance position. The negative incentives that import protectionism appears to provide to exporters, especially in a large domestic market like Indonesia, should give some pause to policy-makers interested in export-led growth and diversification. Further, the results underscore the importance of moving beyond the aggregate NTM variables that much of the literature has focused on, allowing for more focused policy implications in this line of research.

The limitation of the analysis is that we do not explicitly measure competition in the domestic market but rely on existing theoretical and empirical evidence on market concentration and export performance. Linking the customs trade data to firm level data on revenues and costs for the entire production would allow to better understand the mechanisms behind our results.

References

Amiti, M., & Konings, J. (2007). Trade liberalization, intermediate inputs, and productivity: Evidence from indonesia. *American Economic Review*, *97*, 1611–1638. https://doi.org/DOI:10.1257/aer.97.5.1611

Asprilla, A., Berman, N., Cadot, O., & Jaud, M. (2019). Trade policy and market power: Firm-level evidence. *International Economic Review*, *60*, 1647–1673.

Autor, D., Dorn, D., Hanson, G. H., Pisano, G., & Shu, P. (2020). Foreign competition and domestic innovation: Evidence from us patents. *American Economic Review: Insights*, *2*, 357–74.

Bernard, A. B., Jensen, J. B., & Schott, P. (2006). Survival of the best fit: Exposure to low-wage countries and the (uneven) growth of us manufacturing plants. *Journal of international Economics*, *68*, 219–237.

Bernard, A. B., Jensen, J. B., Redding, S. J., & Schott, P. K. (2007). Firms in international trade. *Journal of Economic Perspectives*, *21*(3), 105–130. https://doi.org/10.1257/jep.21.3.105

Besedes, T., & Prusa, T. J. (2011). The role of extensive and intensive margins and export growth. *Journal of Development Economics*, *96*(2), 371–379. https://ideas.repec.org/a/eee/deveco/v96y2011i2p371-379.html

Besedeš, T., & Prusa, T. J. (2006). Product differentiation and duration of us import trade. *Journal of International Economics*, *70*(2), 339–358. https://doi.org/https://doi.org/10.1016/j.jinteco.2005.12.005

Biesebroeck, J. V. (2005). Exporting raises productivity in sub-saharan african manufacturing firms. *Journal of International Economics*, 373–391. https://doi.org/https://doi.org/10.1016/j.jinteco.2004.12.002

Bloom, N., Brynjolfsson, E., Foster, L., Jarmin, R., Patnaik, M., Saporta-Eksten, I., & Van Reenen, J. (2019). What drives differences in management practices? *American Economic Review*, *109*, 1648–83.

Bloom, N., Draca, M., & Van Reenen, J. (2016). Trade induced technical change? the impact of chinese imports on innovation, it and productivity. *The review of economic studies*, *83*, 87–117.

Bombardini, M., & Trebbi, F. (2012). Competition and political organization: Together or alone in lobbying for trade policy? *Journal of International Economics*, *87*(1), 18–26.

Bramati, M., Gaggero, A., & Solomon, E. (2015). International trade and domestic competition: Evidence from belgium. *Review of Industrial Organization*, *46*(4), 383–399. https://EconPapers.repec.org/RePEc:kap:revind:v:46:y:2015:i:4:p:383-399

Bustos, P. (2011). Trade liberalization, exports, and technology upgrading: Evidence on the impact of mercosur on argentinian firms. *American Economic Review*, *101*, 304–40.

Cali, M., Doarest, A., Lake, J., & Puzzello, L. (2021). *The changing nature of protection and its consequences for welfare: Evidence from indonesia* (Mimeo). The World Bank.

Cali, M., Pasha, M., Darko, F., Sumarto, S., Hidayat, T., & Tiwari, S. (2021). *Nutritional impacts of trade policies: Evidence from indonesia* (Mimeo). The World Bank.

Cali, M., Le Moglie, M., & Presidente, G. (2021). *Gain without pain ? non-tariff measures, plants' productivity and markups* (Policy Research Working Paper Series No. 9654). The World Bank. https://EconPapers.repec.org/RePEc:wbk:wbrwps:9654

Calì, M., Chang, P., Daga, R., & Mehta, G. (2019). *Unlocking the dynamism of the indonesian private sector: A country private sector diagnostic*. World Bank Group.

Chang, H. J. (2002). *Kicking away the ladder: Development strategy in historical perspective*. Anthem Press.

Clougherty, J. A., & Zhang, Z. (2009). Domestic rivalry and export performance: Theory and evidence from international airline markets. *Canadian Journal of Economics*, *42*, 440–468.

Correia, S., Guimarães, P., & Zylkin, T. (2019). ppmlhdfe: Fast Poisson Estimation with High-Dimensional Fixed Effects.

De Loecker, J. (2007). Do exports generate higher productivity? evidence from slovenia. *Journal of International Economics*, *73*, 69–98. https://doi.org/https://doi.org/10.1016/j.jinteco.2007.03.003

Ederington, J., & Ruta, M. (2016). *Non-tariff measures and the world trading system* (Policy Research Working Paper Series No. 7661). The World Bank. https://ideas.repec.org/p/wbk/wbrwps/7661.html

Epifani, P. (2003). Trade liberalization, Firm Performances and Labor Market Outcomes in the Developing World, what Can We Learn From Micro-Level Data? *Rivista italiana degli economisti*, (3), 455–486. https://ideas.repec.org/a/mul/jqat1f/doi10.1427-12530y2003i3p455-486.html

Feliciano, Z. M., & Doytch, N. (2020). Trade liberalization and firm performance: The case of thailand. *Contemporary Economic Policy*, *38*(4), 607–621. https://doi.org/https://doi.org/10.1111/coep.12488

Fernandes, A. M., & Paunov, C. (2015). The risks of innovation: Are innovating firms less likely to die? *The Review of Economics and Statistics*, *97*, 638–653.

Fitzgerald, D., & Haller, S. (2018). Exporters and shocks. *Journal of International Economics*, *113*, 154–171.

Fontagné, L., & Orefice, G. (2018). Let's try next door: Technical barriers to trade and multi-destination firms. *European Economic Review*, *101*(100), 643–663. https://EconPapers.repec.org/RePEc:eee:eecrev:v:101:y:2018:i:c:p:643-663

Goldberg, P., & Pavcnik, N. (2016). Chapter 3 - the effects of trade policy. In K. Bagwell & R. W. Staiger (Eds.). North-Holland. https://doi.org/https://doi.org/10.1016/bs.hescop.2016.04.002

Greene, W. H. (2008). *Econometric analysis* (6th). Pearson Education, Inc.,

Hayakawa, K., Ishikawa, J., & Tarui, N. (2020). What goes around comes around: Export-enhancing effects of import-tariff reductions. *Journal of International Economics*, *126*. https://doi.org/https://doi.org/10.1016/j.jinteco.2020.103362

Krugman, P. (1980). Scale economies, product differentiation, and the pattern of trade. *American Economic Review*, *70*, 950–959.

Melitz, M. J. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica*, 1695–1724. https://doi.org/https://doi.org/10.1111/1468-0262.00467

Munadi, E. (2019). Chapter 3 - indonesian non-tariff measures: Updates and insights. In H. T. T. Doan & S. Rosenow (Eds.). ERIA. https://doi.org/https://doi.org/10.1016/bs.hescop.2016.04.002

Muûls, M., & Pisu, M. (2009). Imports and exports at the level of the firm: Evidence from belgium. *World Economy*, *32*, 692–734.

Paul Brenton, E. v. U., Christian Saborowski. (2011). What explains the low survival rate of developing country export flows? *World Bank Economic Review*, *24*, 474–499.

Rodrik, D. (2012). Unconditional Convergence in Manufacturing *. *The Quarterly Journal of Economics*, *128*(1), 165–204. https://doi.org/10.1093/qje/qjs047

Stirbat, L., Record, R., & Nghardsaysone, K. (2015). The experience of survival: Determinants of export survival in lao pdr. *World Development*, *76*, 82–94. https://doi.org/https://doi.org/10.1016/j.worlddev.2015.06.007

Topalova, P., & Khandelwal, A. (2011). Trade liberalization and firm productivity: The case of india. *Review of economics and statistics*, *93*, 995–1009.

World Bank and UNCTAD. (2018). *The unseen impact of non-tariff measures: Insights from a new database* (tech. rep.). United Nations; World Bank. https://unctad.org/system/files/official-document/wb_unctad_2018d1_NTMs_en.pdf

Appendix

A1 Building and Comparing the NTM Data Set

Building on the Economic Research Institute for ASEAN and East Asia (ERIA) NTM 2015 stock-take, we engaged in a labor-intensive exercise of compiling all the relevant regulations on NTMs issued in Indonesia by various ministries from 2008-2018 with the help of the Global Trade Alert dataset. For each regulation, we assigned the NTM 3-digit codes (based on UNCTAD Multi-Agency Support Team (MAST) classification) emanating from that regulation and applied it to the HS codes included in the regulation.

The workflow can be summarized as follows:

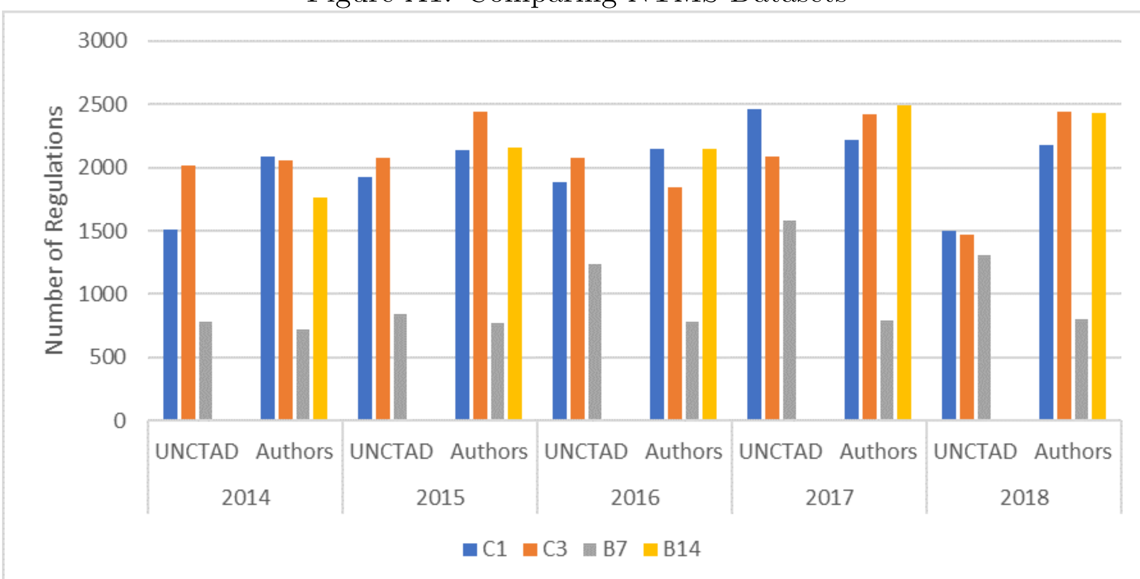
1. Compiling relevant regulations that follows (or preceded) the regulations already compiled by ERIA (as available on UNCTAD website) and checking whether the measures are correctly coded.
2. Compile the HS codes attached to every regulations reviewed
3. Match each regulation with the HS codes they contain
4. Transform the matched dataset into a panel HS-month level data that trace the evolution of each NTM code applied in one particular 10-digit HS code product.

Figure A1 gives a snapshot of the NTM data comparison for Indonesia, comparing the number of HS 6 digit codes between UNCTAD and our data across the 3-digit NTMs in the analysis. The comparison across all 60 NTMs reveal a relatively high correlation between the 2 datasets over the entire period of 2008-2018 for which our NTM dataset spans (0.6675). However the comparison reveals a significant extent of measurement error, which may explain some discrepancies in the table below.

In several cases the UNCTAD/ERIA number is larger than our number (e.g., 2016 for port of entry (C3)). The team investigated these instances and found that the discrepancy comes from differences in the way we interpret what NTMs are derived from the original regulations, as well as from some mis classification of HS codes by ERIA. For example, ERIA classified 65/Permentan/PD.410/5/2014 on Animal Quarantine Measures as B7, whereas we classify them as SPS and INSP, and not TBT. Similarly, ERIA also classifies 65/Permentan/PD.410/5/2014 on Quarantine of Pathogen Material and/or Veterinary Medicine Biologic Preparation as TBT, whereas we classify them as SPS. As another example the numbers for A64 are larger for UNCTAD/ERIA as they mistakenly include hundreds of unrelated manufacturing products under the regulation (nr. 447/Kpts-II/2003 concerning the Harvest or Capture and Distribution of Specimen of Wild Plants & Animals).

We thus proceed to use our dataset for the analysis. For future research, it will be important to check to what extent this measurement error is bound to bias the estimates using the UNCTAD/ERIA data.

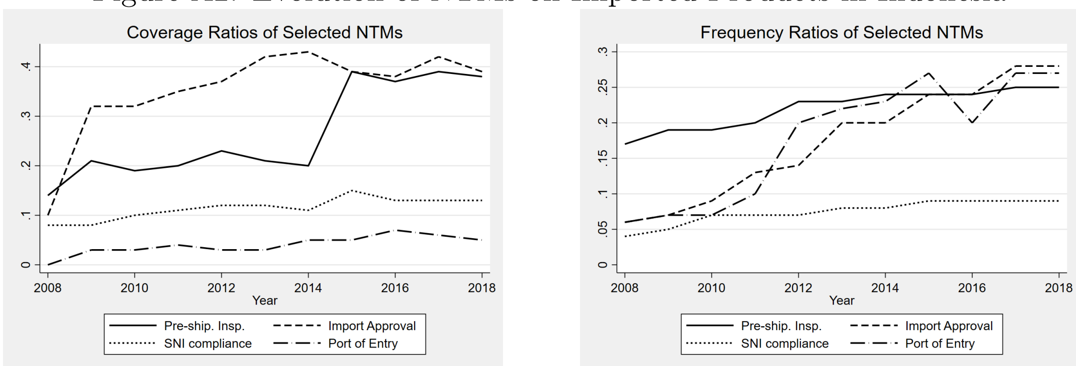
Figure A1: Comparing NTMS Datasets



Source: UNCTAD and Author Calculations

Coverage and Frequency Ratios of the 4 NTMs in Indonesia's Imports

Figure A2: Evolution of NTMs on Imported Products in Indonesia



a. Coverage Ratios b. Frequency Ratios

Source: ID Customs and Author Calculations

A2 Baseline Results Tables

Survival Analysis

Table A1 shows the baseline estimates on the survival analysis.

Table A1: Effect of NTMs on Firm Survival Time

	C1 (PSI)	C3(Entry Port)	B7 (SNI)	B14(Imp. Appr)
NTM Exposure	-1.2070***	-2.3882***	-0.4388	-4.6648***
	(0.4478)	(0.3510)	(0.3975)	(0.4397)
Other NTM Exposure	-11.7578***	-7.4951***	-8.3723***	-4.7247***
	(1.0069)	(0.9938)	(0.8904)	(1.0078)
Tariff Exposure	-3.7292***	-3.0773***	-3.1943***	-3.2212***
	(1.1432)	(1.0810)	(1.0761)	(1.0877)
No of Firms/Failures	16304/4717	16304/4717	16304/4717	16304/4717
Observations	686,358	-686,358	-686,358	-686,358
Log-pseudo-likelihood	-30164.441	-30192.035	-30185.543	-30176.786

Note: Results with loglogistic distribution model with time fixed effects and model controls for $MS_{it} * \gamma_t$, the initial firm market share. Standard errors clustered at the firm level. Source: Authors' estimations.

Extensive Margin

We present the baseline estimates on the extensive margin in Table A2.

Table A2: Effect on Product Diversity, Market Diversity and Product-Destination Pairs

	C1 (PSI)	C3 (Ports)	B7 (SNI)	B14 (Imp.Appr)
	Number of Products			
NTM	-0.0225**	-0.0419***	-0.0467***	-0.0357***
	(0.0110)	(0.0143)	(0.00953)	(0.0108)
Other NTMs	-0.0375***	-0.0369***	-0.0363***	-0.0249**
	(0.0119)	(0.0118)	(0.0119)	(0.0106)
Tariff	-0.0262***	-0.0262***	-0.0260***	-0.0262***
	(0.00454)	(0.00455)	(0.00455)	(0.00455)
Observations	1,012,877	1,012,877	1,012,877	1,012,877
Firm; Time; Ind*Time FE	Yes	Yes	Yes	Yes
NTM=Tariff: p-value	.76	.3	.05	.42
	Number of Destinations			
NTM	-0.0303***	-0.0320***	-0.00852**	-0.0362***
	(0.00456)	(0.00547)	(0.00394)	(0.00439)
Other NTMs	-0.0371***	-0.0388***	-0.0398***	-0.0306***
	(0.00480)	(0.00463)	(0.00467)	(0.00436)
Tariff	-0.00138	-0.00141	-0.00155	-0.00133
	(0.00181)	(0.00181)	(0.00181)	(0.00181)
Observations	1,012,877	1,012,877	1,012,877	1,012,877
Firm; Time; Ind*Time FE	Yes	Yes	Yes	Yes
NTM=Tariff: p-value	0	0	.11	0

Note: Results from Poisson regressions. Coefficients for covariates are standardized. *** for 1%, ** for 5%, and * for 10%. Robust standard errors in parenthesis and are clustered at the firm level. Time and Firm FEs included

Source: Authors' estimations.

Intensive Margin

Table A3 with the baseline estimates on the intensive margin.

Table A3: Effect of NTMs on Export Values and Quantities

	C1 (PSI)	C3(Entry Port)	B7 (SNI)	B14(Imp.Approv)
		Values		
NTM	-0.238***	-0.256***	-0.191***	-0.282***
	(0.0191)	(0.0202)	(0.0192)	(0.0150)
Other NTMs	-0.295***	-0.306***	-0.308***	-0.241***
	(0.0168)	(0.0162)	(0.0164)	(0.0176)
Tariff	-0.0260***	-0.0262***	-0.0261***	-0.0268***
	(0.00577)	(0.00577)	(0.00577)	(0.00578)
Observations	1,013,391	1,013,391	1,013,391	1,013,391
R-squared	0.706	0.706	0.706	0.706
Firm; Time; Ind*Time FE	Yes	Yes	Yes	Yes
NTM=Tariff test: p-value	0	0	0	0
		Quantities		
NTM	-0.195***	-0.235***	-0.187***	-0.249***
	(0.0171)	(0.0187)	(0.0183)	(0.0136)
Other NTMs	-0.276***	-0.275***	-0.275***	-0.225***
	(0.0157)	(0.0147)	(0.0148)	(0.0162)
Tariff	-0.0210***	-0.0214***	-0.0211***	-0.0218***
	(0.00503)	(0.00503)	(0.00503)	(0.00503)
Observations	1,013,391	1,013,391	1,013,391	1,013,391
R-squared	0.707	0.707	0.707	0.707
Firm; Time; Ind*Time FE	Yes	Yes	Yes	Yes
NTM=Tariff test: p-value	0	0	0	0

Note: Coefficients are standardized to make the comparable. Asterics *** for 1%, ** for 5%, and * for 10%. Robust standard errors are in parenthesis and are clustered at the firm level.

Source: Authors' estimations.

Robustness Checks

Robustness Results: Alternative Models

We report results for the survival analysis from the Weibull estimation in Table A4 and from the Poisson with multiple fixed effects in Table 3. We also report OLS results alternative estimation for the extensive margin in Table A5.

Table A4: Effect of NTMs on the Hazard of Exit- Weibull

	PSI (C1)	Port of Entry (C3)	SNI (B7)	Import Approval (B14)
NTM Exposure	1.4449***	1.3865***	1.1971***	1.3189***
	(0.0406)	(0.0279)	(0.0249)	(0.0340)
Other NTMs Exposure	2.2877***	2.1115***	2.3803***	2.8316***
	(0.1339)	(0.1345)	(0.1376)	(0.1783)
Tariff Exposure	1.2403***	1.2972***	1.2491***	1.2396***
	(0.0428)	(0.0470)	(0.0416)	(0.0415)
Observations	687647	687647	687647	687647

Note: Results with Weibull distribution model with time fixed effects. Standard errors clustered at the firm level. Source: Authors' estimations.

Table A5: Effect of NTMs on Product and Market Diversity- OLS

	C1 (PSI)	C3(Port Entry)	B7 (SNI)	B14(Imp.Appr)	C1 (PSI)	C3(Port Entry)	B7 (SNI)	B14(Imp.Appr)
	Products				Destinations			
NTM Exposure	-0.0206***	-0.0233***	-0.0111***	-0.0274***	-0.0195***	-0.0227***	-0.00557	-0.0251***
	(0.00451)	(0.00346)	(0.00408)	(0.00358)	(0.00466)	(0.00326)	(0.00460)	(0.00314)
Other NTMs Exposure	-0.0278***	-0.0295***	-0.0297***	-0.0206***	-0.0269***	-0.0284***	-0.0288***	-0.0241***
	(0.00376)	(0.00388)	(0.00391)	(0.00415)	(0.00334)	(0.00342)	(0.00344)	(0.00402)
Tariff Exposure	-0.00609***	-0.00615***	-0.00620***	-0.00625***	-0.00408***	-0.00414***	-0.00421***	-0.00419***
	(0.00115)	(0.00116)	(0.00116)	(0.00117)	(0.00101)	(0.00102)	(0.00102)	(0.00102)
Observations	1,013,460	1,013,460	1,013,460	1,013,460	1,013,460	1,013,460	1,013,460	1,013,460
R-squared	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012
No. of firms	20,012	20,012	20,012	20,012	20,012	20,012	20,012	20,012

Note: Coefficients are standardized to make the comparable. *** for 1%, ** for 5%, and * for 10%. Robust standard errors in parenthesis and are clustered at the firm level. Time and Firm FEs included. Source: Authors' estimations.

Robustness Results: Excluding top 1% firms

We report results excluding the top 1% firms for the extensive margin in Table A6 and the intensive margin in Table A7.

Table A6: Effect of NTMs on the Extensive Margin: Excluding the top 1% firms

	PSI (C1)	Port of Entry (C3)	SNI (B7)	Import Approval (B14)
		Products		
NTM	-0.0275**	-0.0455***	-0.0529***	-0.0396***
	(0.0118)	(0.0144)	(0.0100)	(0.0111)
Other NTM	-0.0435***	-0.0435***	-0.0431***	-0.0348***
	(0.0122)	(0.0122)	(0.0123)	(0.0110)
Tariff	-0.0251***	-0.0252***	-0.0249***	-0.0251***
	(0.00463)	(0.00463)	(0.00463)	(0.00463)
Observations	1,002,114	1,002,114	1,002,114	1,002,114
Tariff=NTM P-value	0	0	0	0
		Destinations		
NTM	-0.0221***	-0.0323***	-0.0171***	-0.0335***
	(0.00496)	(0.00558)	(0.00429)	(0.00466)
Other NTM	-0.0409***	-0.0381***	-0.0387***	-0.0333***
	(0.00524)	(0.00488)	(0.00493)	(0.00469)
Tariff	-0.00217	-0.00230	-0.00234	-0.00231
	(0.00185)	(0.00185)	(0.00185)	(0.00185)
Observations	1,002,114	1,002,114	1,002,114	1,002,114
Tariff=NTM P-value	.85	.18	.01	.23

Note:Results with Poisson regression with multiple fixed effects. We control for initial market share * year, Time FE, exporter FE and industry*time FE. Standard errors clustered at the firm level. Coefficients for covariates are standardized to make the comparable. *** for 1%, ** for 5%, and * for 10%. Robust standard errors in parenthesis and are clustered at the firm level.

Source: Authors' estimations.

Table A7: Effect of NTMs on the Intensive Margin: Excluding the top 1% firms

	PSI (C1)	Port of Entry (C3)	SNI (B7)	Import Approval (B14)
		Values		
NTM Exposure	-0.240***	-0.253***	-0.192***	-0.275***
	(0.0191)	(0.0202)	(0.0200)	(0.0151)
Other NTMs Exposure	-0.286***	-0.301***	-0.302***	-0.241***
	(0.0169)	(0.0163)	(0.0165)	(0.0177)
Tariff Exposure	-0.0260***	-0.0262***	-0.0260***	-0.0266***
	(0.00577)	(0.00577)	(0.00577)	(0.00578)
Observations	1,002,627	1,002,627	1,002,627	1,002,627
R-squared	0.695	0.695	0.695	0.695
Tariff=NTM p-value	0	0	0	0
		Quantity		
NTM Exposure	-0.199***	-0.232***	-0.190***	-0.242***
	(0.0170)	(0.0187)	(0.0190)	(0.0137)
Other NTMs Exposure	-0.266***	-0.270***	-0.270***	-0.224***
	(0.0158)	(0.0148)	(0.0149)	(0.0163)
Tariff Exposure	-0.0211***	-0.0214***	-0.0211***	-0.0217***
	0	0	0	0
Observations	1,002,627	1,002,627	1,002,627	1,002,627
R-squared	0.694	0.694	0.694	0.694
Tariff=NTM p-value	0	0	0	0

Note: Asterisks *** for 1%, ** for 5%, and * for 10%. Robust standard errors are in parenthesis. Standard errors clustered at the firm level.
Source: Authors' estimations.