Multi-destination exporters, market power and the elasticity of markups across destinations*

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[Very preliminary and incomplete]

Abstract

This paper studies the responses of multi-destination exporters to import cost shocks in the context of variable markups. We develop a trade model with variable markups and propose a methodology that lets us identify the within-firm, across-destinations elasticity of markup and the sensitivity of this elasticity to a firm's market power in the destination. On the empirical side, the methodology requires exogenous cost shocks in order to analyze the response of the firm across its destinations. We use a comprehensive dataset of Argentinian firms and exploit variability in the timing of import barriers imposed on Argentinian products. Not surprisingly, we find that trade barriers reduce imports for those firms that are more exposed to the policy. This, in turn, yields a considerable decline in their total exports. We then use the cost shock to uncover a novel fact: for a given firm, in a given year, the negative effect of rising import costs on exports is more prominent in markets where the firm is smaller relative to other firms in the same sector. In light of our theoretical model, this result implies that the elasticity of markup for a multi-destination exporter is increasing on its market power in the destination market. Intuitively, a multi-destination exporter decides to adjust relatively more its markups (and less their prices and export revenues) in those markets where it has higher market power.

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1 Introduction

Recent literature has documented that heterogeneous firms charge variable markups.[1] Most of these papers have focused on understanding how the elasticity of markup vary with firm-level characteristics.[2] It is also well-known that trade is highly concentrated in a few firms that export to many markets.[3] The fact that multi-destination exporters are predominant in trade suggests that understanding their behavior is important in many contexts. Yet, surprisingly, there is no evidence on how multi-destination exporters adjust their markups in their different markets and which are the firm-destination characteristics that determine these adjustments. In this paper, we aim to fill this gap. How do multi-destination exporters respond in different markets to a cost shock? Does the elasticity of markup for a given firm differ across its destinations? Does the elasticity of markup of a given firm depend on its relative size in the destination?

Analyzing the responses of a given firm, across its many destinations requires rich micro-level data and substantial exogenous variability on the exposure of firms to shocks. Most of the papers that study the elasticity of markup exploit variability from bilateral exchange rate shocks. However, the nature of this variability has prevented the authors to compare responses of a given firm, across its destinations (e.g: Amiti, Itskhoki, and Konings (2015)). In order to address this problem and be able to answer these questions, we develop a methodology that combines the structure of an international trade model with an empirical strategy that exploits exogenous shocks to firms' costs of production.

Our empirical strategy is based on analyzing how a firm responds in its different destinations after being hit by a shock to its costs. We use a comprehensive database of Argentinian firms for the period of 2002-2011 and exploit exogenous variability coming from the timing in which barriers to imports of certain products where imposed between 2005 to 2011, combined with the firm's previous share of imports of the affected product previous to the policy this period. The idea is that barriers to imports of intermediate inputs increase firms' costs to produce. We assume that a firm is more exposed to these cost shocks when it was already using the imported input in its production function and that the shock is firm-year specific.

Our first empirical result is at the firm level in order to show that barriers to importing were, in fact, a cost shock. We show that more exposed firms reduce their amount of exports considerably.[4] Once we have established that import barriers affect costs, we use the shock to uncover our main fact. Conditional on destination-sector-year fixed effects, we test whether firms' responses to the shock vary across its destinations depending on their relative size in the market. We find that a given firm reduces more its export revenues (increase more its prices) in markets where the firm's market share is relatively higher.

Explaining the nature of the observed behavior is at the core of this paper. Therefore, in order

[1] Amiti, Itskhoki, and Konings (2016), Atkeson and Burstein (2008), Berman, Martin, and Mayer (2012), Goldberg, Khandelwal, Pavcnik, and Topalova (2010)

[2] For instance, Berman, Martin, and Mayer (2012) shows that higher performance firms have a higher elasticity of markup. Similarly, Amiti, Itskhoki, and Konings (2015) shows that within a destination, comparing across firms, the elasticity of markup is increasing in the firm's market share in the market.

[3] In our sample, 99.50% of total manufacturing exports are explained by multi-destination exporters.

[4] We also revisit the elasticity of exports with respect to imports. We find that this elasticity is around 50%. We also show a remarkable decline in the probability of exporting and the number of destinations that the firm reaches after access to imports of intermediate goods becomes more costly.

to guide the empirical analysis, we develop a model of export and import choices that allows for variable markups for a given firm in different markets.[5] On the demand side, the framework incorporates variable markups to a standard model of heterogeneous firms, closely following the analysis in Atkeson and Burstein (2008).[6]. On the supply side, we propose a model of import behavior that shares the main ingredients of standard models of importing (Antras, Fort, and Tintelnot (2017), Blaum (2017), Blaum, Lelarge, and Peters (2013), Halpern, Koren, and Szeidl (2009)). We assume that firms draw core productivity and that firms combine inputs in a CES production. We further assume that inputs markets are perfectly competitive as it is standard in the importing literature.

By closely following the model structure, we show that our empirical findings are consistent with a mechanism in which multi-destination exporters decide to adjust more their markups in response to cost shocks in those markets where they are relatively bigger. That is, the elasticity of the elasticity of markup with respect to a firm's market share in a destination (super-elasticity) is positive. Intuitively, when hit by a negative shock, multi-destination exporters are able to absorb a part of this shock by reducing its markups in markets where they have higher market power.

Our paper contributes to different strands of the literature. 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 (e.g: 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.

We also contribute to a growing literature that studies heterogeneous responses of firms in the context of exchange rate movements and incomplete exchange rate pass-through. For instance, Berman, Martin, and Mayer (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, Itskhoki, and Konings (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. Perhaps, more similar to ours is Amiti, Itskhoki, and Konings (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. However, their focus on bilateral

[5]So far the model does not explicitly incorporates quality standards when serving different markets, but in a future version we aim to have this. However, we do present some empirical results that may be consistent with the quality hypothesis being part of the explanation

[6]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 super-elasticity of markups with respect to the firm's market share is model specific. In a sense, we test the hypothesis that this superelasticity is positive. See for instance Arkolakis and Morlacco (2017) for a review of different ways of incorporating variable markups

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. 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. In any case, the estimate is important to develop and calibrate models that analyze the exchange rate pass-through. Therefore, we see our contribution as complementary to the literature that aims to understand price-to-market and incomplete exchange rate pass-through.

When it comes specifically to import costs shocks, De Loecker, Goldberg, Khandelwal, and Pavcnik (2016) find that after India trade liberalization the price declines are small relative to the declines in marginal costs since firms offset their reductions in marginal costs by raising markups. They also demonstrate heterogeneity across firms. However, their focus is on variable markups in domestic markets. Our paper complements these findings by analyzing the responses of firms across export destinations.

We also provide new insights on 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. Bas (2012) uses survey data for 1000 Argentinian firms and exploits variability coming from changes in industry tariffs after Argentina trade liberalization in 1990 to study the effect of input tariffs on exports. However, as data on imports was not available, the author is not able to relate imports to exports. More closely to ours is the work of Feng, Li, and Swenson (2017) that uses tariff liberalization episodes in China between 2006-2010 to establish the connection between imports of intermediate inputs and exports. Their analysis relies on industry level weights of exposure. Finally, Kasahara and Lapham (2013) develop a theoretical model that allows for complementarity between exporting and importing and shows that this complementarity is important to understand the welfare implications of openness to trade.[7]

Finally, the last contribution of the paper is studying the causal effect of a non-tariff barrier to trade. These barriers have been increasingly important on the world trade and are expected to become more predominant in the future, given the restrictions on tariffs by the WTO.[8] Literature on the effects of these barriers on firms' export decisions is scarce. In this paper, we provide new insights about their effect on firms' performance.

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.

[7]Under a different mechanism, Albornoz and Garcia-Lembergman (2018) studies how exporting activity affect importing.

[8]For instance, Nicita and Gourdon (2013) shows that non-automatic licenses are the most used measure to control import quantities (since quotas were made illegal by WTO) and they are specially implemented in developing countries.

2 Data

2.1 Description

Our main data source is administrative data from Argentinian Customs, which provides a comprehensive panel of the universe of Argentinian trade flows by firm, product at most detailed aggregation level (12 digit level, which includes HS 6-digit level and 6 digits specific to Argentina), exports by destination, and imports by source country. The panel has a monthly frequency and spans from 2002 to 2011. We merge these data, using a unique firm identifier, with firms' employment and main sector of activity (CLAE-6digits) from Argentinian Tax Authority, comprising the universe of formal sector. We restrict the sample to manufacturing firms to avoid trading companies whose imports are not intermediate inputs to their own production and whose exports are not produced by other firms. We also restrict the sample to firms that exported at least once in the period 2002-2007. Hence, we focus on the 12,165 manufacturing firms that exported in the period 2002-2007.[9]

Finally, we constructed a unique database containing monthly data on (non) tariff barriers to different products imposed in Argentina during 2002-2011 period. We tracked and digitized executive decrees during the period in order to construct a database listing the month-year in which an administrative barrier was imposed to each of the products at (HS-8-Digit). The policy is described more in detail in the empirical strategy section.

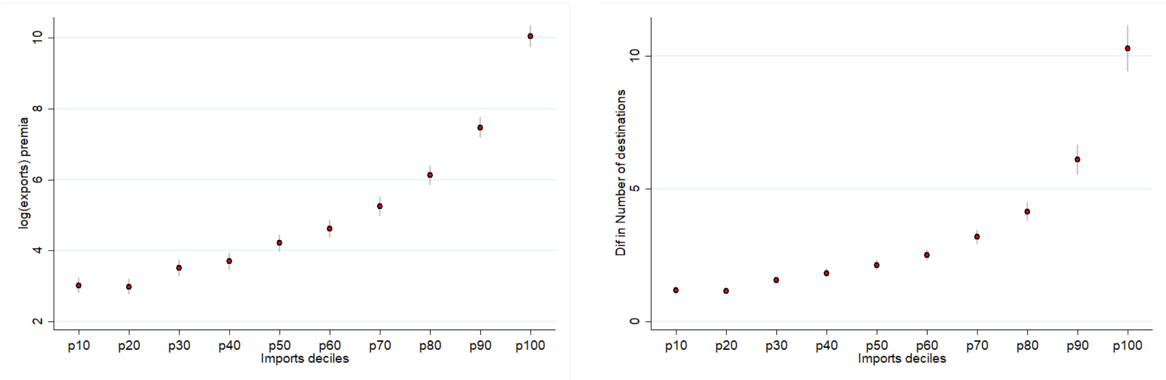
2.2 Stylized Facts

In this section we document patterns in the data that guide our theoretical model assumptions and empirical strategy, as well as motivates our research questions.

Fact 1. Relation between importing and exporting: An empirical regularity is that larger importers are more successful as exporters. This salient pattern is also present in many other datasets. Even after controlling for firm's characteristics such as size, the correlation between importing and exporting is still important. This suggests that, even conditional on firm's characteristics, access to foreign inputs is a key factor to be able to reach export markets. For instance, imports of intermediate inputs help firms to reduce their unit costs (or improve the quality of their products). In the following figures we document this pattern. We separate firms in import deciles and show that larger importers export more and reach more destinations. In addition, the effect intensifies for the largest importers.

[9]Results remain qualitatively unchanged if we don't impose this last restriction.

Figure 1: Firm total exports, number of destinations and size as importer



Fact 2. Price (unit values) dispersion across firms and also within a firm across destinations A salient feature in our data is that there is substantial price dispersion.[10]. First, in a given destination, for a given product (at 12-digits level), controlling for total exports and employment, we can observe that the standard deviation of log (prices) is around 1.04. Put it differently, in a given destination, different firms in a given sector sell similar products at very different prices.

Notably, a fact that has been less explored by the literature is that price dispersion is still remarkably important when we compare prices for a given product in a given year for a given firm, across its destinations markets.[11] This is true even controlling for sector-by-destination-by-year fixed effects in order to compare similar destination markets (i.e: control for size of the market, as well as growth of a particular sector). The standard deviation of prices of the same firm for the same product across similar destinations is around 0.61. This suggests that there are characteristics specific to a firm-destination that affect considerably the price that a firm set for a given product in each market.[12]

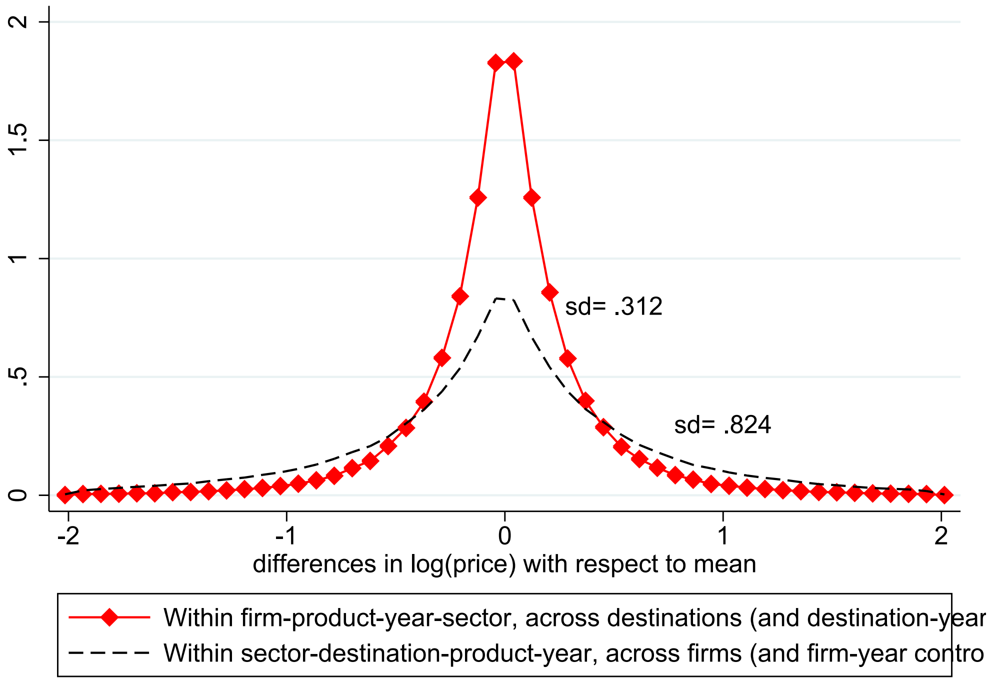
The graph below summarizes the price dispersion described above by plotting the density functions of the difference in log prices with respect to the mean across firms (dashed black line) and within firms across destinations (connected red line).

[10] From hereafter, we proxy prices with unit values and compare products that are in the same unit of measure (e.g: units, kg)

[11] Manova and Zhang (2012) provides similar evidence of this pattern for Chinese firms.

[12] We acknowledge that unit prices are measured with error. Hence, our methodology derive conclusions by focusing on changes in export revenues (similar to Berman, Martin, and Mayer (2012)). However, we believe that using unit values is informative in the descriptive analysis.

Figure 2: Price dispersion across and within firms



Fact 3. Firm's relative size in the market is relevant to explain the price differences

In order to present this fact, it is convenient to construct a variable that will be key in our analysis. Lets denote S_{iskt} the share of firm i exports to market k relative to all firms belonging to sector s, supplying in the destination market k, including Argentinian exporters and exporters from other countries. We define sectors at the HS-4digits level.[13]

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

where $WorldImports_{skt}$ is total imports of country k of products belonging to sector s. We summarize the distribution of this variable in Table 5 of the appendix.

First, in order to estimate the correlation for a given product-by-destination-by-sector across similar firms, we run the following regression:

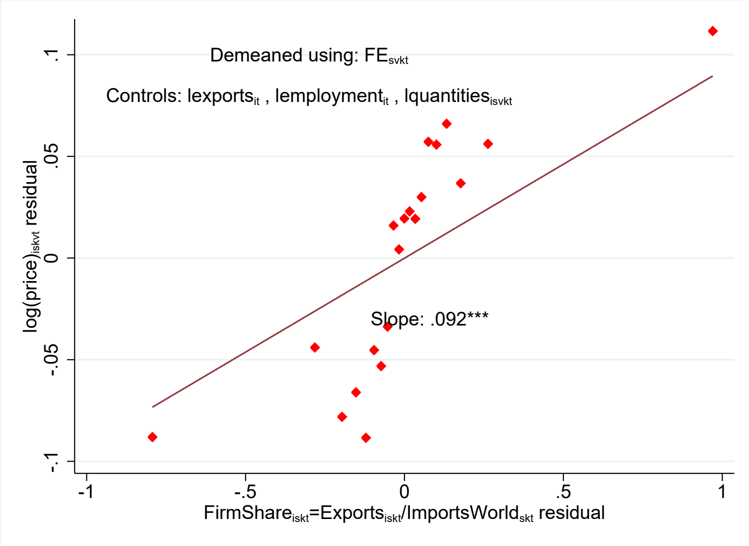
$$\log(price)_{isbkt} = \beta S_{iskt} + FE_{sbkt} + controls_{it} + \epsilon_{ispkt}$$

where b is the product at 12 digits.[14] To be as transparent as possible with the variability that we are capturing, we plot the bin scatter of the demeaned variables, as well as the fitted line; which slope is the main coefficient of the regression (β). The figure shows that the same product, sold in the same market in a given year is increasing in the firm's market share in the destination. This is true, even controlling for the size of the firm.

[13] Alternatively, this fact and main results of the paper remains qualitatively unchanged if we define the sector at the HS6 level. Results are availabe upon request.

[14] In addition, we compare products which quantity is measure in the same unit.

Figure 3: Market power and price dispersion across firms, within a destination

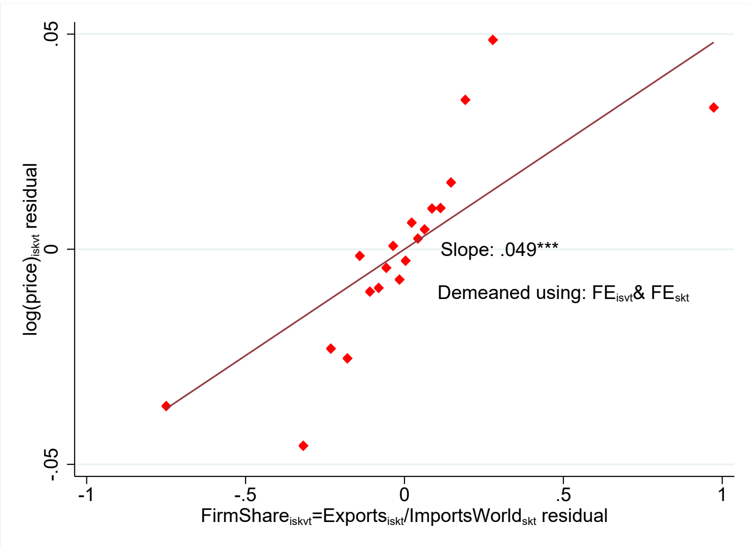


More importantly, we document a new stylized fact: Conditional on destination-by-sector-by-year characteristics, the same firm, exporting the same product, charges higher prices in markets where it represents a larger share of the country imports in the sector. To do so, we run the following regression:

$$\log(price)_{ispkt} = \beta S_{iskt} + FE_{isbt} + FE_{kt} + \epsilon_{isbkt}$$

In Figure 4 we document that a given firm charges higher prices in markets where its market share is relatively higher. This is true even controlling for destination-by-sector-by-year FE.

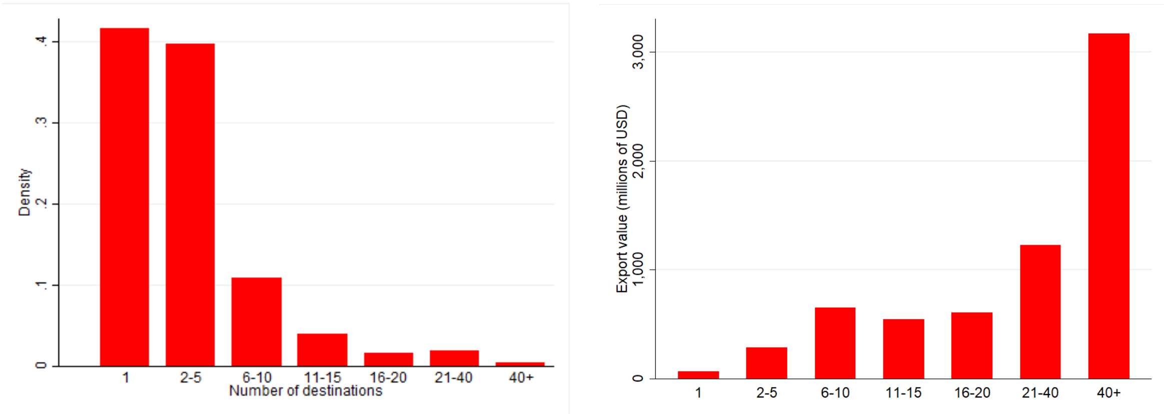
Figure 4: Market power and price dispersion within firm, across markets



Fact 4. Most of trade flows are explained by multi-destination exporters

It is well-known that trade is concentrated among a few big firms. In our sample, roughly 60% of the exporters, export to more than one destination in a given year. In addition, these firms represent more than 99% of Argentine manufacturing exports. Figure 4 summarizes the importance of multi-destination exporters.

Figure 5: Most of trade is concentrated among multi-destination exporters.



3 Model

We consider a static small open economy where local firms can import their intermediate inputs and export their output. As it is standard in the literature, importing inputs from abroad reduces the unit cost of production of firms, but it is subject to fixed costs (Antras, Fort, and Tintelnot (2017), Blaum (2017), Blaum, Lelarge, and Peters (2013), Halpern, Koren, and Szeidl (2009)). For now, we will focus on the intensive margin of exports and imports in the theoretical section.[15]

We allow firms to sell their products to k foreign markets which differ in their demand. Importantly, guided with the patterns in the data described below, we allow for variable markups of a firm in each market. In particular, we want the model to generate higher markups for firms with higher shares in a market. Our model follows closely Atkeson and Burstein (2008) variable markups model.[16]

As a side-note, the 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 suggest that it is possible to estimate it using only information on 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.[18] Consumers in each market have a nested CES demand over the varieties of

[15] Although 1) We will show results on the extensive margin in the empirical section; and 2) soon we will add propositions for the extensive margin

[16] other papers using this

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

[18] For brevity, we drop the subscripts s and t for sector and time. To facilitate to relate this paper to other papers with variable markups, we will try to follow closely the notation in Atkeson and Burstein (2008), Amiti, Itskhoki, and Konings (2015) and is standard in the literature.

goods.

In particular, provided exporting to market k, a firm i faces the following demand:

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

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 $\rho > \eta > 1$. This demand endogenously generates variable markups that crucially depend on a firm's market share in market k. Define this market share as,

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

Note that the effective demand elasticity for firm i in market k is given by,

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

As $\rho > \eta$, this elasticity is decreasing in the market share of the firm. 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

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

It will be informative for the rest of the analysis to understand how mark-ups react to changes in the price of a firm in market k. Holding constant sector price index, markup elasticity with respect to firm's price is given by,

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

Three key features arise from inspection of the equations above that worth mentioning. First, firms that have a higher share in market k also have higher markups in that market. This feature is consistent with Fact 3. Second, the elasticity of markup with respect 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-elasticity ($\S = \partial \log \Gamma_{ik} / \partial \log S_{ik} > 0$) 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.

Definition 1

Super-elasticity of markup **(§): The derivative of the absolute value of the elasticity of markup with respect to market share in destination k. Formally, (§ $= \partial \log \Gamma_{ik} / \partial \log S_{ik}$).**

PROPOSITION **1.**

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.*

Proof. See appendix. □

3.2 Import Decision and unit costs

We now turn to the import behavior of the firm. This together with its productivity draw determines the firm's unit costs. We consider a standard framework of import behavior where firms' import decisions are the solution to a maximization problem. Since foreign suppliers can be more efficient at producing some of the intermediate varieties, firms may be willing to demand imported inputs as a vehicle to reduce unit cost of production. A measure N of final-good producers each produces a single differentiated product. Firms are characterized by an heterogeneous attribute φ that, for concreteness, is interpreted as core productivity. Just like 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:

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

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. As for the moment we will not focus on the source market, lets assume that there is only one market from where the firm can source inputs. Hence, $v = product$ from that market. [19] Importing variety v involves a fixed cost (κ^m), which (for now) we assume common across firms and sources. We further assume that firms take input prices (adjusted by quality) as given and 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}):

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

[19]This leads the same prediction as Antras, Fort, and Tintelnot (2017) where the gains from variety comes from productivity draws of foreigners from a Frechet distribution function of foreigners akin to Eaton Kortum

3.3 Firm Import Behavior

We briefly analyze the firm's behavior in equilibrium. It is convenient to define a sourcing strategy Ω as the set of input varieties v, such that the firm imports positive amounts of these varieties. We focus first in firms' decision, conditional on the sourcing strategy Ω.

3.3.1 Optimal amount of imports conditional on sourcing strategy

To obtain the amount of imports of variety v, the firm minimizes its cost function subject to its production function.

The optimal quantities of variety v are given by,

$$z_v^*(\varphi, \Omega, Q) \equiv arg \min_{z_v} \sum_{v\in\Omega} p_v z_v \text{ s.t } Q = \varphi \left[\sum_{v\in\Omega} (z_v)^{\frac{\theta-1}{\theta}} \right]^{(\theta/\theta-1)} . \tag{3.1}$$

Solving,

$$z_v(\varphi, \Omega, Q) = \frac{Q}{\varphi} \frac{\left(\frac{1}{p_v}\right)^{\theta}}{\left[\sum_{(v)\in\Omega} \left(\frac{1}{p_v}\right)^{\theta-1} \right]^{\theta/\theta-1}} \qquad \forall v \in \Omega, \tag{3.2}$$

Or in terms of value,

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

Once we have the intensive margin of imports for any variety that belongs to the firm sourcing strategy (Equation 3.3), it is straightforward to obtain the minimum unit cost function for a given sourcing strategy.

$$c_i = \frac{h(\Omega)}{\varphi} = \frac{1}{\varphi} \left[\sum_{v\in\Omega} \left(\frac{1}{p_v}\right)^{\theta-1} \right]^{-\frac{1}{\theta-1}} = \frac{1}{\varphi} \left[\sum_{v\in\Omega} \left(\frac{A_v}{\tau_{iv}}\right)^{\theta-1} \right]^{-\frac{1}{\theta-1}} = \frac{1}{\varphi} [\Phi]^{-\frac{1}{\theta-1}}, \tag{3.4}$$

where h() is the part of the unit cost given by inputs and in the last identity we defined the sourcing capability of a firm as,

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

Also note that total amount of imports of intermediate goods of firm i is given by,

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

Expenditure share of firm i on imported variety v is given by,:

$$m_{iv}(\Omega) = \frac{\left(\frac{A_v}{\tau_{iv}}\right)^{\theta-1}}{\left[\sum_{v\in\Omega}\left(\frac{A_v}{\tau_{iv}}\right)^{\theta-1}\right]} \qquad \forall v \in \Omega;$$

$$m_{iv}(\Omega) = 0 \qquad \forall v \notin \Omega$$

and, by Shepard's Lemma:

$$\frac{\partial log c_i}{\partial log \tau_{iv}} = m_{iv} \tag{3.6}$$

Note that the model predicts that the barrier to import has a higher impact on costs, 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.

As we will not derive conclusions on the extensive margin of imports, in what follows we omit the argument Ω.

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:

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

PROPOSITION **2.** *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,*

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

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:

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

and, total revenues of a firm are given by,

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

[20]

3.6 Predictions

The model generate two set of predictions that will guide our empirical section. The first set of results are firm-destination specific. We establish the direct effect of an increase on trade barriers for a given input on the firm's exports in each market k. Importantly, this proposition predicts the expected responses of a multi-destinations 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 how trade barriers affect total export revenues and total imports and guide the estimation of the elasticity of exports with respect to imports at the firm level.

We begin by establishing the effect of import cost shocks on export revenues in a given market k.

PROPOSITION **3** (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}:*

$$\frac{\partial \log R_{ik}}{\partial \log \tau_{iv}} = (1-\rho)\left[\frac{1}{1+\Gamma_{ik}} m_{iv}\right] \leq 0 \qquad (3.7)$$

$$\frac{\partial \log R_{ik}}{\partial \log \tau_{iv} \partial m_{iv}} = (1-\rho)\left[\frac{1}{1+\Gamma_{ik}}\right] \leq 0 \qquad (3.8)$$

[20] Note that when we extend the model to allow for entry and exit into import and export, lower costs through higher inputs may let us

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):*

$$\frac{\partial \log R_{ik}}{\partial(\log \tau_{iv}\partial m_{iv})\partial \Gamma_{ik}} \geq 0 \tag{3.9}$$

C. *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:*

$$\frac{\partial \log R_{ik}}{\partial(\log \tau_{iv}\partial m_{iv})\partial S_{ik}} \geq 0 \tag{3.10}$$

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 **4** (Firm level predictions).

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

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

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:*

$$\frac{\partial \log M_i}{\partial \log \tau_{iv}} = -m_{iv}\left[\rho \sum_k \frac{Q_{ik}}{Q_k}\frac{1}{1+\Gamma_{ik}} - 1\right] \leq 0 \tag{3.12}$$

$$\frac{\partial \log M_i}{\partial(\log \tau_{iv}\partial m_{iv})} = -\left[\rho \sum_k \frac{Q_{ik}}{Q_k}\frac{1}{1+\Gamma_{ik}} - 1\right] \leq 0 \tag{3.13}$$

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,*

$$\mathcal{E}_{XM} = \frac{\frac{\partial \log R_i}{\partial \log \tau_{iv}}}{\frac{\partial \log M_i}{\log \tau_{iv}}} = \frac{\partial \log R_i}{\partial \log M_i} = \frac{(1-\rho)\sum_k \frac{R_{ik}}{R_i}\left[\frac{1}{1+\Gamma_{ik}}\right]}{1-\rho\left[\sum_k \frac{Q_{ik}}{Q_k}\frac{1}{1+\Gamma_{ik}}\right]} > 0 \tag{3.14}$$

Proof to proposition 4. A.

B. 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

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

C. 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.

□

4 Empirical Strategy

The model described above suggests that in order to answer the questions of this paper, we need a supply shock to import costs of specific products (i.e: τ_{iv}), combined with information of the share of imports of the product of a firm m_{iv}. On this ground, we exploit exogenous variability in import costs to specific products coming from the timing in which Argentinian government imposed (non-tariff) barriers to imports of specific products from between 2002 and 2011. We combine the timing of the restrictive policy to a product with data on the share of that product on firm's total imports before the policy took place.

In this section we describe the context, the policy, the identification assumptions and how we implement the empirical strategy.

4.1 Context: description of the policy

Governments have different tools to discourage imports allowed by WTO: tariff measures (a tax that is applied to import products, whether ad-valorem or fixed amount), measures against unfair trade (anti-dumping, safeguards and countervailing measures), technical barriers to trade (Which imposes minimum requirements of quality in the products) and import licensing (permit that allows an importer to bring in a specified quantity of certain goods during a specified period), among others.[21]

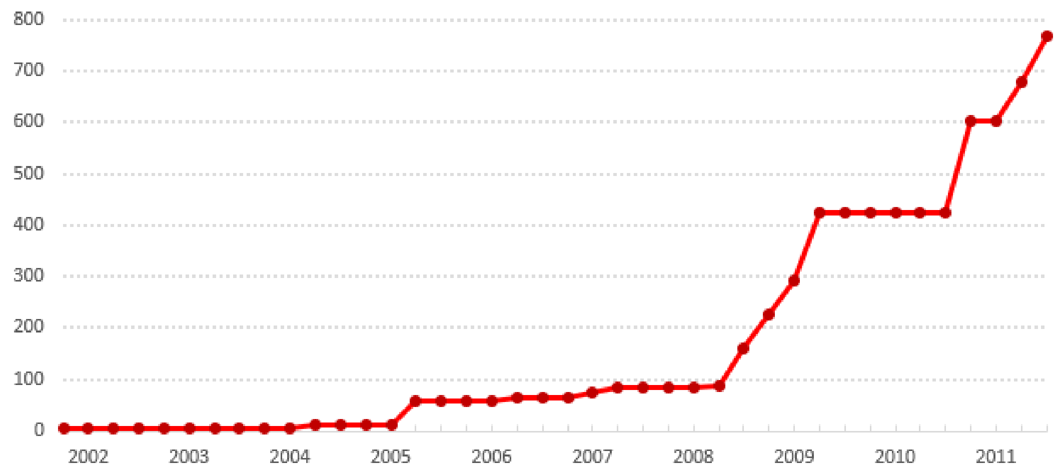
In Argentina, Import Licensing Procedures take two forms: Automatic Import Licencing and Non-Automatic Import Licencing (NAILs, from now on). Automatic import licensing procedures are generally use to collect information about imports and they are not administered in such a manner

[21] Each of these measures 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 that there is genuine injury to the competing domestic industry.

as to have restricting effects on imports.[22] In contrast, Non-automatic import licensing procedures (NAILs) are used, among other policy objectives, to administer quantitative restriction and tariff quotas justified within the WTO legal framework. Non-automatic import licensing procedures are much more complex and may imply important transaction costs for importers of those items affected. In particular, it can take up to 2 months to process an application and approval is not granted. In practice, the NAILs works as a non-tariff barrier to trade.

From 2005 to 2011, Argentine government systematically increased the number of products in the NAILs, usually with the objective of reducing trade imbalances. The products were added in different months by executive decrees. Figure 6 summarizes the timing in which products were added to the NAILs system. As the government had limited capacity to quickly impose other measures to discourage imports, the NAILs represented the main increase in trade restrictions during that period. In the paper, we exploit variability in the timing in which a intermediate input entered to the NAILs system as exogeneous variation to the costs of the firms.[23]

Figure 6: Evolution of NAILs over time.



A remarkable feature of the NAILs imposed in Argentina is that there were not concentrated in a few sector of the economy. The barriers ended up affecting firms in most of the sectors, as shown in Figure 10 of the appendix. This let us compare firms within a given sector.

4.2 Methodology

We will use the policy described above to construct a cost shock for a firm. In particular, in order to construct a time-varying firm-level variable that proxy a firm's exposure to import barriers, we proceed as follows. We use the import basket 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

[22] 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 licences (non-discrimination); and, (ii) the application shall be approved immediately on receipt when feasible or within a maximum of 10 working days

[23] We restrict the period of analysis to 2011 since during 2012 the Argentine government implemented a new licensing system that affected all imported products.

multiply it by an indicator that takes value 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 4.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.

4.3 Relevance of the policy and identifying assumption

4.3.1 Effectiveness of the NAILs in reducing imports

Before moving to the results of the paper, we first explore whether the NAILs were actually effective in reducing imports of those items that were added to the list. We can perform an event study at the product level to analyze if being added to NAILs, reduce imports of a item at HS-8-digits level. Formally,

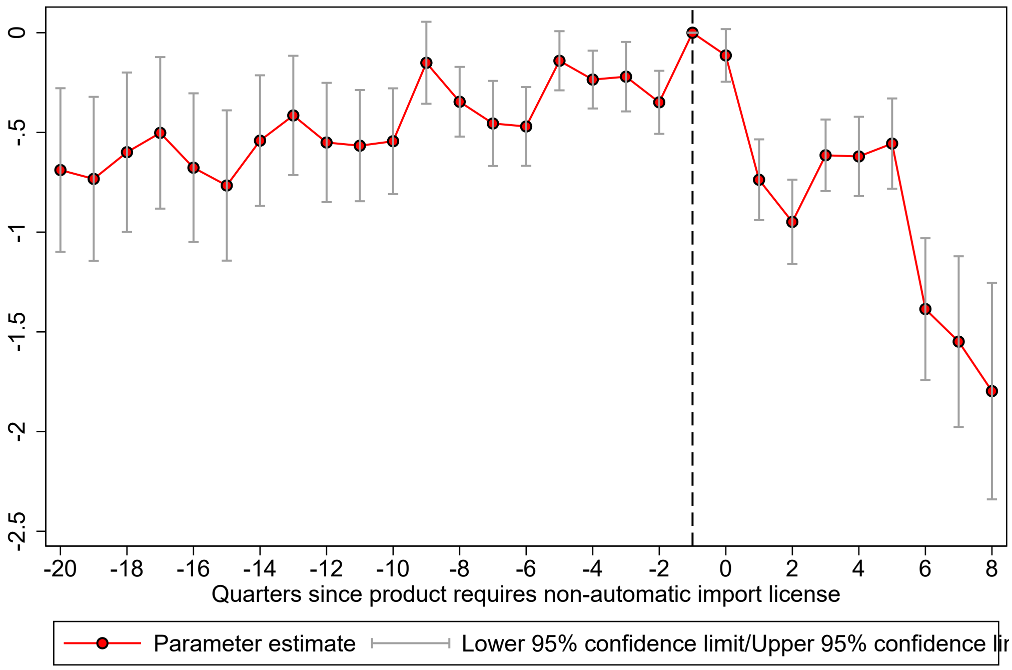
$$\log(Imports_{vt}) = \sum_{j=-27}^{12} \beta_j 1[QuartersSinceNAILs_{it} = j] + \alpha_i + \gamma_t + u_{it},$$

where the negative values correspond to years before the product entered to the NAILs list. We focus on parameter β that represent the impact of the incorporation of NAIL on products' imports. Figure 2 plots the coefficients β. [24] Reassuring, we do not observe systematic differences in the years before the product was added to the NAIL system. As expected, the NAILs seem to work as an important barrier to trade, specially since the second quarter after the product was included.[25]. Imports of a product that is added to the NAILs list decline by 50% the first year with respect to its counterfactual.

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

[25]In the first months, importers used previous approved authomatic lisencing to import, so NAILs might require some months to effectively affect the firm.

Figure 7: Event study. The impact of Non Automatic Import License on $\log(imports)$.



4.3.2 Identification assumption

Once we have proven that including a product in NAIL system reduces the amount 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 to the NAILs system is not correlated with changes in firm's export decisions and/or characteristics of the destination market. Put it differently, 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 its exports. Before turning to the results, a graph 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 a graph as follows. Again, 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, being the later 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,

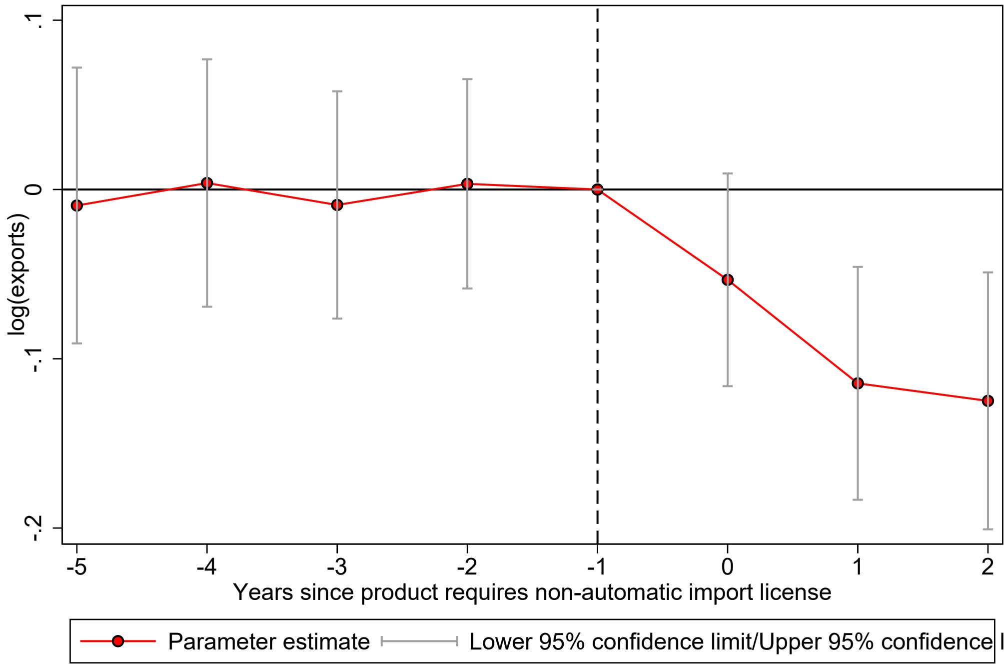
$$\log(exports_{it}) = \sum_{j=-6}^{3} \beta_j 1[YearsSinceExposureToNAILs_{it} = j] + \alpha_i + \gamma_t + u_{it}.$$

[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 in 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, for our main results, the assumptions are even milder than this paralell trends since we exploit variability across destinations.

Figure 8 plots the coefficients β of this regression. Reassuring, 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 of the results that we will show in the next section: the value of exports are significantly reduced after the firm is exposed to NAILs.

Figure 8: Event study. The impact of Non automatic Import License on firms' log(exports).



In this section we documented that the NAILs were actually effective on reducing imports and that the government do 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. First, we identify the direct effect of NAILs on exports and the elasticity of total exports with respect to total imports. Then, 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 with respect 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 4.C indicates, this elasticity is given by $\mathcal{E}_{XM} = \frac{\frac{\partial \log R_i}{\partial(\log \tau_{iv} m_{iv})}}{\frac{\partial \log M_i}{(\log \tau_{iv} m_{iv})}}$.

Put it differently, 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:

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

and

$$\log(Exports)_{ist} = \beta NAILexposure_{ist} + \gamma_i + \gamma_t + \gamma_{st} + \mu_{it}, \tag{5.1}$$

where $imports_{it}$, $exports_{it}$ are the amount 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 5.1). According to our model, introducing import barriers to intermediate inputs v increases the marginal cost for those firms that used to import the input and reduces their competitiveness in foreign markets. Therefore, we expect to observe that those firms that use more intensively 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 served. Results from the estimation of equation 5.1 are reported in Table 1.

Table 1: Reduced form: The effect of NAILs exposure on firm's total exports

	$\log(exports)_{it}$	$Exportstatus_{it}$	$\#Destinations$
$NAILexposure_{it}$	-0.3882**	-0.0333**	-0.1911***
	(0.1563)	(0.0137)	(0.0591)
Observations	126,150	126,150	126,150
R-squared	0.6268	0.4982	0.8818
Firm FE	yes	yes	yes
Year FE	yes	yes	yes
Sector-Year FE	yes	yes	yes
Mean dep variable	6.562	0.539	2.342

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 reduced considerably the intensive and extensive margin of exports. For instance, firms whose import basket is entirely affected by NAIL system, reduce 39% 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 destination that the firm reaches is affected negatively by the raise in import costs.

Once we have shown the reduced form effects, we turn to the instrumental variable estimation of the elasticity of substitution of exports with respect to imports at the firm level. Results are reported in Table 2. The first thing to notice is that the coefficient for the first stage is -0.95. Namely, a firm for which the 10% of their inputs is affected by the NAILs, reduce their total imports by 8.3%. Additionally, the F statistic of the first stage is over the conventional threshold. Second, we find that an increase in 10% of imports of intermediate inputs increases export values in 4%.[28] In addition, imports also have considerably effects on extensive margin of exports. An increase in 10% of imports increase 3.5 percent points the probability of being active in export markets (6.5% 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 2: Elasticity of exports with respect to imports at the firm level

	(1) $\log(exports)_{it}$	(2) $Exportstatus_{it}$	(3) # Products	(4) $\#Destinations$
$\log(imports)_{it}$	0.4083**	0.0351**	0.4781*	0.2010***
	(0.1613)	(0.0142)	(0.2570)	(0.0654)
Observations	126,150	126,150	126,150	126,150
R-squared	0.6452	0.5149	0.8298	0.8828
Firm FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
Sector-Year FE	yes	yes	yes	yes
First Stage				
$NAILexposure_{it}$	-0.9508	-0.9508	-0.9508	-0.9508
F	38.99	38.99	38.99	38.99
Mean dep variable	6.562	0.539	4.251	2.342

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

5.2 Within firm, across destinations super-elasticity of markup

We now turn to the empirical estimation of the super-elasticity of markup. That is, we aim to test whether a given multi-destinations firm adjusts less its prices (export revenues) in response to a cost shock in those destinations where it has higher market share. In order 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:

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

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

where $WorldImports_{skt}$ is total imports of country k of products in sector s.[29]

Proposition 3 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 3.7 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,

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

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:

$$\Delta \log Expo_{iskt} = \beta_1 \Delta Nailexposure_{it} + \beta_2 \Delta Nailexposure_{it} * S_{ikt-1} + \gamma S_{ikt-1} + \gamma_{it} + \gamma_{skt} + \Delta e_{iskt}. \tag{5.2}$$

where

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

Equation (5.2) 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 $t-1$. Note that 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 **??** we provide a graphical representation our methodology to identify the super-elasticity of markup.

Table 3 reports the results for different versions of equation (5.2). In the first row we report the coefficient for the average effect, while in the second one 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

[29] The distribution of this variable is summarized in Table 5 of the appendix.

firm exports; such as the country growing in the sector of the firm. As expected, the average effect of the cost shock on exports in negative. An increase of 10% on exposure, cause 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 3: 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.

Robustness Checks

In Table 4 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.

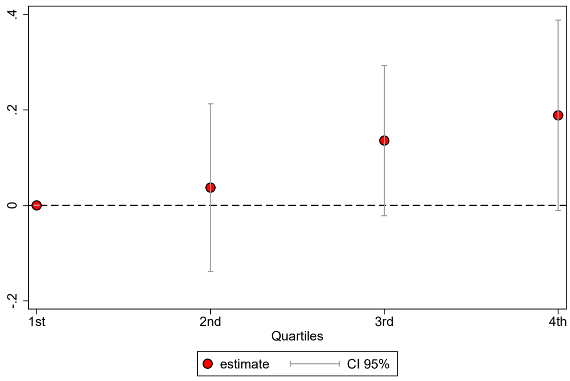
Table 4: Robustness Check: Elasticity of markup and relation with market share

	(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 5.2, but splitting market share variable into quartiles. In figure 9 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 9: Market share and markups, non-parametric results



6 Conclusion

Most of 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 understand aggregate trade flows, welfare gains from trade, and the distribution of these gains.

We develop a methodology that combines a theoretical model with a empirical strategy to explain how multi-destination exporters adjust markups and prices in response to cost shocks. When a firm is hit by a firm-year specific cost shock, it reduces its export revenues (increase prices) in every destination. However, in those destinations where the firm is relatively larger, it adjusts less it export revenues, 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 exogenoeus variability of firms costs coming from the timing in which import barriers were imposed by Argentinian government between 2005 and 2011 to document that the within-firm responses across different destinations is a key margin of adjustment.

This heterogeneity of responses across destinations is interesting by its own right, and it also has important implications for the impact of shocks on exports at the aggregate level. The mechanism that we document suggest that an unilateral trade liberalization that reduces local costs for every Argentinian firm, will increase relatively more (reduce prices relatively more) exports to destinations in which the firm has 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 liberalization will be unevenly distributed in foreign countries, being 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. In further versions of the paper, we plan to explore more closely this conclusion.

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A Appendix: Data construction

A.1 Market Share

Distribution of Market share variable S_{iskt}

Table 5: 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

A.2 NAILs by sector

Figure 10: Average firm's share of imports corresponding to affected inputs (2011), by sector CLAE 2 digits