The Consequences of Non-Tariff Trade Barriers: Theory and Evidence from Import Licenses in Argentina*

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Abstract

As WTO regulations rendered tariffs less viable, the trade policy landscape experienced a significant transformation: Non-tariff barriers have proliferated, becoming a central instrument of countries' trade policy. How do Non-Tariff import Barriers affect downstream firms? What role do firm market power and market concentration play in shaping the effects of these barriers? This paper investigates the effects of import licenses (NAILs) in Argentina from 2005 to 2011. We construct a novel database with yearly data on products that require import licenses to analyze the causal effects of NAILs on firms' imports, exports, and employment. Our empirical strategy leverages the staggered introduction of NAILs as a unique opportunity for causal identification. We find that NAILs significantly reduce firm imports, leading firms reliant on these imported inputs to decrease exports and employment. In a trade model with oligopolistic competition in export markets, we provide conditions under which firms' market power can shape the aggregate impact of NAILs. In markets where a firm is relatively large, it can respond to NAILs by adjusting its markups while maintaining relatively stable prices and output. This reduces the overall impact on consumer prices in more concentrated markets.

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1 Introduction

Since the establishment of the World Trade Organization (WTO) and the conclusion of the General Agreement on Tariffs and Trade (GATT) Uruguay Round in 1994, countries have collectively committed to lower import tariffs. According to the World Bank, this initiative has led to a steep decline in global average tariffs, which fell from 8.6% in 1994 to just 2.6% by 2017, according to the World Bank.[1] As WTO regulations rendered tariffs less viable, trade policy landscape experienced a significant transformation. Non-tariff barriers (NTBs) to imports have surged and proliferated, becoming a central instrument in countries' trade policy Beghin et al. (2015). Therefore, understanding their effects is crucial, especially since escalating geopolitical tensions and other global challenges have brought trade policy back into the spotlight in recent years.

This paper investigates the impact of non-tariff barriers in Argentina, with a specific focus on Non-Automatic Import Licenses (NAILs) and their influence on their effect on firm exporting dynamics and employment of firms that rely on imported inputs. We use comprehensive firm-level data and construct a novel database categorizing products affected by NAILs annually from 2005 to 2011. Employing an event-study design, we causally estimate the effects of NAILs. We integrate these findings with a model of importers and exporters that allows for oligopolistic competition in export markets. This analysis quantifies the role of NAILs to intermediate inputs in shaping firm behavior while highlighting the role of firm market power and overall market concentration in mediating the effects of these barriers.

Analyzing the consequences of NTBs has been challenging. NBTs are difficult to quantify and the lack of exogenous variation further hampers the ability of researchers to assess their causal effects. In addition, non-tariff measures tend to entail specificities that govern the degree to which imports will be constrained, thus hindering the comparability of two measures applied, even within a specific sector. As a result, we know little about NTBs and their consequences. A system of Non-Autamatic Import Licenses (NAILs) imposed by Argentina offers a unique setting to overcome these challenges.

Between 2005 and 2011, the Argentine government rolled out a system of Non-Automatic Import Licenses (NAILs), which required that certain products obtain approval from a public official before being imported – a process that could delay approval by up to two months. In practice, the NAILs functioned as a non-tariff trade barrier, raising firms' import costs. Argentina experience is ideal for several reasons. Firstly, the stakes were high: by 2011, NAILs affected over 600 product lines, which accounted for 17% of firms' imports of intermediate inputs and affected 35% of importing firms, marking this as one of the largest non-tariff barriers on manufacturing goods globally. Second, a unique aspect of the policy was that products were phased into the NAILs system at different periods, without any apparent systematic approach, culminating in including all products by 2012. The staggered inclusion of products in the NAILs system provides an ideal empirical framework allowing for causal identification of the effects of non-tariff barriers on firm dynamics.[2]

[1] The average tariff is the average of effectively applied rates weighted by the product import shares corresponding to each partner country.

[2] Our analysis concludes in 2012 for two primary reasons. Initially, not all products were affected by the policy before this date, enabling us to utilize the staggered inclusion of products as a means for identification. Furthermore, in December 2011, the Argentine government imposed significant restrictions on dollar purchases, a policy change likely

Our approach requires the creation of a novel dataset that combines three datasets spanning from 2002 to 2012. First, we obtain the universe of Argentine exporters and importers, detailing their export and import transactions at the firm-country-HS8 product level from official customs data. Second, we incorporate firm-level employment data from the official Argentina Internal Revenue Service (AFIP). Finally, we have digitized monthly government decrees to create a new dataset that documents the annual imposition of NAILs on HS8 products.

Our empirical strategy leverages exogenous variability from the timing of product entries into the NAILs system from 2005 to 2011, combined with data on each firm's import share of the affected products before the policy implementation. The idea is that firms previously importing an intermediate input that was later subjected to NAILs are more exposed to the policy, resulting in a higher increase in their production costs. We then use the firm-level exposure to NAILs as a firm-level shock to a firm's production costs to examine how firms downstream respond to these shocks in terms of imports, exports, and employment. This study provides the first causal evidence of how non-tariff barriers on inputs influence these three key economic dimensions.

Our first finding is that the exposure to this policy significantly affected firms' import activities. Not surprisingly, firms with greater exposure to NAILs not only reduced their overall imports but also their likelihood of importing. This pattern proves that NAILs were effective as a non-tariff import barrier, which might have significantly affected firms' production costs.

Once we have established that NAILs effectively reduce imports, we investigate their impact on firms' exports and employment. Our analysis provides the first causal evidence that non-tariff barriers to imports, represented by non-automatic import licenses (NAILs), decrease firm exports and employment. Specifically, a 10 percentage point increase in a firm's exposure to NAILs leads to a 6% reduction in exports and a 2% reduction in employment. Firms more affected by NAILs also reduce their export destinations and increase the likelihood to exit export markets and leave operations. In light of our model, this indicates that firms that used imported inputs affected by the policy face an increase in their production costs, leading to an increase in their prices, rendering them less competitive.

We then explore how firms' reactions to NAILs differ across export markets, depending on their relative importance in each market as indicated by their market share. Integrating these findings with our structural model offers new insights into firms' market power in international trade and how market concentration can mediate the overall impact of trade policies. We find that the negative effect of NAILs on exports is smaller in markets where the firm is relatively larger.

To strengthen our identification strategy and validate our findings on heterogeneous responses, we compare the reactions to NAILs of multi-destination firms across their various markets. Considering that more than 95% of Argentina's total exports are explained by firms that export to many markets, understanding their behavior is also relevant in other contexts. Armed with the structure of the model, we develop a methodology that requires a large exogenous cost shock to ensure enough variability for including firm-year fixed effects and being able to compare responses across different destinations. NAILs can provide such a shock. We find that a firm's responses in export markets to firm-level exposure to NAILs vary by its market share in each destination. A firm re-

to have influenced imports and exports, thereby complicating the identification of non-tariff barrier effects after 2012. Subsequent studies, such as that by Atkin et al. (2024), address some of these complexities and explore the effects of Argentina's discretionary policy between 2012 and 2015 on import prices.

duces less its exports and maintains prices more stable in markets where the firm's market share is relatively higher. This implies that even the same firm responds differently in different markets depending on its market power in each market.

The fact that firms respond less in markets where they have higher market power has broader implications for understanding how market concentration mediates the impacts of trade barriers. Following the structure of the model, we analyze the effects of NAILs at the sector-destination level and observe that the impact is less in markets with higher concentration, as indicated by the Herfindahl-Hirschman Index. This suggests that in more concentrated markets, consumers are less affected by trade policy.

Explaining the nature of the observed behavior is at the core of this paper. Therefore, to guide the empirical analysis and quantify the effects of NAILs, we develop a model of exporting and importing that incorporates variable markups. On the demand side, the framework incorporates variable markups to a standard model of heterogeneous firms, closely following the analysis in Atkeson and Burstein (2008a).[3] On the supply side, firms have a CES production function combining imported intermediate inputs. We assume that firms draw core productivity and combine inputs in a CES production. We further assume that input markets are perfectly competitive as it is standard in the importing literature.

We demonstrate that our empirical results reveal new aspects of market structure in international trade. They are consistent with a model of oligopolistic competition in export markets, characterized by variable markups at the firm-by-destination level. In response to cost shocks induced by non-tariff barriers to imports, exporters strategically adjust their markups more significantly in markets where they have a larger market share. This strategy allows exporters to mitigate some of the shock's impact by reducing their markups, thereby maintaining more stable prices and quantities in markets with greater market power. This dynamic has broader implications: in more concentrated markets, characterized by a high Herfindahl index, the impact of non-tariff barrier shocks is lower because larger firms in these markets tend to keep prices more stable.

Our paper contributes to four strands of the literature. First, our paper relates to the papers that studies the effects of trade policies (Albornoz et al. (2021), Amiti and Konings (2007), Amiti et al. (2019), Bas (2012), Cole and Eckel (2018), De Loecker et al. (2016), Fajgelbaum et al. (2020), Flaaen et al. (2020), Flach and Gräf (2020), Goldberg et al. (2010), Romalis (2007)). Our paper is the first to analyze the causal impact of non-tariff trade barriers that restrict the quantity of goods that can be imported, such as import quotas, import licenses, or import bans. Our particular focus is on non-automatic import licenses. [4]

On this ground, Atkin et al. (2024) analyzes the effect of a similar policy of discretionary import licenses in Argentina 2013-2015 on import prices. Our study complements their work in two ways. First, while Atkin et al. (2024) focuses solely on the effect of import licenses on import prices, we demonstrate that an important aspect of such policies is that they can affect downstream firms' production, employment, and export dynamics by increasing production costs. Secondly, by uti-

[3]The main conclusions regarding variable markups hold in a wider class of models of trade that have been used in recent papers. However, the direction of the elasticity of markups with respect to the firm's market share is model-specific. See, for instance, Arkolakis and Morlacco (2017) for a review of different ways of incorporating variable markups.

[4]Nicita and Gourdon (2013) shows that non-automatic licenses are the most used measure to control import quantities and they are specially implemented in developing countries.

lizing the staggered implementation of Non-Automatic Import Licenses (NAILs) between 2005 and 2011, and noting that not all products were included in the system at the same time, we can more accurately estimate the causal impacts of import licenses on firm-level outcomes.[5] More similar to our work, Ghose et al. (2023) study a ban to fertilizers imports in Sri Lanka. While this paper focuses on a particular input and effects on the agricultural sector, we analyze a larger-scale trade policy involving more than 600 products and affecting firms in the manufacturing sector.

We extend the analysis to the effect on the labor markets. While some of the literature has focused on the effect of trade policies on labor markets (Autor et al. (2013), Caliendo et al. (2019), Dix-Carneiro (2014), Gurkova et al. (2023)), to our knowledge, we are the first to study the impact of non-tariff trade barriers (through their effect on imports) on wages and employment.

Second, our paper is also related to the literature that studies the different margins of adjustment of firms to trade policy, viewed as a cost shock (De Loecker et al. 2016). We document a previously unexplored dimension of firm heterogeneity. We highlight the importance of the elasticity of markups for a given firm, across its export destinations. Previous papers have documented in the cross-section of firms that a given firm, charges different prices across destinations (Manova and Zhang (2012)). However, these papers have not analyzed how these prices respond to shocks specific to the firm. We show that firms adjust not only product scope and total export volumes, but also their markups across destinations. In making decisions, multi-destination firms optimally decide to adjust more their markups to cost shocks in markets where they have higher market shares. As most of the trade flows are concentrated in a few firms that export to many markets, this margin of adjustment could potentially be important to estimate welfare gains from trade. In addition, this may have consequences on the distribution of gains from unilateral trade liberalization in foreign countries.

In a similar note contribute to a growing literature that studies heterogeneous responses of firms but in the context of exchange rate movements and incomplete exchange rate pass-through. For instance, Berman et al. (2012) find that higher performance firms tend to absorb exchange rate movements in their markups so that their average prices in the foreign market are less sensitive. Amiti et al. (2016) also show the existence of variable markups in the domestic market and analyze the role of strategic complementarity. However, these papers do not analyze differential responses in foreign markets and don't take a stand on whether a firm adjustment depends on characteristics specific to the firm-destination. More similar to ours is Amiti et al. (2015), which decomposes the exchange rate pass-through into the role of firms marginal costs, import intensity, and market power of a firm in a given market and do analyze adjustments of firms depending on their market share. [6] We innovate by exploiting an import costs shock (supply shock) that let us identify the markup elasticity and how it depends on market share of the firm in different markets while holding constant demand shocks. By comparing the same firm across destinations, our estimate can be interpreted as a more accurate estimate of the super-elasticity of markup, or as an estimate of a new super-elasticity.

[5] Post-2012, all products became subject to import licenses. Concurrently, the government began regulating discretionary dollar purchases by firms, which complicates the precise identification of the effects of the import licenses.

[6] However, their focus on bilateral exchange rates (demand shock) is not the most convenient setting to specifically test whether firms adjust differently their markups in different markets because a) a bilateral exchange rate shock may not hold demand constant, and b) the shock provides less variability for a firm across destinations. Hence, their analysis focuses on comparing firm-responses within a given destination.

Third, we contribute to the literature on market power and seller market power (Atkeson and Burstein (2008b), Atkin and Donaldson (2015), Bergquist and Dinerstein (2020), Rubens (2023)) Several models of market power feature a closed form for markups or markdowns as a function of firm size and the elasticities of substitution within and across markets (Alviarez et al. (2020), Asturias et al. (2019), Atkeson and Burstein (2008b), Berger et al. (2022), Felix (2021)). Our contribution to this body of work is the identification of a super-elasticity of markups for each market. More broadly, by extending our results to the market level, we contribute to the growing literature on market concentration (Amiti and Heise (2024), Burstein et al. (2020), Juarez (2024), Zavala (2022)).

Finally, we provide new insights into the causal elasticity of firm-level exports with respect to imports, contributing to recent literature that studies the specific interplay between importing and exporting activities. Surprisingly, only a few papers have investigated how imports of intermediate goods causally affect exports (Albornoz and Garcia-Lembergman (2022), Feng et al. (2017), Kasahara and Lapham (2013)).

The remainder of the paper is structured as follows. We begin Section 1 by describing the data and documenting patterns in the data that guide our theoretical and empirical approach. Section 2 develops the theoretical framework. In Section 3 we describe the empirical strategy, the policy that we exploit, and discuss our identification assumptions. In section 4, we present the main results. We conclude in section 5.

2 Data and descriptive statistics

2.1 Data Sources

To study the effects of import licenses in Argentina, we combine three datasets: a dataset with information on the effective non-automatic Import Licenses policy in Argentina, Customs Data, and Employment Data.

To gather information on non-automatic import licenses, we compiled a database including monthly data on non-tariff barriers for various products in Argentina from 2002 to 2011. This database was constructed by tracking and digitizing executive decrees issued during this period using the InfoLEG website for each specific resolution[7]. Each decree was publicly recorded to specify the month and year an administrative barrier was imposed on products at the HS-8-Digit level. Detailed information about this policy can be found in the empirical strategy Section 2.2.

Administrative data from Argentinian Customs provides a comprehensive panel covering the entirety of Argentinian trade flows. This panel has a monthly frequency and spans from 2002 to 2011. For exports, the dataset contains information on the exporter ID, the destination country, the traded product, the transaction value, the quantity, and the unit. For imports, the dataset includes the importer ID, the country of origin, the product, the trade value, the quantity, and the unit. In both cases, the products are classified at the most detailed aggregation level (12-digit level, which includes the HS 6-digit level plus 6 additional digits specific to Argentina).

[7] Appendix A.3 shows an example of one resolution available on the website, the Resolucion 1660/2007.

Employment information is obtained from the Administracion Federal de Ingresos Publicos (AFIP). The Formulario 931 in Argentina, issued by AFIP, is a mandatory monthly declaration that employers must submit. This form records the contributions and withholdings made by employers for their employees to the social security system. In Formulario 931, employers report detailed information on the number of workers and of the wages they receive [8]. We merge these data, using a unique firm identifier, with firms' employment and main sector of activity (CLAE-6digits), comprising the universe of formal sector.

We restrict the sample to only manufacturing that were active and imported for at least 1 year in the period 2003-2007. Hence, we focus on the 12.896 manufacturing firms that exported from 2002-2007. More details on the data cleaning process are described in Appendix A.2.

2.2 Non-Automatic Import Licenses (NAILs) policy

Governments have various tools to discourage imports allowed by the WTO, including tariff measures (a tax applied to imported products, whether ad-valorem or a fixed amount), measures against unfair trade (such as anti-dumping, safeguards, and countervailing measures), technical barriers to trade (which impose minimum quality requirements on products), and import licensing (a permit that allows an importer to bring in a specified quantity of certain goods during a specified period), among others.[9]

In the WTO agreement, Import Licensing Procedures take two forms: Automatic Import Licensing and Non-Automatic Import Licensing (NAILs). Automatic import licensing procedures are generally used to collect information about imports and are not administered in a manner that restricts imports.[10]In contrast, Non-automatic import licensing procedures (NAILs) are used, among other policy objectives, to administer quantitative restrictions and tariff quotas supported by the WTO legal framework. Non-automatic import licensing procedures are much more complex and may imply significant transaction costs for importers of the affected items. In particular, it can take up to two months to process an application, and approval is not guaranteed. In practice, NAILs function as a non-tariff barrier to trade.

Currently, 67 economies notify the WTO of their use of non-automatic licenses.[11] Figure 1 shows the countries with the largest share of imports subject to NAILs. The economies with the highest use of this instrument are emerging countries (excluding Israel, which heads the list). In the next sections, we will focus on the application of NAILs in Argentina until 2011. In that year, Argentina had 17% of its imports subject to NAILs. Currently, only four countries exceed that level, which suggests that the magnitude of this policy was significant.

Higher values of product coverage do not necessarily indicate that non-automatic licenses are be-

[8]Failure to submit Formulario 931 can result in various penalties and the loss of social security benefits for employees, as their contributions will not be registered correctly with the relevant authorities.

[9]Each of these instruments requires different periods of time to be applied. For example, Argentina's tariff measures are determined under Mercosur's common external tariff, with limited scope for individual deviation. Measures against unfair trade require an investigation to demonstrate genuine injury to the competing domestic industry.

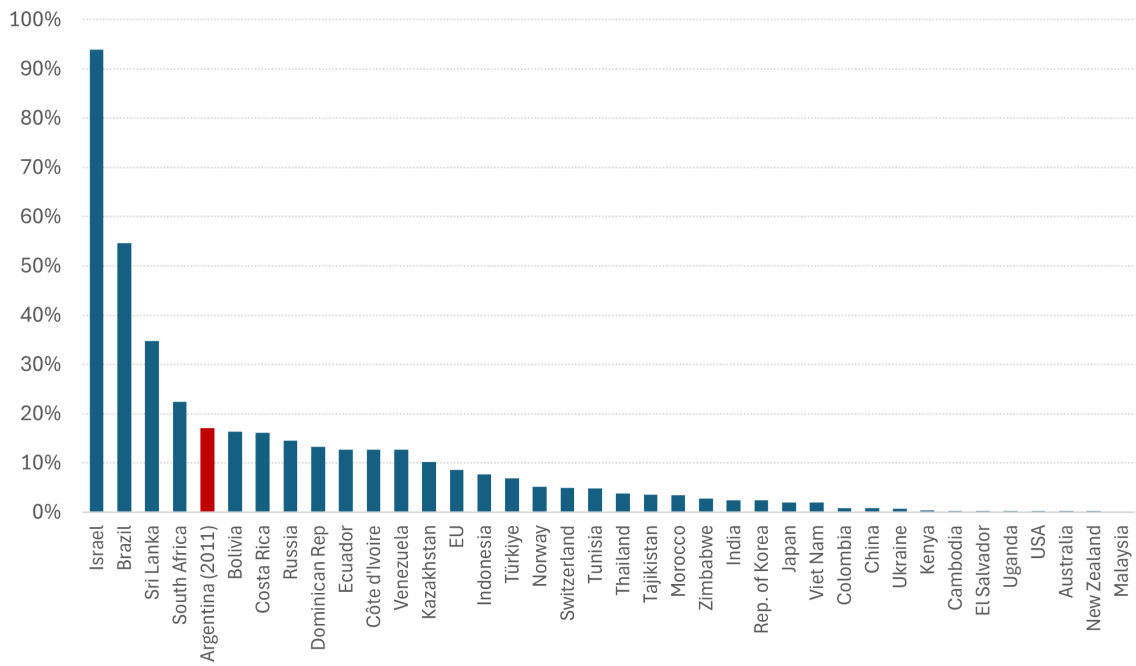
[10]In fact, approval of the import application through Automatic Licenses is granted in all cases. According to their definition (i), any person fulfilling the legal requirements should be equally eligible to apply for and obtain import licenses (non-discrimination); and, (ii) the application shall be approved immediately on the receipt when feasible or within a maximum of 10 working days.

[11]Since EU countries are represented as a bloc, 93 countries are implementing non-automatic licenses.

ing used as an import barrier; this depends on the policy objectives of each government. Typically, notifications to the WTO cite objectives such as "preserving human and animal health," which involves verifying compliance with other regulations, or "administering trade," where authorization may depend more on an economic authority.

However, in the most recent WTO Trade Policy Review, four out of the five countries with the highest shares of imports subject to NAILs received concerns from their trading partners regarding the management of import licenses.

Figure 1: Imports with NAILs by country (% of total imports)



Notes: The figure shows the share of total imports by country that were subject to NAILs

Source: World Trade Organization (WTO)

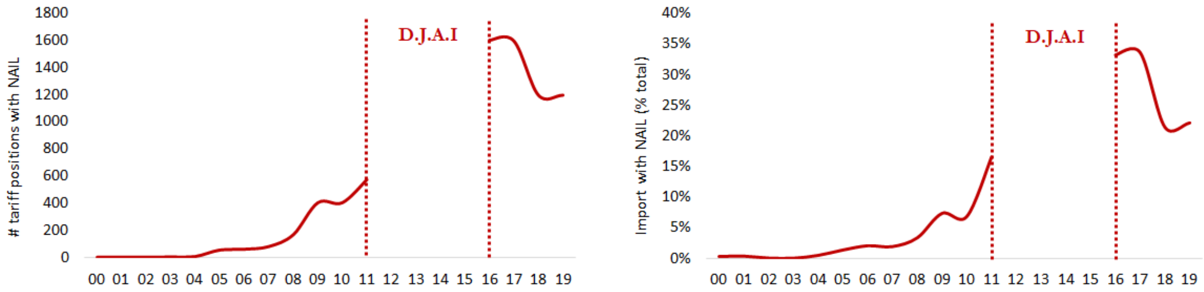
To better understand the effect of this policy, it is important to examine the types of affected products. We group the products in the tariff nomenclature according to broad economic categories to distinguish the use of the products affected by the NAILs. On average, 44% of imports with NAILs are inputs, mainly represented by basic chemicals, machinery parts, and agricultural products. Additionally, one out of every three imported dollars subject to NAILs is for consumer goods, including products that may pose a risk to public health or safety, such as products of animal origin, pesticides, and weapons. Finally, capital goods represent only 17% of imports with NAILs, primarily vehicles, electrical machinery, and equipment.[12]

[12]Regarding products, those that may pose a risk to public health and safety are frequently subject to NAILs. Within this group, basic chemicals, explosives, weapons, and ammunition stand out. For example, in the case of Brazil, all agricultural products and their derivatives are subject to NAILs mainly to verify compliance with other standards (pest risk analysis, export establishment qualification, product registration, importer establishment registration). Additionally, other industrial products that usually require NAILs include vehicles and machinery.

2.3 NAILs in Argentina

Argentina adhered to the Uruguay Round agreement, and since 1995, it has incorporated the protocol of the import licensing regime into its legislation. Figure 2 shows the evolution of the application of NAILs in Argentina. The figure on the left shows the evolution of tariff positions reached by NAILs and the right displays the share of imports covered by this regime [13]. The first licenses were established in October 1999 and covered 4 tariff positions in the paper sector. These were the only licenses in force until December 2003 when bicycles were incorporated. From 2005 to 2011, the Argentine government systematically increased the number of products in the NAILs, usually intending to fix external sector imbalances. At the end of 2011, the number of products in NAIL list was 6 times higher than the products listed in 2007. That evolution is similar to the share of imports covered by this regime. While until 2008, NAILs only affected less than 5% of the imports, this value grew to 17% in 2011.

Figure 2: Evolution of NAIL in Argentina



Notes: The graphs show the evolution of the NAIL in Argentina. The first panel illustrates the amount of products at the HS8 level that where affected by the policy. The second panel shows the share of import flow affected by the policy throughout the years. Source: Centre of Documentation and Information (CDI) in Argentina.

Until 2011, NAILs represented the only significant policy change related to imports. There were no new trade agreements in force, tariffs had been established in the mid-1990s by Mercosur with limited room for deviation, and other trade barriers, such as anti-dumping and technical measures, had a limited scope.

In 2012, the Argentinian government implemented more restrictive import controls by replacing the NAIL regime with the Advance Sworn Declaration of Import (D.J.A.I., for its initials in Spanish). This new regime was similar to NAILs but covered all tariff positions.[14] This measure was combined with strict controls on foreign currency acquisition. Every importer, after having their import request approved, had to request the acquisition of foreign currency from the central bank. If the foreign currency was not obtained, the importer had to either discard the import order or acquire the foreign currency on the parallel market, which had a higher exchange rate than the

[13] As a reference, there are approximately 10,000 products on the Nomenclatura Común del Mercosur

[14] Its application was questioned internationally and led to a WTO panel dispute settlement, where Argentina was ruled against in 2014 (and the ruling was ratified in 2015). In this ruling, it was highlighted that, as a requirement to import, the Argentine authorities requested importers to offset the value of imports with an equivalent value of exports, reach a certain level of national content in production, make investments in Argentina, and abstain from repatriating profits.

official market. Since it is not possible to isolate the effect of NAILs after 2012, we restrict our analysis to the period 2003-2011.

Table 1: Exposure to NAIL in Argentina 2011

	Total firms	Non exporters	Exporters
Number of firms	19678	12970	6708
Share of importers	23%	13%	42%
Sh. of firms exposed to NAIL	35%	28%	48%
Sh. of imports subject to NAIL	10%	10%	10%
Sh. of imports subject to NAIL (if exposed)	30%	37%	22%

Notes: Share of imports refers to the average of all firms. Exposed firms are those that import in the base period at least one product with NAIL in 2011.

A remarkable feature of the NAILs regime in Argentina is that it affected many different companies. In Table 1, we can see that only 23% of the 19,678 companies that imported during our base period remained importers in 2011. However, 35% were exposed to NAILs, meaning they imported at least one product during the base period that was subject to NAILs in 2011. Within the group of exposed companies, one-third of their imports required government authorization to proceed. The subset of firms that exported were proportionally more affected by this instrument. Almost half of these companies were exposed to NAILs, and 42% continued importing in 2011. However, within the exposed group, the share of their imports requiring NAILs was 22%.

3 Model

Consider a static small open economy where local firms import their intermediate inputs and export their output. As is standard in the literature, importing inputs from abroad reduces firms' unit cost of production, but it is subject to fixed costs (Antras et al. (2017), Blaum (2017), Blaum et al. (2013), Edmond et al. (2015), Halpern et al. (2009)).[15] Firms sell their products to k foreign markets, which differ in demand. Guided by the patterns in the data described below, there is imperfect competition, and firms charge variable markups in each market. [16]

Our model offers an alternative way to measure the average elasticity of markups with respect to prices when information on unit costs or prices is not easily available.[17] In particular, it suggests that it is possible to estimate it using only information on the firm's total imports and exports.

3.1 Demand

Consider a firm producing in sector s, at year t, a differentiated good i supplying it to destination market k in period t. Consumers in each market have a nested CES demand over the varieties of goods. In particular, provided exporting to market k, a firm i faces the following demand:

[15] The theoretical section will focus on the intensive margin of exports and imports. However, we also show results on the extensive margin in the empirical section.

[16] Our model follows closely Atkeson and Burstein (2008a) and Amiti et al. (2015) variable markups model.

[17] Even when available, unit cost and price information is typically measured with error.

$$Q_{ik} = \gamma_{ik} P_{ik}^{-\rho} P_k^{\rho-\eta} D_k,$$

where γ_{ik} is a taste shock for the final good of firm i in market k, P_{ik} is the price of the firm in market k, P_k is the price index in the sector in which the firm operates, D_k is the size of market k. ρ denotes the elasticity of substitution across the varieties within sectors, while η stands for the elasticity of substitution across sectoral aggregates. We assume that $\rho > \eta > 1$ [18]. This demand endogenously generates variable markups that depend on a firm's market share in market k defined in the following way:

$$S_{i,k} = \frac{P_{i,k} Q_{i,k}}{\sum_{i'} P_{i',k} Q_{i',k}} = \mu_{i',k} \left(\frac{P_{i',k}}{P_k} \right)^{(1-\rho)}.$$

Note that the effective demand elasticity for Cournot competition for firm i in market k is given by [19],

$$\sigma_{i,k} = \left(\frac{1}{\rho}(1 - S_{i,k}) + \frac{1}{\eta} S_{i,k} \right)^{-1}$$

As $\rho > \eta$, this elasticity is decreasing in the firm's market share. Intuitively, when a large firm changes its price, it also affects considerably the sectorial price index. Hence, market demand for those firms is less responsive to changes in their own price.

Then, the markup, $\mathcal{M}$, is given by

$$\mathcal{M}_{i,k} = \frac{\sigma_{i,k}}{\sigma_{i,k} - 1} = 1 + \left[\frac{1}{\rho}(S_{i,k} - 1) - \frac{1}{\eta} S_{i,k} \right]^{-1} \tag{3.1}$$

3.2 Import Decision and unit costs

We consider a standard framework of import behavior where firms' import decisions are the solution to a maximization problem. The import behavior of the firm, along with its productivity draw, determines its unit costs. Since foreign suppliers can be more efficient at producing some of the intermediate varieties, firms may be willing to demand imported inputs to reduce the unit cost of production. A measure N of final-good producers each produce a single differentiated product. Firms are characterized by a heterogeneous attribute φ that is interpreted as core productivity. In the same way as in Melitz (2003), this parameter is exogenously drawn from a probability distribution $g(\varphi)$ and revealed to the firms once they start to produce. The production function takes the following CES form:

$$Q = q(z) = \varphi \left[\sum_v (z_v)^{\frac{\theta-1}{\theta}} \right]^{(\theta/\theta-1)}$$

[18] The intuition behind this assumption is that it is less costly for a consumer to substitute between varieties than sectors.

[19] In Appendix C.2 we solve the same problem but for Bertrand competition. Under both formulations, the following definitions and predictions on the paper hold.

where z_v denotes the amount of imports of product variety v (item p sourced from market j) and $\theta > 1$ is the elasticity of substitution of inputs. For the moment, we will not focus on the source market. Let's assume there is only one market from which the firm can source inputs. Hence, $v = product$ from that market.[20] Importing variety v involves a fixed cost (κ^m), which, in this section, we assume is common across firms and sources. We further assume that firms take input prices, adjusted by quality, as given. They are determined by characteristics specific to the origin-product, A_v (i.e, quality, technology, and wages in country j for producing product p), and bilateral trade costs specific to the firm-variety (τ_{iv}):

$$P_v = \frac{\tau_{iv}}{A_v}$$

3.3 Firm Import Behavior in Equilibrium

In this subsection, we briefly analyze the firm's behavior in equilibrium. We define a sourcing strategy Ω as the set of input varieties v, so the firm imports positive amounts of these varieties. First, we will focus on the firms' decisions, conditional on the sourcing strategy Ω.

3.3.1 Optimal amount of imports conditional on sourcing strategy

To obtain the number of imports of a variety v, the firm minimizes its cost function, which is subject to its production function.

The optimal quantities of variety v are given by,

$$z_v^*(\varphi, \Omega, Q) \equiv arg \min_{z_v} \sum_{v \in \Omega} p_v z_v \text{ s.t } Q = \varphi \left[\sum_{v \in \Omega} (z_v)^{\frac{\theta-1}{\theta}} \right]^{(\theta/\theta-1)} . \tag{3.2}$$

After solving, we get the following expression,

$$z_v(\varphi, \Omega, Q) = \frac{Q}{\varphi} \frac{\left(\frac{1}{p_v}\right)^{\theta}}{\left[\sum_{(v) \in \Omega} \left(\frac{1}{p_v}\right)^{\theta-1} \right]^{\theta/\theta-1}} \qquad \forall v \in \Omega, \tag{3.3}$$

which corresponds to the following imports value,

$$p_v z_v(\varphi, \Omega, Q) = \frac{Q}{\varphi} \frac{\left(\frac{1}{p_v}\right)^{\theta-1}}{\left[\sum_{v \in \Omega} \left(\frac{1}{p_v}\right)^{\theta-1} \right]^{\theta/\theta-1}} \qquad \forall v \in \Omega, \tag{3.4}$$

After solving for the intensive margin of imports for any variety corresponding to the firm sourcing strategy (Equation 3.4), obtaining the minimum unit cost function for a given strategy is straight-

[20] This leads to the same prediction as Antras et al. (2017), where the gains from variety come from the productivity draws of foreigners, which follow a Fréchet distribution function similar to that proposed by Eaton and Kortum.

forward;

$$c_i = \frac{h(\Omega)}{\varphi} = \frac{1}{\varphi}\left[\sum_{v\in\Omega}\left(\frac{1}{p_v}\right)^{\theta-1}\right]^{-\frac{1}{\theta-1}} = \frac{1}{\varphi}\left[\sum_{v\in\Omega}\left(\frac{A_v}{\tau_{iv}}\right)^{\theta-1}\right]^{-\frac{1}{\theta-1}} = \frac{1}{\varphi}\left[\Phi\right]^{-\frac{1}{\theta-1}}, \tag{3.5}$$

where $h(\Omega)$ is the part of the unit cost given by inputs. We define the sourcing capability of a firm as,

$$\Phi_i = \left[\sum_{v\in\Omega}\left(\frac{A_v}{\tau_{iv}}\right)^{\theta-1}\right].$$

Therefore, the total amount of imports of intermediate goods of firm i is given by,

$$M_i(\Omega) = \frac{Q_i}{\varphi}\left[\sum_{v\in\Omega}\left(\frac{A_v}{\tau_{iv}}\right)^{\theta-1}\right]^{-\frac{1}{\theta-1}}, \tag{3.6}$$

and the expenditure share of firm i on imported variety v is given by,:

$$\begin{aligned} m_{iv}(\Omega) &= \frac{\left(\frac{A_v}{\tau_{iv}}\right)^{\theta-1}}{\left[\sum_{v\in\Omega}\left(\frac{A_v}{\tau_{iv}}\right)^{\theta-1}\right]} && \forall v \in \Omega; \\ m_{iv}(\Omega) &= 0 && \forall v \notin \Omega \end{aligned}$$

By Shepard's Lemma:

$$\frac{\partial log c_i}{\partial log \tau_{iv}} = m_{iv} \tag{3.7}$$

Note that the model predicts that the barrier to import has a higher impact on costs [21], the larger the share of the firm's expenditure on the input affected by the barrier. In our empirical section, we use this to construct our firm-level shock.

3.4 Price setting

Given a sourcing strategy, with its corresponding unit cost $c_i(\Omega, \varphi)$, solving for optimal price in market k is standard:

$$P_{ik} = \frac{\sigma_{ik}}{\sigma_{ik}-1}c_i(\Omega, \varphi) \tag{3.8}$$

PROPOSITION **1.** *Holding constant the sectoral price P_k, the elasticity of price with respect to a tariff to input v of firm i is given by,*

$$\frac{d\log P_{ik}}{d\log \tau_{iv}} = \frac{1}{1+\Gamma}m_{iv}$$

[21] In what follows, we omit the argument Ω, as we will not derive conclusions on the extensive margin of imports.

Proof.

$$P_{ik} = \mathcal{M}(\frac{P_{ik}}{P_k})c(\Omega, \varphi)$$

$$d\log P_{ik} = -\Gamma(d\log P_{ik} - d\log P_k) + \frac{\partial \log c(\tau, \varphi)}{\partial \log \tau_{iv}} d\log \tau_{iv}$$

$$\frac{d\log P_{ik}}{d\log \tau_{iv}} = \frac{1}{1+\Gamma}\frac{\partial \log c(\Omega, \varphi)}{\partial \log \tau_{iv}}$$

Applying Shepard's Lemma and rearranging we have the result:

$$\frac{d\log P_{ik}}{d\log \tau_{iv}} = \frac{1}{1+\Gamma} m_{iv}$$

□

We hold constant P_k, as we do so throughout the empirical section by including sector-year FE in every specification. If markup is constant, then the effect of a tariff to a intermediate input on price is equivalent to the initial share of the input that the firm was using m_{iv}. In contrast, if markups are variable, we expect that the impact is lower for larger firms which have a higher Γ. This will be a key feature to explain differential effects of (lack) of access to intermediate inputs on exports depending on the relative position of the firm in the market.

3.5 Revenues in equilibrium

Revenues for firm i in market k are given by:

$$R_{ik} = \frac{1}{\mathcal{M}_{ik}^{\rho-1}} \frac{\varphi^{\rho-1}}{h_i^{\rho-1}} P_k^{\rho-\eta} D_k, \tag{3.9}$$

and total revenues of a firm are given by, [22]

$$R_i = \frac{\varphi^{\rho-1}}{h_i^{\rho-1}} \sum_k \frac{1}{\mathcal{M}_{ik}^{\rho-1}} P_k^{\rho-\eta} D_k, \tag{3.10}$$

3.6 Predictions

The model generates two sets of predictions that will guide our empirical section. The first set of results is firm-destination specific. We establish the direct effect of increased trade barriers for a given input on the firm's exports in each market k. This proposition predicts the expected responses of a multi-destination firm in its different markets, depending on variable markups and characteristics of the firm-destination. The second set of results are at the firm level. These predictions show

[22] Note that when we extend the model to allow for entry and exit into import and export, lower costs through higher inputs may impact results.

how trade barriers affect total export revenues and total imports and guide the estimation of the elasticity of exports for imports at the firm level.

We first establish the effect of import cost shocks on export revenues in a given market k.

PROPOSITION **2** (Firm-destination responses).

A. *Provided $\rho > 1$, revenues in market k are weakly decreasing in the costs of importing variety v (τ_{iv}). In addition, the effect is larger (more negative), the higher is m_{iv}:*

$$\frac{\partial \log R_{ik}}{\partial \log \tau_{iv}} = (1-\rho)\left[\frac{1}{1+\Gamma_{ik}} m_{iv}\right] \leq 0 \tag{3.11}$$

$$\frac{\partial \log R_{ik}}{\partial \log \tau_{iv} \partial m_{iv}} = (1-\rho)\left[\frac{1}{1+\Gamma_{ik}}\right] \leq 0 \tag{3.12}$$

B. *The effect of increasing import costs on exports to market k is weakly decreasing in the elasticity of markup Γ_{ik} (it is strictly decreasing if markups are not constant):*

$$\frac{\partial \log R_{ik}}{\partial (\log \tau_{iv} \partial m_{iv}) \partial \Gamma_{ik}} \geq 0 \tag{3.13}$$

Proof. Proofs are straigh-forward from the inspection of equations above. See appendix. □

We now turn to analyze the effects at the firm level.

PROPOSITION **3** (Firm level predictions).

A. ***(Effect on total exports)*** *The effect on total exports is negative and decreasing in the size of the firm.*

$$\frac{\partial \log R_i}{\partial \log \tau_{iv}} = (1-\rho)\sum_k \frac{R_{ik}}{R_i}\left[\frac{1}{1+\Gamma_{ik}} m_{iv}\right] < 0 \tag{3.14}$$

B. ***(Effect on total imports)*** *Provided $\rho > 1$, imports are weakly decreasing in the trade costs of importing variety v (τ_{iv}). In addition, the negative effect is stronger, the higher the share of firm's imports corresponding to v:*

$$\frac{\partial \log M_i}{\partial \log \tau_{iv}} = -m_{iv}\left[\rho \sum_k \frac{Q_{ik}}{Q_k}\frac{1}{1+\Gamma_{ik}} - 1\right] \leq 0 \tag{3.15}$$

$$\frac{\partial \log M_i}{\partial (\log \tau_{iv} \partial m_{iv})} = -\left[\rho \sum_k \frac{Q_{ik}}{Q_k}\frac{1}{1+\Gamma_{ik}} - 1\right] \leq 0 \tag{3.16}$$

C. ***(Elasticity of exports with respect to imports)*** *The total amount of exports of a firm are increasing on the amount of imports of the firm. That is,*

$$\mathcal{E}_{XM} = \frac{\frac{\partial \log R_i}{\partial \log \tau_{iv}}}{\frac{\partial \log M_i}{\log \tau_{iv}}} = \frac{\partial \log R_i}{\partial \log M_i} = \frac{(1-\rho)\sum_k \frac{R_{ik}}{R_i}\left[\frac{1}{1+\Gamma_{ik}}\right]}{1-\rho\left[\sum_k \frac{Q_{ik}}{Q_k}\frac{1}{1+\Gamma_{ik}}\right]} > 0 \tag{3.17}$$

Proof. See proof in Appendix C.5. □

It is worth noting that total imports' reaction to changes in import costs also depends on how variable markups are. This is not explained by direct raises to unit costs but by the fact that variable markups affect the quantity the firm needs to produce and, thus, total imports. The literature has less stressed the relation between variable markups and imports.[23] The model provides predictions about the elasticity of total exports for total imports in the presence of variable markups in Section 6.

4 Empirical Strategy

In this section, we put together the model intuitions with a supply shock to import costs of specific products (i.e.: τ_{iv}), combined with information on the share of imports of the products of a firm m_{iv}. On this ground, we exploit exogenous variability in import costs to specific products from when the Argentinian government imposed (non-tariff) barriers to imports of specific products between 2002 and 2011. We combine the timing of the restrictive policy to a product with data on the share of that product on the firm's total imports before the policy took place.

In the following subsections, we describe the context, the policy, the identification assumptions, and how we implement the empirical strategy.

4.1 Methodology

We use the policy described above to construct a cost shock for a firm. In particular, to construct a time-varying firm-level variable that proxies a firm's exposure to import barriers, we proceed as follows: we use the import basket of the firm in the period 2002-2006 (before the large increase in the products included in this policy) and calculate the share of the firm's expenditure on imported inputs that corresponds to each product v ($m_i v$). Then, holding this share constant over time, we multiply it by an indicator that takes a value of 1 in those years when the product is affected by the NAILs. Then, we sum across products for a given firm. Formally, we define a firm's exposure to NAILs in time t as,

$$NAILexposure_{it} = \sum_{v} m_{iv} NAIL_{vt}, \tag{4.1}$$

where m_{iv} represents the share of expenditure on imported input v in the period 2002-2005 and $NAIL_{vt}$ is an indicator that takes value 1 if the product v is affected by NAILs in period t.

Intuitively, guided by Proposition 6.B., we assume that a firm is more exposed to the import shock, the higher the initial share of expenditure that corresponded to the affected product in the period before the policy took place.

[23] A reason for this might be that the interest relies on unaffected unit costs.

4.2 Relevance of the policy and identifying assumption

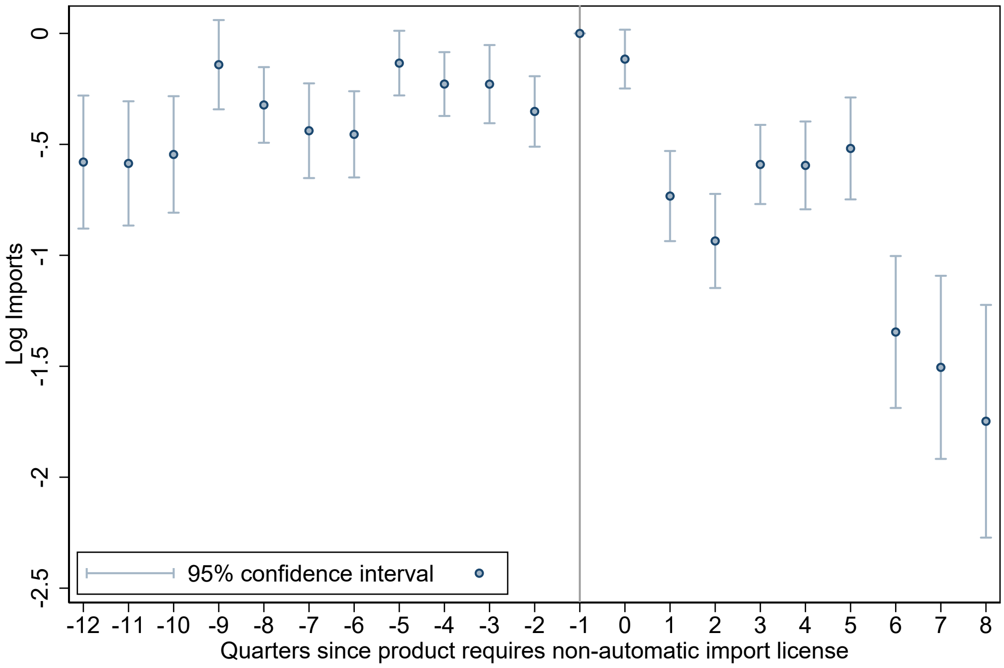
4.2.1 Effectiveness of the NAILs in reducing imports

Before moving to the paper's main results, we first explore whether the NAILs effectively reduced imports of items that were added to the list. To do so, we perform an event study at the product level to analyze if being added to NAILs, reduces imports of an item at the HS-8-digits level. Formally,

$$\log(Imports_{vt}) = \sum_{j=-27}^{12} \beta_j 1[QuartersSinceNAILs_{vt} = j] + \alpha_v + \gamma_t + u_{vt}, \tag{4.2}$$

where the negative values correspond to years before product v entered the NAILs list. We focus on parameter β that represents the impact of the incorporation of NAIL on products' imports. Figure 3 plots the coefficients β. [24] We do not observe systematic differences in the years before the product was added to the NAIL system. As expected, the NAILs work as an important barrier to trade, especially since the second quarter after the product was included in the policy.[25] We find that imports of a product that is added to the NAILs list decline by 50% the first year relative to its counterfactual.

Figure 3: Event study. The impact of Non Automatic Import License on $\log(imports)$.



Notes: The figure shows the effects on the log of import values up to 8 quarters after the imposition of the non-automatic import license and the pre-trend from 12 quarters before between 2002Q1 and 2010Q4. Standard errors are clustered at the HS-8 level.

[24] We restrict the sample to those products that entered at some point into the NAILs system.

[25] In the first months, importers used previously approved automatic licensing to imports, so NAILs might require some months to affect the firm effectively.

4.2.2 Identification assumption

Once we have proven that including a product in the NAILs, system reduces the value of imports of that product, we want to test our identification assumption. Our main identification assumption is that the timing in which a product enters the NAILs system is not correlated with changes in the firm's export decisions and/or characteristics of the destination market. In other words, the evolution of exports in firms that were more exposed to NAILs would have been similar to the evolution of exports of firms less exposed in the absence of the policy. One of the main threats to our identification assumption is reverse causality. It could be the case that the government targeted products used by firms that were predicted to experience a decline in exports. Before turning to the results, Figure 4 provides a useful way of both seeing the relevant variation in the data, and of gauging the plausibility of the parallel trends assumption.[26] We construct the graph as follows. First, we define as $t = 0$ the year for which at least one product of the firm was affected. Then, we divide firms into high and low exposure to NAILs, the latter those that are in the lowest 25th percentile of exposure.[27] We then graph the event study for the differences in log (exports) between these groups.

Formally, we run the following regression,

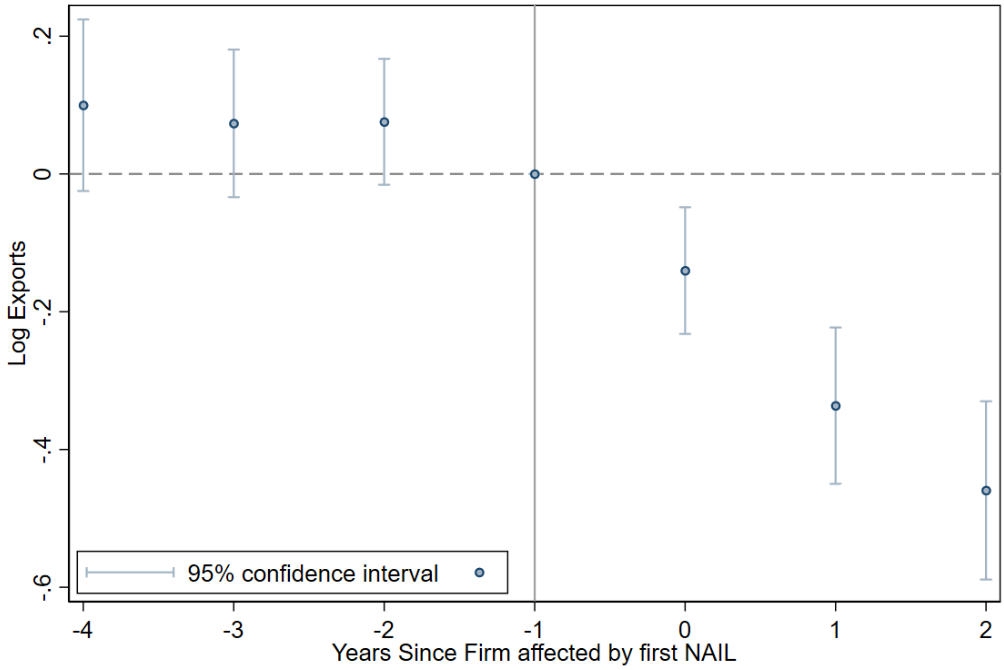
$$\log(exports_{it}) = \sum_{j=-6}^{3} \beta_j 1[YearsSinceExposureToNAILs_{it} = j] + \alpha_i + \gamma_t + u_{it}. \tag{4.3}$$

Figure 4 plots the coefficients β of this regression. Reassuring our intuition, we do not observe any systematic differences in the firms' exports in the years before the firm became affected by NAILs. This suggests that the parallel trend assumption may hold in our context. In addition, the Figure provides a first glance at the results that we will show in the next section: the value of exports is significantly reduced after the firm is exposed to NAILs.

[26] In fact, our main identification assumption is milder. The assumption is that the government did not target inputs that were specifically used for firms to export to markets where they have less market share.

[27] We are aware that the test is not clean since we don't actually have two groups, but it is reassuring to observe that under this arbitrary grouping, we don't observe much going on before the event takes place. In our main empirical strategy, we use the continuous measure of exposure. In addition, the assumptions are even milder for our main results than these parallel trends since we exploit variability across destinations.

Figure 4: Event study. The impact of Nonautomatic Import licenses on firms' logs (exports).



Notes: The figure shows the effects on the export values of the principal product for firms that were exposed to non-automatic licenses up to 2 years after the exposition and the pre-trend from 4 years before. A firm is classified as exposed if at least one of its products imported during 2003-2005 was affected by non-automatic import licenses. Standard errors are clustered at the firm level. Regression includes sector controls.

In this section we documented that the NAILs were actually effective in reducing imports and that the government does not seem to target the NAILs based on the behavior of the exporters that use more intensively those imported inputs.

We now turn to the empirical results of the paper.

5 Results

In this section we present the main results of the paper. First, we document the effect of the policy at the firm level in order to have a sense on the magnitude of the effect of the import barriers on firms' exports. We identify the direct effect of NAILs on exports and the elasticity of total exports with respect to total imports. Then, in Section 6 we use the predictions of the model to identify the elasticity of markup of a firm across its destinations and estimate whether it is increasing on a firm's relative size in the market.

5.1 Firm-level elasticity of exports to imports of intermediate inputs

As discussed in the introduction, there is still scarce evidence about the elasticity of exports with respect to imports of intermediate goods at the firm level. In this subsection, we use the exogenous variation on the timing of the policy to document this elasticity at the firm level.

As Proposition 6.C indicates, this elasticity is given by $\mathcal{E}_{XM} = \frac{\frac{\partial \log R_i}{\partial (\log \tau_{iv} m_{iv})}}{\frac{\partial \log M_i}{(\log \tau_{iv} m_{iv})}}$.

In other words, the elasticity of exports with respect to imports is the coefficient of an IV estimation where the reduced form coefficient and the first stage coefficient are obtained by estimating:

$$\log(Imports)_{it} = \beta NAILexposure_{it} + \gamma_i + \gamma_t + \mu_{it} \tag{5.1}$$

and

$$\log(Exports)_{ist} = \beta NAILexposure_{ist} + \gamma_i + \gamma_t + \gamma_{st} + \mu_{it}, \tag{5.2}$$

where $imports_{it}$, $exports_{it}$ are the value of imports and exports for firm i in year t respectively, $NAILexposure_{it}$ is defined as in equation 4.1, γ_i, γ_t and γ_{st} are fixed effects at the firm, year and sector-year level.

We begin by estimating the reduced form (equation 5.2). According to our model, introducing import barriers to intermediate inputs v increases the marginal cost for firms exposed to this barrier and reduces their competitiveness in foreign markets. Therefore, we expect to observe that those firms that use more intensive products affected by the NAILs, export a lower amount, are less likely to enter an export market, and are more likely to reduce the number of markets that they serve. Results from the estimation of equation 5.2 are reported in Table 2.

Table 2: Reduced form: The effect of NAILs exposure on firm's total exports

	(1)	(2)	(3)	(4)
	$log(exports)_{it}$	$Exportstatus_{it}$	$\#Products$	$\#Destinations$
$NAILexposure_{it}$	-0.6017***	-0.0526***	-0.4186***	-0.2080***
	(0.1032)	(0.0091)	(0.1349)	(0.0358)
Observations	177,102	177,102	177,102	177,102
R-squared	0.85	0.80	0.92	0.95
Mean dep variable	4.26	0.35	2.33	1.50
Firm FE	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes

Note: Clustered standard error at firm level in parenthesis. Column (1) outcome use the inverse hyperbolic sine transformation. *** p<0.01, ** p<0.05, * p<0.1

As expected, being exposed to NAILs considerably reduced the intensive and extensive margin of exports. For instance, firms whose import basket is entirely affected by the NAIL system reduce 60% their export amount with respect to a non-affected firm. In addition, the restriction also has considerable effects on the extensive margin of exports. The probability of being an exporter and the number of destinations that the firm reaches is affected negatively by the rise in import costs.

Once we have shown the reduced form effects, we turn to the IV estimation of the elasticity of substitution of exports with respect to imports at the firm level. Results are reported in Table 3. The first aspect to notice is that the coefficient for the first stage is -1.88. Namely, a firm for which 10% of their inputs are affected by the NAILs reduces their total imports by 18%. [28] Second, we find that an increase in 10% of imports of intermediate inputs increases export values in 3%.[29] In

[28] Note that also the F statistic of the first stage is over the conventional threshold.

[29] Remarkably, this is far below the elasticity of 100% that standard models with constant markup would predict

addition, imports also have considerably effects on extensive margin of exports. An increase in 10% of imports increase 2.8 percentage points the probability of being active in export markets (8% with respect to the unconditional probability). We also observe significant effects of imports on the number of products and destinations that the firm is able to serve.

Table 3: Elasticity of exports with respect to imports at the firm level

	(1)	(2)	(3)	(4)
	$log(exports)_{it}$	$Exportstatus_{it}$	$\#Products$	$\#Destinations$
$log(imports)_{it}$	0.3194***	0.0279***	0.2222***	0.1104***
	(0.0544)	(0.0048)	(0.0713)	(0.0193)
Observations	177,102	177,102	177,102	177,102
Firm FE	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes
First Stage				
$NAILexposure_{it}$	-1.8841***	-1.8841***	-1.8841***	-1.8841***
	(0.1260)	(0.1260)	(0.1260)	(0.1260)
F	223.49	223.49	223.49	223.49
Mean dep variable	4.83	4.83	4.83	4.83

Note: Clustered standard error at firm level in parenthesis. Column (1) outcome use the inverse hyperbolic sine transformation. *** p<0.01, ** p<0.05, * p<0.1

5.1.1 Differentiated Products and Export Destinations

It is important to understand which destinations and which products are affected by the NAILs regime. Hence, we distinguish exports to countries of Mercosur (a trade alliance with Argentinian border countries) and exports to OECD countries in 2000 (to capture exports to high-income countries). Additionally, we group firms according to their differentiation condition using the Micro-D classification (Bernini et al. 2018).[30] Results are shown in table 5.1.1.

The elasticity of differentiated exports with respect to imports is 0.30, doubling the value of the elasticity for non-differentiated exports. This result suggests that access to imported inputs tends to be more crucial for this set of products, whose growth is often targeted by public policy due to the spillover effects they generate in the economy. In addition, exports to OECD countries are more sensitive to imports than those to Mercosur countries.

The impact of NAIL exposure to exports is primarily driven by its impact on the exporters of differentiated goods, whose exports are reduced by 5% for firms with average NAIL exposure. It is consistent with the fact that differentiated products are more intensive in the use of intermediate inputs. It is also important to note that the reduction in exports comes from OECD and other countries, while exports to Mercosur were unaffected.

This result relates with Bastos et al. (2018) who found that the quality of exports is higher on shipments to richer countries, and those products require high-quality inputs that in developing

[30] Those firms whose exports of differentiated goods were higher than the exports of undifferentiated goods are classified as Differentiated, while the rest are undifferentiated

Table 4: Elasticity of exports with respect to imports by destination and differentiation status

	(1) $log(exports)_{it}$ $differenciated$	(2) $log(exports)_{it}$ $undifferenciated$	(3) $log(exports)_{it}$ $OECD$	(4) $log(exports)_{it}$ $Mercosur$
$log(imports)_{it}$	0.3041**	0.1559**	0.4539***	0.1073
	(0.1443)	(0.0788)	(0.1270)	(0.1300)
Observations	106,866	106,866	106,866	106,866
Firm FE	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes
First Stage				
$NAILexposure_{it}$	-1.10***	-1.10***	-1.10***	-1.10***
	(0.1639)	(0.1639)	(0.1639)	(0.1639)
F	44.65	44.65	44.65	44.65

Note: Clustered standard error at firm level in parenthesis. We use Column (1) outcome use the inverse hyperbolic sine transformation. *** p<0.01, ** p<0.05, * p<0.1

countries are usually provided by imports (Kugler and Verhoogen 2009). In this case, the impact of import barriers on firms' exports is greater on differentiated products to richer countries, indicating that they could not substitute the quality from imported inputs in the local market. This finding has important implications for firms' upgrading since exporting to richer countries requires hiring high-skill workers and is frequently associated with paying higher wages (Brambilla et al. 2012, Brambilla and Porto 2016).

5.2 Firm-level elasticity of employment to imports of intermediate inputs

Major exporters and importers significantly influence employment, often hiring a substantial portion of the domestic workforce. While a growing body of evidence focuses on the effects of trade through wages[31] as Borusyak and Jaravel (2021), Burstein and Vogel (2017), Helpman et al. (2016), Porto (2006), to the best of our knowledge, there have been no studies examining the effects of non-tariff barriers (NTB) on the labor market.

In this section, we analyze the impact of Non-Tariff Barriers (NTBs) on the labor market through firms. Specifically, we examine how these policies directly affect employment and wages. The variation in the implementation of Non-Automatic Import Licenses (NAILs) across firms within markets enables us to estimate the elasticities of both employment and labor.

The effects of NTBs on employment and wages are not straightforward. Exporters often use a mix of foreign intermediate inputs and local labor in production. Therefore, non-tariff trade barriers, such as NAILs, can reduce imports of intermediate inputs and directly impact the domestic labor market. When a firm encounters NAILs, it faces trade-offs: should it allocate funds to intermediate inputs or increase payments to labor? The impact could be through wages or the number of employees. If labor and intermediate inputs are complements, both may increase. However, if some types of labor and intermediate inputs are substitutes, an increase in imports might lead to a

[31]Some of the literature even specifically focuses on how gains from trade and the losses from protectionism are unequally distributed in society.

decline in labor demand.

Table 5 shows our results. First, as shown in Column 1, we find that a 10 percentage point increase in a firm's exposure to NAILs leads to a 6% reduction in exports and a 2% reduction in employment. Analyzing the rest of the table, Column 2 reveals a modest but significant negative impact on the intensive margin of employment, indicating that firms reduce the number of hours worked or the number of employees slightly. Column 3 shows a significant decrease in the probability of a firm remaining active, suggesting that increased exposure to NAILs can lead to firm closures or temporary shutdowns. Interestingly, Column 4 indicates a slight increase in wages, implying that firms may raise wages to retain their remaining employees. This could reflect a strategy to maintain productivity with fewer workers or to compensate for the increased difficulty of acquiring foreign intermediate inputs.[32]

Table 5: Labor Market Effects

	(1) Log(Employment)	(2) Intensive Margin	(3) Pr(Active=1)	(4) Log(Wages)
$NAILexposure_{it}$	-0.2265***	-0.0233*	-0.1145***	0.0249**
	(0.0260)	(0.0137)	(0.0110)	(0.0108)
Observations	157,424	118,892	177,102	40,667
R-squared	0.85	0.96	0.56	0.89
Mean dep variable	2.09	2.09	0.72	7.99
Firm FE	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes

Clustered standard errors at firm level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

6 Heterogeneous effects through market shares

In this section, we explore the heterogeneous effects through market shares to understand how larger firms can react differently to price changes compared to smaller firms. Studying this is important because it helps to explain the competitive dynamics within markets and the strategic behavior of firms. Larger firms with substantial market shares have more pricing power and can influence market conditions more significantly. This analysis also sheds light on how market share impacts firms resilience to economic shocks and their ability to maintain stability in prices and quantities. Understanding these effects is essential for designing effective economic policies and for anticipating the broader implications of market changes.

Holding constant sector price index in market k, markup elasticity to firm's price is given by,

$$\Gamma_{ik} = -\frac{\partial \log \mathcal{M}_{ik}}{\partial \log P_{ik}} = -\frac{\left(\frac{1}{\rho} - \frac{1}{\eta}\right)\frac{\partial \log S_{i,k}}{\partial \log p_{i,k}}}{\left[\frac{1}{\rho}(S_{i,k} - 1) - \frac{1}{\eta}S_{i,k}\right]} > 0$$

Three key features arise from the inspection of the equations above that are worth mentioning. First, firms that have a higher share in market k also have higher markups in that market. Second, the elasticity of markup to prices is negative. Third, the absolute value of the elasticity of markups with respect to price is increasing in the firm's share in market k. Put it differently, the super-

[32] In Appendix B.4.1 we expand these results at the market level.

elasticity, defined as the derivative of the absolute value of the elasticity of markup with respect to market share in destination k ($\S = \partial \log \Gamma_{ik} / \partial \log S_{ik} > 0$), is positive. Intuitively, firms with larger market share have larger markups and choose to adjust markups in response to shocks, while keeping quantities and prices more stable.

We summarize this in the following proposition:

PROPOSITION **4.**

1. *Markup of firm i ($\mathcal{M}_{ik}$) is increasing in a firm's market share in the market.*

2. *The elasticity of markup with respect to price ($-\Gamma_{ik}$) is negative.*

3. *Increasing superelasticity (§): The absolute value of the elasticity of markup with respect to price is increasing in market share of the firm.*

4. *if* $\S = \frac{\partial \log \Gamma_{ik}}{\partial \log S_{ik}} > 0$*, then the absolute value of the elasticity of exports to market k with respect to import costs is weakly decreasing on the size of the firm* S_{ik}*. It is decreasing if markups are not constant:*

$$\frac{\partial \log R_{ik}}{\partial (\log \tau_{iv} \partial m_{iv}) \partial S_{ik}} \geq 0 \tag{6.1}$$

Proof. See appendix. □

6.1 Within firm, across destinations markup super-elasticity

We now turn to the empirical estimation of the super-elasticity of markup. That is, we aim to test whether a given multi-destination firm adjusts its prices (export revenues) less in response to a cost shock in those destinations where it has a higher market share. To compute firms' market share in destination k, S_{iskt} we combine Argentinian customs data with import values at country-product (HS 4-digit) level from BACI dataset:

$$S_{iskt} = \frac{Exports_{iskt}}{WorldImports_{skt}} * 100,$$

where $WorldImports_{skt}$ is total imports of country k of products in sector s.[33]

Proposition 2 C. of our model guides the methodology to estimate the theoretical relationship between the elasticity of markup and market share in the destination (super-elasticity of markup). Adding the time subscript to equation 3.11 and recalling that we include sector-year-destination FE throughout the empirical analysis, the effect of barriers on exports to market k is given by,

$$\frac{\partial \log R_{iskt}}{\partial \log \tau_{ivt} m_{iv}} = (1-\rho) \left[\frac{1}{1+\Gamma_{ik}} \right] \leq 0$$

We can rewrite the above derivative as,

$$\frac{\partial \log R_{ikt}}{\partial \log \tau_{ivt} m_{iv}} = (1-\rho) \left[\frac{1}{1+\bar{\Gamma}_i} \right] + (1-\rho) \left[\left(\frac{1}{1+\Gamma_{ik}(S_{ik})} \right) - \left(\frac{1}{1+\bar{\Gamma}_i} \right) \right]$$

[33] The distribution of this variable is summarized in Table 8 of the appendix.

where $\bar{\Gamma}_i$ is the average elasticity of markup of firm i and we make explicit that the elasticity of markup in market k Γ_{ik} depends on the share of the firm in that market.

We can identify the theoretical coefficients in the relationship between markup elasticity and market share by estimating the following equation for those firms that report active exports to a market in $t-1$ and in t:

$$\Delta \log Expo_{iskt} = \beta_1 \Delta Nailexp_{it} + \beta_2 \Delta Nailexp_{it} * S_{ikt-1} + \gamma S_{ikt-1} + \gamma_{it} + \gamma_{skt} + \Delta e_{iskt}. \tag{6.2}$$

where

$$S_{ikt} = 100 \frac{ExportValues_{ikt}}{\sum_{i \in s} ExportValues_{iskt}}$$

Equation 6.2 is our benchmark empirical specification. Given that we are focusing on markups, we restrict our attention to firm destinations that have positive revenues in t and $t-1$. In our preferred specification, we include firm-by-year fixed effects, firm-by-destination fixed effects, and sector-by-destination-by-year fixed effects. Hence, the strategy relies on comparing changes in the response of the firm to a change in its costs, in the same year, in similar destination-year-sectors, across destinations in which the firm has different market shares. If the elasticity of markup does not depend on a firm's size in the market, then we expect β_2 to be zero. In contrast, if the elasticity of markup is increasing in the market share, then we expect $\beta_2 > 0$. In Figure 9, we provide a graphical representation of our methodology to identify the markup super-elasticity.

Table 6 reports the results for different versions of equation 6.2. In the first row, we report the coefficient for the average effect, while in the second one, we report the interaction between exposure and market share. We begin with a simple specification and build up to our preferred specification. In column (1), we include sector-by-destination by-year fixed effects and firm-fixed effects. The sector-by-destination-by-year fixed effects control for trends in the destination country where the firm exports, such as the country growing in the sector of the firm. As expected, the average effect of the cost shock on exports is negative. An increase of 10% on exposure causes a decline of 2.3% in average exports. However, consistent with the theory, the negative effect on exports is attenuated in markets where firms have higher market share. This suggest that the super-elasticity of markup is positive. In column (2) to (4), we add firm-year fixed effects and report the main results of the paper. Adding firm-year fixed effects allows us to compare responses of a given firm across its markets. Our preferred specification is Column (4) where we saturate the model with the full vector of fixed effects. We find that a given firm in a given year, comparing across similar sector-destinations-years, adjust less their export revenues (and thus prices) in those destinations where it is relatively large. Interpreting our results quantitatively, we find that a firm that was affected 100% by the cost shock reduced its export values by 23% in a destination in which the firm has nearly zero market share, while it only reduced 11% its export revenues in a market in which the firm has 5% of the market share.

Table 6: Elasticity of markup and relation with market share

	(1)	(2)	(3)	(4)
			$\Delta log(Exports_{iskt})$	
$\Delta Nailexposure_{it}$	-0.2306***			
	(0.0544)			
$\Delta Nailexposure_{it}$*	0.0197***	0.0238***	0.0245***	0.0190***
$*S_{iskt-1}$	(0.0034)	(0.0058)	(0.0058)	(0.0063)
Observations	104,532	76,707	76,707	76,707
R-squared	0.1412	0.3375	0.3401	0.4725
Firm FE	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes
Sector-Destination FE	Yes	Yes	Yes	Yes
Firm-Year FE	No	Yes	Yes	Yes
Sector-destination-year FE	Yes	No	No	Yes
$log(gdppc)_{kt-1}$ control	No	No	Yes	No
S_{ikt-1} control	Yes	Yes	Yes	Yes

Standard errors clustered at the firm-year level in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Conditional on firm-markets with positive values of exports.

7 Aggregation: Market Level

In this section, we describe how the model aggregates outcomes from the firm level to the sector level. Sectoral markups can be expressed as a harmonic mean (weighted by market shares) of firm-level markups, following Burstein et al. (2020):

$$\mathcal{M}_{sk} = \left[\sum_{i=1}^{N_k} \mathcal{M}_{ik}^{-1} S_{ik}\right]^{-1}$$

Substituting the markup-market-share relationship 3.1 under Cournot competition, we can express the sectoral markup, M_{sk}, as a simple function of the sector's Herfindahl-Hirschman index, $HHI_{kt} = \sum_i S_{ik}^2$: [34]

$$\mathcal{M}_{s,k} = \frac{\sigma_{ik} - 1}{\sigma_{ik}} = 1 + \left[\frac{1}{\rho}(HHI_{s,k} - 1) - \frac{1}{\eta} HHI_{s,k}\right]^{-1} \tag{7.1}$$

Revenues for sector s in market k are given by (see Appendix C.6.1 for proof.):

$$R_{s,k} = \frac{1}{\mathcal{M}_{s,k}^{\rho-1}} \frac{\varphi^{\rho-1}}{h_s^{\rho-1}} P_k^{\rho-\eta} D_k$$

[34] The Herfindahl-Hirschman Index (HHI) is calculated as the sum of the squares of market shares of all firms in the market, resulting in a value between 0 and 1, where higher values indicate greater market concentration.

And, replacing the sectoral markup, the total revenues of a sector are given by:

$$R_s = \frac{\varphi^{\rho-1}}{h_s^{\rho-1}} \sum_k \frac{1}{\left(1 + \left[\frac{1}{\rho}(HHI_{s,k} - 1) - \frac{1}{\eta} HHI_{s,k}\right]^{-1}\right)^{\rho-1}} P_k^{\rho-\eta} D_k \tag{7.2}$$

7.1 Market Level Outcomes

In this section, we explore market-level predictions regarding the heterogeneous effects of market shares. First, the effect on total exports is increasing in the Herfindahl-Hirschman Index (HHI). Specifically, the relationship is described by the equation

$$R_{s,k} = \frac{1}{\mathcal{M}_{s,k}^{\rho-1}} \frac{\varphi^{\rho-1}}{h_s^{\rho-1}} P_k^{\rho-\eta} D_k, \tag{7.3}$$

The elasticity of total exports to a firm's price is given by

$$\frac{\partial \log R_{s,k}}{\partial \log \tau_{s,k}} = (\rho - 1) \sum_k \frac{R_{s,k}}{R_s} \frac{1}{1 + \Lambda_{s,k}} m_{s,v} > 0, \tag{7.4}$$

which is positive if $\rho > 1$. The $\Lambda_{s,k}$ function incorporates the HHI index, indicating that higher market concentration leads to a greater sensitivity of exports to price changes.

Second, the effect on total imports suggests that imports are weakly decreasing in the trade costs of the importing varieties, provided ρ. The equation captures this relationship.

$$\frac{\partial \log M_s}{\partial \log \tau_{s,v}} = -m_{s,v} \left[\rho \sum_k \frac{Q_{s,k}}{Q_s} \frac{1}{1 + \Lambda_{s,k}} - 1\right] \leq 0, \tag{7.5}$$

implying that as trade costs increase, total imports decrease, reflecting the sensitivity of import volumes to cost variations.

Finally, the elasticity of exports with respect to imports indicates that the total amount of exports in a sector is positively related to the amount of imports in that sector. This is formalized by the equation.

$$\Sigma_{X,M} = \frac{\frac{\partial \log R_{s,k}}{\partial \log \tau_{s,k}}}{\frac{\partial \log M_s}{\partial \log \tau_{s,v}}} = \frac{\partial \log R_{s,k}}{\partial \log M_s} = \frac{(1-\rho) \sum_k \frac{R_{s,k}}{R_s} \left[\frac{1}{1+\Lambda_{s,k}}\right]}{(1-\rho) \left[\sum_k \frac{Q_{s,k}}{Q_k} \frac{1}{1+\Lambda_{s,k}}\right]} > 0, \tag{7.6}$$

indicating a positive relationship between imports and exports, underscoring the interconnected nature of trade dynamics within a sector. Together, these findings highlight the importance of considering market shares and trade costs in understanding the broader economic impacts on exports and imports. A formal proposition is derived in Appendix C.6 with its corresponding proof in Appendix C.6.4.

7.2 Market Level Estimation

We can identify the theoretical coefficients in the relationship between the change in market-level exports and cost shocks by estimating the following equation at the market level: [35]

$$\Delta \log Expo_{skt} = \beta_1 \Delta Nailexp_{skt} + \beta_2 \Delta Nailexp_{skt} * HHI_{skt-1} + \gamma HHI_{skt-1} + \gamma_{sk} + \gamma_{kt} + \gamma_{st} + \Delta e_{skt} \tag{7.7}$$

The variable $\Delta NAILexp_{skt}$ is the average exposure for all the firms active in that specific market at the moment t weighted by the share of each firm in that market on moment t. Our specification's key coefficients of interest are β_1 and β_2. The coefficient β_1 measures the direct effect of a change in NAIL exposure on market-level exports, while β_2 captures the interaction effect between NAIL exposure and market concentration (HHI). Table 7 presents the results from our regression analysis with different fixed effects.

Table 7: Market Level Effects

	(1)	(2)	(3)	(4)
			$\Delta \log(Exports_{skt})$	
$\Delta NAILexposure_{skt}$	-1.0838***	-0.5118**	-0.5375***	-0.7830***
	(0.2140)	(0.2118)	(0.1983)	(0.2637)
HHI_{skt-1}	0.2968***	0.4886***	0.4045***	0.9183***
	(0.0197)	(0.0245)	(0.0218)	(0.0489)
$\Delta NAILexposure_{st}$ * HHI_{skt-1}	0.6085***	0.5000**	0.5288**	0.6030**
	(0.2346)	(0.2465)	(0.2287)	(0.2762)
Observations	75,602	75,602	75,602	75,602
R-squared	0.0660	0.2743	0.2315	0.5835
HS8 FE	No	Yes	No	No
Destination-Year FE	No	Yes	Yes	Yes
HS8-Destination FE	No	No	No	Yes
Sector FE	No	No	Yes	No
Sector-Year FE	No	No	No	Yes

Notes: Clustered standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Conditional on firm-markets with positive values of exports.

Column (1) includes only the sector-market fixed effects (γ_{sk}), controlling for persistent differences across sectors and markets. For example, this could account for inherent differences in export capabilities between the textile and automotive sectors or differences between the Argentine market and the Brazilian market. Column (2) adds market-time fixed effects (γ_{kt}), accounting for time-specific shocks to particular markets, such as temporary economic downturns in a specific country or sudden changes in trade policies affecting certain markets. Column (3) includes sector-time fixed effects (γ_{st}), which control for sector-wide trends over time, like technological advancements in a particular sector or global shifts in demand for specific goods. By incorporating these fixed effects, we ensure that our estimated coefficients reflect the causal effects of cost shocks and market concentration on export dynamics rather than spurious correlations.

From the table, we observe that β_1 is negative and statistically significant across all specifications, indicating that an increase in NAIL exposure leads to a decrease in market-level exports. This result aligns with our expectation that higher trade barriers (NAILs) reduce firms' ability to export. The coefficient β_2 on the interaction term is positive and significant, suggesting that the negative

[35] We include firms that report active exports to a market in $t-1$ and in t

impact of NAIL exposure on exports is mitigated in more concentrated markets. This finding implies that firms with greater market power can better absorb the cost shocks associated with NAILs, possibly by adjusting their markups or leveraging their dominant positions to maintain export levels.

The coefficient on HHI_{skt-1}, γ, is also positive and significant, further supporting the idea that market concentration itself has a stabilizing effect on exports in the face of cost shocks. Overall, these results highlight the importance of market structure in determining the resilience of exports to trade barriers, with more concentrated markets exhibiting greater robustness. Our analysis shows that while cost shocks from increased NAIL exposure generally reduce market-level exports, firms in more concentrated markets are better equipped to mitigate these effects. This underscores the role of market power in shaping the response of firms to trade policies, suggesting that policymakers should consider market structure when designing and implementing trade regulations.

8 Conclusion

Most of the trade is concentrated in a few firms that export to many markets. In our sample, roughly 60% of the exporters serve more than one destination. These firms represent more than 99% of total exports in the manufacturing sector. As a consequence, understanding the behavior of these firms, how they set prices, and how they react to shocks is crucial to understanding aggregate trade flows, welfare gains from trade, and the distribution of these gains.

We develop a methodology that combines a theoretical model with an empirical strategy to explain how multi-destination exporters adjust markups and prices in response to cost shocks. When a firm-year-specific cost shock hits a firm, it reduces its export revenues (increases prices) in every destination. However, in those destinations where the firm is relatively larger, it adjusts its export revenues less while absorbing part of the shock by reducing its markup in the destination.

Our main contribution is providing empirical evidence of this margin of adjustment of multi-destination exporters. We exploit the exogenous variability of firms' costs, which came from when the Argentinian government imposed import barriers between 2005 and 2011, to document that the within-firm responses across different destinations are a key margin of adjustment.

This heterogeneity of responses across destinations is interesting by its right, and it also has important implications for the impact of shocks on exports at the aggregate level. The mechanism that we document suggests that a unilateral trade liberalization that reduces local costs for every Argentinian firm will increase (reduce prices relatively more) exports to destinations where the firm has a lower market share. In our sample, these destinations are typically countries with high GDP per capita. Therefore, the margin of adjustment analyzed in this paper will determine that the gains from Argentina's liberalization will be unevenly distributed among foreign countries, with the richer countries the ones that benefit the most. In contrast, poorer countries, where multi-destination exporters have a higher market share, the reduction in costs would be partially absorbed in the markups of the firm.

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A Appendix: Data construction

A.1 Data Sources

Data	Data Source	Notes
Argentinian Exports	Aduanas (2000-2012)	Access through Ministry of Productive Development
Argentinian Imports	Aduanas (2000-2012)	Access through Ministry of Productive Development
Decrete Information	Secretary of Trade, Argentina	Ministry of Productive Development
Employment	Form 931 Declaration	Administracion Federal de Ingresos Publicos (AFIP)
Micro-D Classification	Bernini et al. (2018)	Classification of differentiated exports
NAILS in Argentina	InfoLEG, MECON	Centre of Documentation and Information (CDI)
NAILS Worldwide	World Trade Organization	WTO Trade Policy Review

A.2 Baseline Sample

In this section, we describe how the data for the baseline analysis was constructed. We put together three datasets: (i) AFIP Employment Data, (ii) Customs import data, and (iii)

First, we take AFIP Employment Data. This dataset includes information on employment and activity sectors for the universe of firms in Argentina (e.g. exporters, importers, domestic firms, etc.) from 2001 to 2019. We keep information for the period 2003-2011. To construct our sample we proceed with some cleaning steps: (i) keep firms with positive employment (e.g. more than 1 employee), (ii) keep firms with information on the activity sector, (iii) keep all firms that were active in 2007 [36] and were active for at least 1 year in our sample [37].

Second, we add data from Customs containing the universe of importers and exporters in Argentina. The customs dataset is at the firm level and includes information on the trade flows of each firm, destination or origin, year, and product at the most detailed aggregation level (12-digit level, which includes HS 6-digit level and 6 digits specific to Argentina). We restrict the sample to (i) manufacturing firms to avoid trading companies whose imports are not intermediate inputs to their production and whose exports are not produced by other firms and (ii) firms that exported at least once in 2002-2007. Exclusions include imports of used goods, products originating from provinces in Argentina, those associated with consignment export returns, and products originating from Argentina. Regarding the export database, firm-level data between 2000 and 2012 are considered, excluding non-reexported products and those produced in Argentina. Products destined for Argentina are also excluded, retaining only newly exported items.

Third, we constructed a unique database containing monthly data on (non) tariff barriers to different products imposed in Argentina during the 2002-2011. We tracked and digitized executive decrees during the period to construct a database listing the month-year in which an administrative barrier was imposed on each of the products at (HS-8-Digit). We get this information from InfoLEG. InfoLEG is a juridical database, where the Legislative Information and Documentation Area of the Centre of Documentation and Information (CDI) of the Ministry of Economy and Finance (MECON) co-ordinates the collection and updating of national legislation, its rules of interpretation and background.

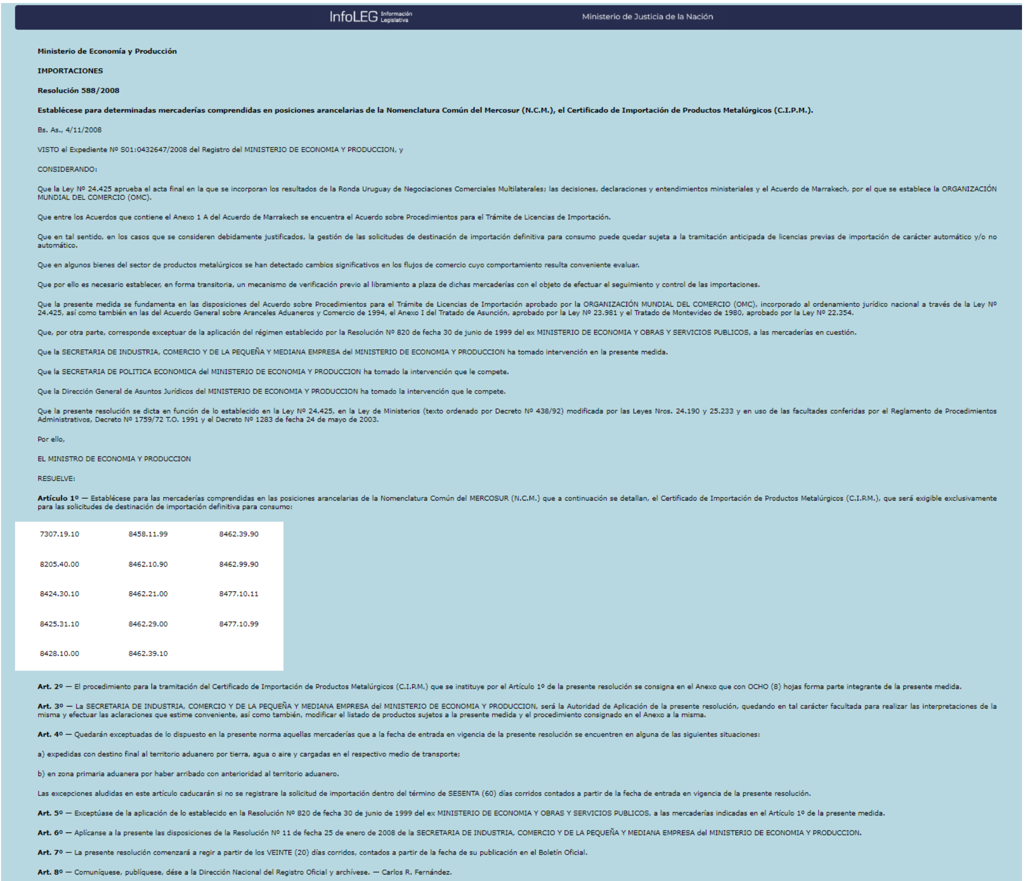
[36] Note that this step does not have relevant consequences since most of the firms being excluded here are very small and do not import or export.
[37] Results remain qualitatively unchanged if we don't impose this last restriction.

The main challenge in constructing price and volume indices with customs data is the unit value bias. Unit values, determined by dividing observed values by quantities, do not accurately reflect real prices. They can fluctuate even when there is no actual price change due to shifts in composition. We follow the methodology developed by Boz et al. (2019) to mitigate this issue.

A.3 InfoLEG - Centre of Documentation and Information (CDI)

A page on the InfoLEG website for a specific resolution, such as ResoluciÃşn 1660/2007, typically includes the official title and number, the date of issuance, the main text detailing the legal provisions and regulations, and the names and positions of the signatories. It also provides information on related legal documents and amendments, the applicability and scope of the resolution, and specific implementation instructions, including timelines and responsible authorities.

Figure 5: Example of NAILs



InfoLEG Información Legislativa — Ministerio de Justicia de la Nación

Ministerio de Economía y Producción

IMPORTACIONES

Resolución 588/2008

Establécese para determinadas mercaderías comprendidas en posiciones arancelarias de la Nomenclatura Común del Mercosur (N.C.M.), el Certificado de Importación de Productos Metalúrgicos (C.I.P.M.).

Bs. As., 4/11/2008

VISTO el Expediente Nº S01:0432647/2008 del Registro del MINISTERIO DE ECONOMIA Y PRODUCCION, y

CONSIDERANDO:

Que la Ley Nº 24.425 aprueba el acta final en la que se incorporan los resultados de la Ronda Uruguay de Negociaciones Comerciales Multilaterales; las decisiones, declaraciones y entendimientos ministeriales y el Acuerdo de Marrakech, por el que se establece la ORGANIZACIÓN MUNDIAL DEL COMERCIO (OMC).

Que entre los Acuerdos que contiene el Anexo 1 A del Acuerdo de Marrakech se encuentra el Acuerdo sobre Procedimientos para el Trámite de Licencias de Importación.

Que en tal sentido, en los casos que se consideren debidamente justificados, la gestión de las solicitudes de destinación de importación definitiva para consumo puede quedar sujeta a la tramitación anticipada de licencias previas de importación de carácter automático y/o no automático.

Que en algunos bienes del sector de productos metalúrgicos se han detectado cambios significativos en los flujos de comercio cuyo comportamiento resulta conveniente evaluar.

Que por ello es necesario establecer, en forma transitoria, un mecanismo de verificación previo al libramiento a plaza de dichas mercaderías con el objeto de efectuar el seguimiento y control de las importaciones.

Que la presente medida se fundamenta en las disposiciones del Acuerdo sobre Procedimientos para el Trámite de Licencias de Importación aprobado por la ORGANIZACIÓN MUNDIAL DEL COMERCIO (OMC), incorporado al ordenamiento jurídico nacional a través de la Ley Nº 24.425, así como también en las del Acuerdo General sobre Aranceles Aduaneros y Comercio de 1994, el Anexo I del Tratado de Asunción, aprobado por la Ley Nº 23.981 y el Tratado de Montevideo de 1980, aprobado por la Ley Nº 22.354.

Que, por otra parte, corresponde exceptuar de la aplicación del régimen establecido por la Resolución Nº 820 de fecha 30 de junio de 1999 del ex MINISTERIO DE ECONOMIA Y OBRAS Y SERVICIOS PUBLICOS, a las mercaderías en cuestión.

Que la SECRETARIA DE INDUSTRIA, COMERCIO Y DE LA PEQUEÑA Y MEDIANA EMPRESA del MINISTERIO DE ECONOMIA Y PRODUCCION ha tomado intervención en la presente medida.

Que la SECRETARIA DE POLITICA ECONOMICA del MINISTERIO DE ECONOMIA Y PRODUCCION ha tomado la intervención que le compete.

Que la Dirección General de Asuntos Jurídicos del MINISTERIO DE ECONOMIA Y PRODUCCION ha tomado la intervención que le compete.

Que la presente resolución se dicta en función de lo establecido en la Ley Nº 24.425, en la Ley de Ministerios (texto ordenado por Decreto Nº 438/92) modificada por las Leyes Nros. 24.190 y 25.233 y en uso de las facultades conferidas por el Reglamento de Procedimientos Administrativos, Decreto Nº 1759/72 T.O. 1991 y el Decreto Nº 1283 de fecha 24 de mayo de 2003.

Por ello,

EL MINISTRO DE ECONOMIA Y PRODUCCION

RESUELVE:

Artículo 1º — Establécese para las mercaderías comprendidas en las posiciones arancelarias de la Nomenclatura Común del MERCOSUR (N.C.M.) que a continuación se detallan, el Certificado de Importación de Productos Metalúrgicos (C.I.P.M.), que será exigible exclusivamente para las solicitudes de destinación de importación definitiva para consumo:

7307.19.10	8458.11.99	8462.39.90
8205.40.00	8462.10.90	8462.99.90
8424.30.10	8462.21.00	8477.10.11
8425.31.10	8462.29.00	8477.10.99
8428.10.00	8462.39.10	

Art. 2º — El procedimiento para la tramitación del Certificado de Importación de Productos Metalúrgicos (C.I.P.M.) que se instituye por el Artículo 1º de la presente resolución se consigna en el Anexo que con OCHO (8) hojas forma parte integrante de la presente medida.

Art. 3º — La SECRETARIA DE INDUSTRIA, COMERCIO Y DE LA PEQUEÑA Y MEDIANA EMPRESA del MINISTERIO DE ECONOMIA Y PRODUCCION, será la Autoridad de Aplicación de la presente resolución, quedando en tal carácter facultada para realizar las interpretaciones de la misma y efectuar las aclaraciones que estime conveniente, así como también, modificar el listado de productos sujetos a la presente medida y el procedimiento consignado en el Anexo a la misma.

Art. 4º — Quedarán exceptuadas de lo dispuesto en la presente norma aquellas mercaderías que a la fecha de entrada en vigencia de la presente resolución se encuentren en alguna de las siguientes situaciones:

a) expedidas con destino final al territorio aduanero por tierra, agua o aire y cargadas en el respectivo medio de transporte;

b) en zona primaria aduanera por haber arribado con anterioridad al territorio aduanero.

Las excepciones aludidas en este artículo caducarán si no se registrare la solicitud de importación dentro del término de SESENTA (60) días corridos contados a partir de la fecha de entrada en vigencia de la presente resolución.

Art. 5º — Exceptúase de la aplicación de lo establecido en la Resolución Nº 820 de fecha 30 de junio de 1999 del ex MINISTERIO DE ECONOMIA Y OBRAS Y SERVICIOS PUBLICOS, a las mercaderías indicadas en el Artículo 1º de la presente medida.

Art. 6º — Aplícanse a la presente las disposiciones de la Resolución Nº 11 de fecha 25 de enero de 2008 de la SECRETARIA DE INDUSTRIA, COMERCIO Y DE LA PEQUEÑA Y MEDIANA EMPRESA del MINISTERIO DE ECONOMIA Y PRODUCCION.

Art. 7º — La presente resolución comenzará a regir a partir de los VEINTE (20) días corridos, contados a partir de la fecha de su publicación en el Boletín Oficial.

Art. 8º — Comuníquese, publíquese, dése a la Dirección Nacional del Registro Oficial y archívese. — Carlos R. Fernández.

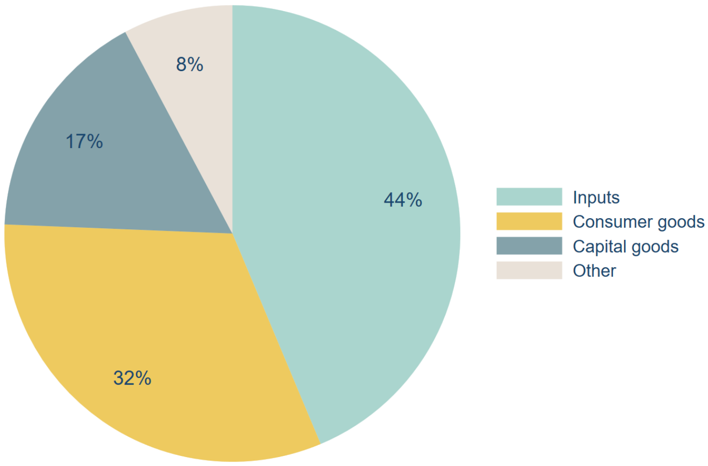
Notes: The figure shows an example of one of the digitalized decretes.

Source:InfoLEG

B Appendix: Empirical Part

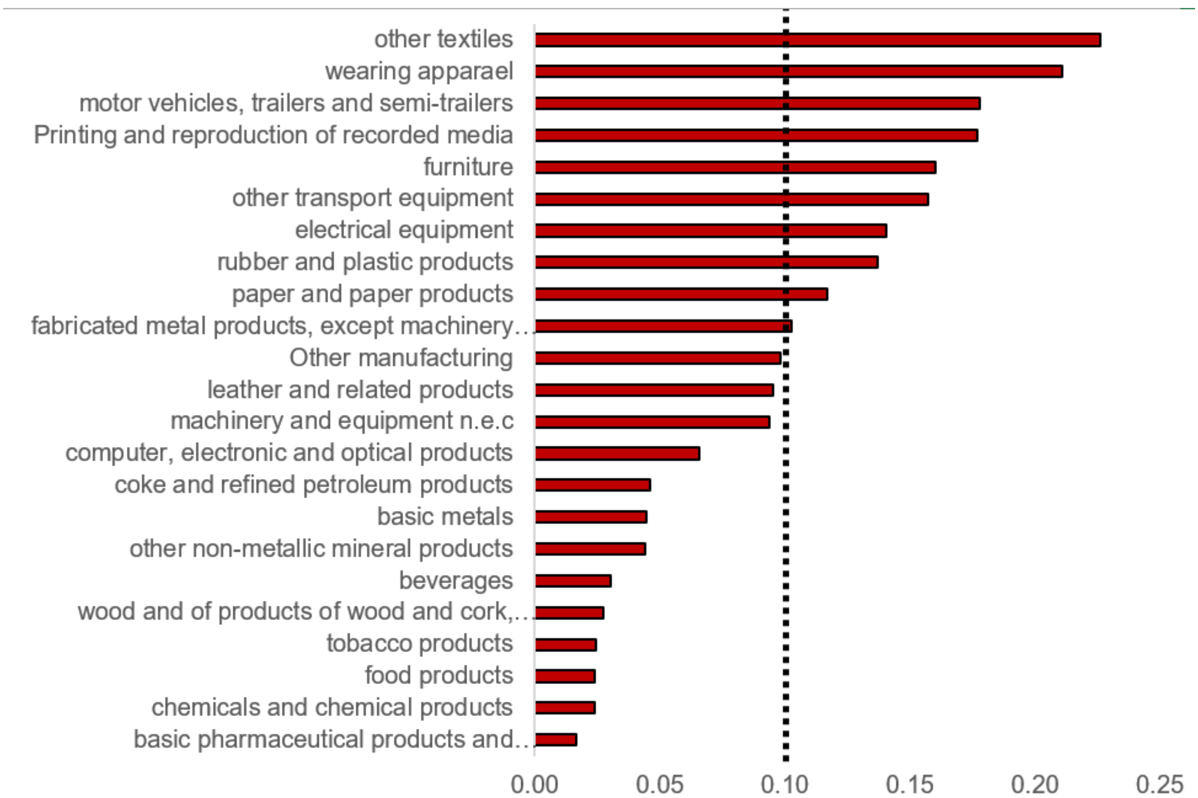
B.1 Broad economic categories affected by NAILs

Figure 6: Imports with NAIL by broad economic categories



B.2 NAILs by sector

Figure 7: Average firm's share of imports corresponding to affected inputs (2011), by sector CLAE 2 digits



B.3 Market Share

Distribution of Market share variable S_{iskt}

Table 8: Market Share distribution. Year 2006

percentile	S_{iskt}
p10	0.004
p25	0.038
p50	0.299
p75	2.043
p99	9.633
Average	4.163

B.4 Heterogeneity by Destination

In this Appendix, we show how the effect is heterogeneous depending on the destination of the exports and the type of exported product. Table 9 illustrates this results.

Table 9: Heterogeneity by Destination and Product Type

	(1) $log(exports)_{it}$ differenciated	(2) log(exports)$_{it}$ undifferenciated	(3) log(exports)$_{it}$ OECD	(4) log(exports)$_{it}$ Mercosur
$NAILexposure_{it}$	-0.3331**	-0.1708**	-0.4972***	-0.1175
	(0.1620)	(0.0818)	(0.1233)	(0.1450)
Observations	106,866	106,731	106,866	106,866
R-squared	0.8287	0.8797	0.8464	0.8419
Firm FE	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes
First Stage				
$NAILexposure_{it}$	-1.0953***	-1.0953***	-1.0953***	-1.0953***
	(0.1639)	(0.1639)	(0.1639)	(0.1639)
F	44.65	44.65	44.65	44.65

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

B.4.1 Labor Market Outcomes Heterogeneity

An increasing amount of research indicates that trade has a notable impact on wages in labor markets that are more exposed to import competition than those with less exposure. These trends have been observed across different settings, such as in India (Edmonds et al. (2010)), Brazil (Kovak (2013)), Felix (2021)), and the United States (Autor et al. (2013)).

Table 10: Heterogeneity of Labor Market Effects

	(1)	(2)	(3)
		$\Delta Log(Employment_{st})$	
$\Delta Exposure_{st}$	-1.2428***	-0.6357**	-0.8492***
	(0.2639)	(0.2613)	(0.3141)
$\Delta Exposure_{st} \cdot HHI_{st}$	1.8396***	1.4485***	1.5751***
	(0.5721)	(0.5489)	(0.5886)
Observations	5,578	5,578	5,578
R-squared	0.0813	0.1924	0.6129
Year FE	No	Yes	Yes
Product FE	No	No	Yes

Clusterd standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Conditional on firm-markets with positive values of exports.
$\Delta NAILexposure_{skt} = S_{ikt} \Delta NAILexposure_{iskt}$

B.5 Robustness Checks

In Table 11 we show that results are not explained by other factors. In Column (1) we present the results for our benchmark regression. A concern is that the market share might be correlated with income of the destination country. Hence, we are capturing changes in exports due to the interaction between the cost shock and characteristics of the destination country. In Column (2), we control for the interaction between exposure to NAILs and GDP per capita in the destination. The main coefficient remains almost unchanged. A second concern is that firms might import more from destinations that they export more. Hence, a shock to imports might affect deferentially destinations where the firm is large. In Column (4), we control for imports of the firm from the destination market. Similarly, in Column (5) we exclude China from the sample. Reassuringly, the coefficient remains stable throughout the different specifications.

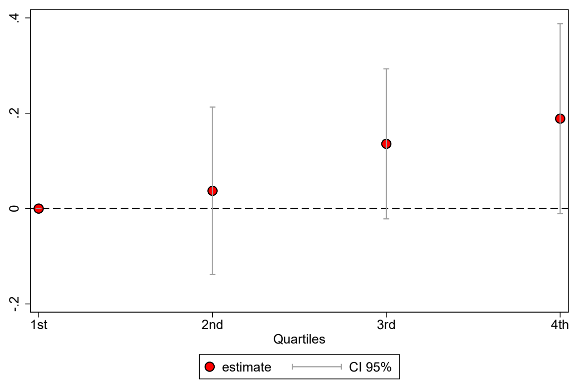
Table 11: Robustness Check: Elasticity of markup and relation with market share

	(1)	(2)	(3)	(4)	(5)
		$\Delta log(Exports_{iskt})$			
$\Delta Nailexposure_{it}$	0.0190***	0.0185***	0.0172***	0.0171***	0.0187***
$*S_{iskt-1}$	(0.0063)	(0.0058)	(0.0065)	(0.0062)	(0.0063)
$\Delta Nailexposure_{it}$		0.0354			
$*log(gdppc)_{kt-1}$		(0.0478)			
$\Delta Nailexposure_{it}$			0.0026**		
$*ShareWithinFirm_{iskt-1}$			(0.0012)		
Observations	76,707	76,707	76,707	76,707	76,707
R-squared	0.4725	0.3509	0.4773	0.4725	0.4751
Firm-Year FE	yes	yes	yes	yes	yes
Sector-destination-year FE	yes	yes	yes	yes	yes
imports from k	no	no	no	yes	no
Exc China	no	no	no	no	yes

Standard errors clustered at the firm-year level in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Conditional on firm-markets with positive values of exports two consecutive years.

Our empirical findings reflect that that multi-destination exporters adjust more their markup in those destinations where they have a higher market share. This is consistent with the predictions of our model. However, we want to ensure that this results is not driven by outliers and/or are only explained by our linear specification or the continuity of the market share variable. In order to address this concern, we re-estimate equation 6.2, but splitting market share variable into quartiles. In figure 8 we plot the coefficient of the interaction for each quartile. The base group is the 1st quartile of market share. Although not significant at 5%, we can observe that the interaction between NAILexposure increase monotonically as we move from low to high market share.

Figure 8: Market share and markups, non-parametric results

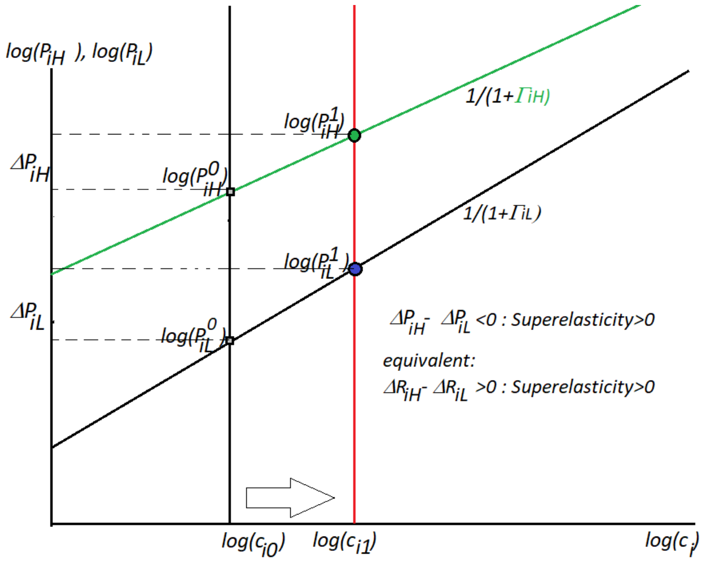


C Appendix: Theory

C.1 Graphical example of our strategy to get §

Recall that $\frac{dlnP_{ik}}{dlnc_i} = \frac{1}{1+\Gamma_{ik}}$

Figure 9: Cost shock, elasticity and super-elasticity



C.2 Bertrand Competition

The demand elasticity for the case of Bertrand competition for firm i in market k is given by,

$$\sigma_{i,k} = \rho(1 - S_{i,k}) + \eta S_{i,k}.$$

Then, the markup, $\mathcal{M}$, is given by

$$\mathcal{M}_{ik} = \frac{\sigma_{i,k}}{\sigma_{i,k} - 1} = \frac{\rho + (\eta - \rho)S_{i,k}}{\rho + (\eta - \rho)S_{i,k} - 1}$$

Holding constant sector price index, markup elasticity with respect to firm's price is given by,

$$\Gamma_{ik} = -\frac{\partial \log \mathcal{M}_{ik}}{\partial \log P_{ik}} = \frac{S_{ik}}{\left(\frac{\rho}{\rho-\eta} - S_{ik}\right)\left(1 - \frac{\rho-\eta}{\rho-1}S_{ik}\right)} > 0$$

C.3 Lemma 1: Proof

$$R_{sk} = \frac{1}{\mathcal{M}_{sk}^{\rho-1}} \frac{\phi^{\rho-1}}{h_s^{\rho-1}} P_k^{\rho-\eta} D_K$$

Taking logs,

$$
\begin{aligned}
logR_{sk} &= (1-\rho)log\mathcal{M}_{sk} + (1-\rho)logh_s \\
\frac{dlogR_{sk}}{dlog\tau_{sv}} &= (1-\rho)\left[\frac{dlog\mathcal{M}_{sk}}{dlog\tau_{sv}} + \frac{dlogh_s}{dlog\tau_{sv}}\right] = \\
&= (1-\rho)\left[\frac{dlog\mathcal{M}_{sk}}{dlogP_{sk}}\frac{dlogP_{sk}}{dlog\tau_{sv}} + m_{sv}\right] = \\
&= (1-\rho)\left[-\frac{\Lambda_{sk}}{1+\Lambda_{sk}}m_{sv} + m_{sv}\right] = \\
&= (1-\rho)\frac{1}{1+\Lambda_{sk}}m_{sv} \leq 0
\end{aligned}
$$

Now, given $R_s = \sum_k R_{sk}$. Applying logs

$$
logR_s = log(\sum_k R_{sk})
$$

Then,

$$
\begin{aligned}
\frac{dlogR_s}{dlog\tau_{sv}} &= \sum_k \frac{1}{\sum_k R_{sk}} R_{sk}\frac{dlogR_{sk}}{dlog\tau_{sv}} = \\
&= (1-\rho)\sum_k \frac{R_{sk}}{R_s}\frac{1}{1+\Lambda_{sk}}m_{sv} \leq 0
\end{aligned}
$$

C.4 Lemma 2: Proof

Imports are given by:

$$
M_i = Qc_i
$$

In a sector level:

$$
\sum_{i=1}^{N_k} M_i = \sum_{i=1}^{N_k} Qc_i \rightarrow M_s = Qc_s
$$

By Shepard LemmaâĂŹs, we know that the derivative of the log unit cost with respect to $\log(\tau_{sv})$ is equal to m_{sv}. Then

$$
\frac{\partial \log M_s}{\partial \log \tau_{sv}} = \frac{\partial \log Q_s}{\partial \log \tau_{sv}} + m_{sv}
$$

The adjustment in quantities is given by:

$$
\frac{\partial \log Q_s}{\partial \log \tau_{sv}} = -\rho m_{sv} \sum_k \frac{Q_{sk}}{Q_s}\frac{1}{1+\Lambda_{sk}}
$$

So

$$
\frac{\partial \log M_s}{\partial \log \tau_{sv}} = -m_{sv}\left[\rho \sum_k \frac{Q_{sk}}{Q_s}\frac{1}{1+\Lambda_{sk}} - 1\right] \leq 0
$$

C.5 Proof of Proposition III

A. First, we prove that the elasticity of imports with respect to τ_{iv} is as described above.

Imports are given by:

$$M_i = Qc_i$$

By Shepard Lemma's, we know that the derivative of the log unit cost with respect to $log(\tau_{iv})$ is equal to m_{iv}. Then,

$$\frac{\partial \log M_i}{\partial \log \tau_{iv}} = \frac{\partial \log Q_i}{\partial \log \tau_{iv}} + m_{iv}$$

The adjustment in quantities is given by,

$$\frac{\partial \log Q_i}{\partial \log \tau_{iv}} = -\rho m_{iv} \sum_k \frac{Q_{ik}}{Q_k} \frac{1}{1+\Gamma_{ik}},$$

so

$$\frac{\partial \log M_i}{\partial \log \tau_{iv}} = -m_{iv} \left[\rho \sum_k \frac{Q_{ik}}{Q_k} \frac{1}{1+\Gamma_{ik}} - 1 \right]$$

B. Note that the elasticity of total exports with respect to total imports is the ratio between the effect of barriers on total exports over the effect of barriers on total imports.

C.6 Market Level Formal Proposition

C.6.1 Demonstration Revenues

We can express the revenues of the sector as:

$$R_{sk} = \frac{1}{\mathcal{M}_{sk}^{\rho-1}} \frac{\varphi^{\rho-1}}{h_s^{\rho-1}} P_k^{\rho-\eta} D_k$$

We can define τ_{sv} as $\sum_{i=1}^{N_k} \tau_{iv}$ and:

$$P_v = \frac{\tau_{iv}}{A_v} \rightarrow \sum_{i=1}^{N_k} P_v = \sum_{i=1}^{N_k} \frac{\tau_{iv}}{A_v}$$

$$N_k P_v = \frac{\tau_{sv}}{A_v}$$

$$P_v = \frac{\tau_{sv}}{A_v N_k}$$

The problem for optimal amount of imports does not change and we can define c_s as:

$$\sum_{i=1}^{N_k} c_i = c_s = \sum_{i=1}^{N_k} \frac{h(\Omega)}{\phi} = \frac{1}{\phi} \sum_{i=1}^{N_k} \left(\sum_{v \in \Omega} \left(\frac{1}{p_v} \right)^{\theta-1} \right)^{-\frac{1}{\theta-1}}$$

$$\sum_{i=1}^{N_k} c_i = c_s = \sum_{i=1}^{N_k} \frac{h(\Omega)}{\phi} = \frac{1}{\phi} \sum_{i=1}^{N_k} \left(\sum_{v \in \Omega} \left(\frac{A_v N_k}{\tau_{sv}} \right)^{\theta - 1} \right)^{-\frac{1}{\theta-1}}$$

Then we can define the sectoral price as:

$$P_{sk} = \mathcal{M}_{st} c_s(\Omega, \phi)$$

And if we define the sectoral demand as:

$$Q_{sk} = \gamma_{sk} P_{sk}^{-\rho} P_k^{\rho - \eta} D_k$$

The revenues are:

$$R_{sk} = P_{sk} Q_{sk} = \gamma_{sk} P_{sk}^{1-\rho} P_k^{\rho-\eta} D_k$$

$$R_{sk} = \gamma_{sk} (\mathcal{M}_{st} c_s(\Omega, \phi))^{1-\rho} P_k^{\rho-\eta} D_k = \frac{1}{\mathcal{M}_{sk}^{\rho-1}} \frac{\varphi^{\rho-1}}{h_s^{\rho-1}} P_k^{\rho-\eta} D_k$$

C.6.2 Demonstration of m_{sv}

Remember that:

$$\sum_{i=1}^{N_k} c_i = c_s = \sum_{i=1}^{N_k} \frac{h(\Omega)}{\phi} = \frac{1}{\phi} \sum_{i=1}^{N_k} \left(\sum_{v \in \Omega} \left(\frac{A_v N_k}{\tau_{sv}} \right)^{\theta - 1} \right)^{-\frac{1}{\theta-1}}$$

Total amount of imports of intermediate goods of sector s is given by (**assumption**):

$$M_s(\Omega) = \frac{Q_s}{\phi} \sum_{i=1}^{N_k} \left(\sum_{v \in \Omega} \left(\frac{A_v N_k}{\tau_{sv}} \right)^{\theta - 1} \right)^{-\frac{1}{\theta-1}}$$

Expenditure share of sector s on imported variety v is given by (**assumption**):

$$m_{sv} = \frac{\left(\frac{A_v N_k}{\tau_{sv}} \right)^{\theta-1}}{\sum_{v \in \Omega} \left(\frac{A_v N_k}{\tau_{sv}} \right)^{\theta-1}}$$

By ShepardâĂŹs Lemma:

$$\frac{\partial log c_s}{\partial log \tau_{sv}} = m_{sv}$$

From $P_{sk} = \mathcal{M}_{sk}(P_{sk}(P_{ik}), P_k) c_s(\Omega, \phi)$

$$\begin{aligned} log P_{sk} &= log \mathcal{M}_{sk}(\cdot) + log c_s(\cdot) \\ \frac{dlog P_{sk}}{dlog \tau_{sv}} &= \frac{dlog \mathcal{M}_{sk}}{dlog P_{sk}} \frac{dlog P_{sk}}{dlog \tau_{sv}} + \frac{dlog c_s}{dlog \tau_{sv}} = \\ \frac{dlog P_{sk}}{dlog \tau_{sv}} [1 + \Lambda_{sk}] &= \frac{dlog c_s}{dlog \tau_{sv}} \end{aligned}$$

By Sheppard's Lemma.

$$\frac{dlogP_{sk}}{dlog\tau_{sv}} = \frac{1}{1+\Lambda_{sk}} m_{sv}$$

.

C.6.3 Formal Proposition

Definition 2
Super-elasticity of sectoral markup **($\S_{s,k}$): The derivative of the absolute value of the elasticity of markup with respect to HHI in sector s, destination k. Formally, ($\S_{s,k} = \partial \log \Lambda_{sk} / \partial \log HHI_{sk}$).**

PROPOSITION **5.**

1. *Market level markups ($\mathcal{M}_{s,k}$) are increasing in the HHI in sector s, destination k.*

2. *The elasticity of markup with respect to price (Λ_{sk}) is negative.*

$$\Lambda_{sk} = \frac{\partial \log \mathcal{M}_{sk}}{\partial \log p_{sk}} = -\frac{(\frac{1}{\rho} - \frac{1}{\eta})\frac{\partial \log HHI_{sk}}{\partial \log p_{sk}}}{\left[\frac{1}{\rho}(HHI_{sk} - 1) - \frac{1}{\rho} HHI_{sk}\right]} < 0 \tag{C.1}$$

3. *The absolute value of the market elasticity of markup with respect to price is increasing in the HHI of the market.*

Proof. See Appendix C.6.4 for proof. □

C.6.4 Proof: The sectoral markup depends on the HHI in that market:

Because $\sum_{i=1}^{N_k} S_{i_k} = 1$ and using $\sigma_{i,k}^{-1} = \frac{1}{\rho}(1 - S_{i,k}) + \frac{1}{\eta} S_{i,k}$ and defining the Herfindahl Hirschman Index as follows $\sum_{i=1}^{N_k} = S_{i,k}^2 = HHI_{s,k}$:

$$\mathcal{M}_{sk} = \left[\sum_{i=1}^{N_k}(1 - \sigma_{ik}^{-1})S_{ik}\right]^{-1} \tag{C.2}$$

$$= \left[\sum_{i}^{N_k} S_{ik} - \sum_{i}^{N_k} S_{ik}\sigma_{ik}^{-1}\right]^{-1} \tag{C.3}$$

$$= \left[1 - \sum_{i}^{N_k}\left(\frac{1}{\rho}(1 - S_{ik}) + \frac{1}{\eta}S_{ik}\right) S_{ik}\right]^{-1} \tag{C.4}$$

$$= \left[1 - \frac{1}{\rho} + \left(\frac{1}{\rho} - \frac{1}{\eta}HHI_{sk}\right)\right]^{-1} \tag{C.5}$$

$$= \left[1 + \frac{1}{\rho}(HHI_{sk} - 1) - \frac{1}{\eta}HHI_{sk}\right]^{-1} \tag{C.6}$$

We can define $\Lambda_{s,k}$ as:

$$\Lambda_{s,k} = \frac{\partial \log \mathcal{M}_{s,k}}{\partial \log p_{s,k}} = -\frac{\left(\frac{1}{\rho} - \frac{1}{\eta}\right)\frac{\partial \log HHI_{s,k}}{\partial \log p_{s,k}}}{\left[\frac{1}{\rho}(HHI_{s,k} - 1) - \frac{1}{\eta}HHI_{s,k}\right]} < 0$$

$$\mathcal{M}_{s,k} = 1 + \left[\frac{1}{\rho}(HHI_{s,k} - 1) - \frac{1}{\eta}HHI_{s,k}\right]^{-1} \tag{C.7}$$

Taking logs:

$$\log \mathcal{M}_{s,k} = \log\left(1 + \left[\frac{1}{\rho}(HHI_{s,k} - 1) - \frac{1}{\eta}HHI_{s,k}\right]^{-1}\right) \approx \log\left(\left[\frac{1}{\rho}(HHI_{s,k} - 1) - \frac{1}{\eta}HHI_{s,k}\right]^{-1}\right)$$

$$\log \mathcal{M}_{s,k} = -\log\left(\left[\frac{1}{\rho}(HHI_{s,k} - 1) - \frac{1}{\rho}HHI_{s,k}\right]\right)$$

Differentiating

$$\partial \log \mathcal{M}_{s,k} = -\partial \log\left(\left[\frac{1}{\rho}(HHI_{s,k} - 1) - \frac{1}{\eta}HHI_{s,k}\right]\right) = -\frac{\left(\frac{1}{\rho} - \frac{1}{\eta}\right)\frac{\partial \log HHI_{s,k}}{\partial \log p_{s,k}}\partial \log p_{s,k}}{\left[\frac{1}{\rho}(HHI_{s,k} - 1) - \frac{1}{\eta}HHI_{s,k}\right]}$$

$$\Lambda_{s,k} = \frac{\partial \log \mathcal{M}_{s,k}}{\partial \log p_{s,k}} = -\frac{\left(\frac{1}{\rho} - \frac{1}{\eta}\right)\frac{\partial \log HHI_{s,k}}{\partial \log p_{s,k}}}{\left[\frac{1}{\rho}(HHI_{s,k} - 1) - \frac{1}{\rho}HHI_{s,k}\right]} < 0$$

C.6.5 Market Level Outcomes Formal Proposition

PROPOSITION **6** (Market level predictions)**.**

A. ***(Effect on total exports)*** *Effect of total exports is increasing in HHI.*

$$R_{s,k} = \frac{1}{\mathcal{M}_{s,k}^{\rho-1}}\frac{\varphi^{\rho-1}}{h_s^{\rho-1}}P_k^{\rho-\eta}D_k \tag{C.8}$$

$$\frac{\partial \log R_{s,k}}{\partial \log \tau_{s,k}} = (\rho - 1)\sum_k \frac{R_{s.k}}{R_s}\frac{1}{1 + \Lambda_{s.k}}m_{s,v} > 0 \tag{C.9}$$

If $\rho > 1$ that equation is positive. Inside the $\Lambda_{s,k}$ function is the HHI index.

B. ***(Effect on total imports)*** *Provided ρ, imports are weakly decreasing in the trade costs of the importing varieties.*

$$\frac{\partial \log M_s}{\partial \log \tau_{s,v}} = -m_{s,v}\left[\rho\sum_k \frac{Q_{s.k}}{Q_s}\frac{1}{1 + \Lambda_{s.k}} - 1\right] \leq 0 \tag{C.10}$$

C. ***(Elasticity of exports with respect to imports)*** *The total amount of exports of a sector are increasing on the amount of imports of the sector. That is,*

$$\Sigma_{X,M} = \frac{\frac{\partial \log R_{s,k}}{\partial \log \tau_{s,k}}}{\frac{\partial \log M_s}{\partial \log \tau_{s,v}}} = \frac{\partial \log R_{s,k}}{\partial \log M_s} = \frac{(1-\rho)\sum_k \frac{R_{s,k}}{R_s}\left[\frac{1}{1+\Lambda_{s.k}}\right]}{(1-\rho)\left[\sum_k \frac{Q_{s,k}}{Q_k}\frac{1}{1+\Lambda_{s.k}}\right]} > 0$$