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Abstract

This study analyzes the firm-level impacts of temporary safeguard import tariffs implemented in Ecuador from 2015 to 2017. Employing a difference-in-differences methodology, we explore the policy's effects on a unique dataset combining firm- and product-level data. We focus on the direct effects on importing firms and indirect effects through the value chain. The analysis shows, that while the safeguards significantly reduced imports, they also resulted in short-run negative scale effects on firms. These include reduced sales, employment, labor costs, and material costs, without positive impacts on local firms in import-competing industries. Overall, our findings suggest a contractionary effect of protectionist policies, particularly in a dollarized economy, highlighting the complex implications of trade measures on firm performance and economic sectors.

JEL classifications: F13, F14, F16, O24, O54
Keywords: Trade policy, Protectionism, Input-output linkages, Emerging markets, Latin America

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1. Introduction

Trade tariffs throughout the world have remained stable or declined in recent decades, yet the use of temporary trade barriers (TTBs)—antidumping measures, countervailing duties, and safeguards—has ballooned (Bown, 2011; Grübler and Reiter, 2021). Several articles have analyzed the firm-level effects of recent cases of countries using TTBs, but have focused mainly on antidumping (see e.g. Jabbour et al., 2019; Konings and Vandenbussche, 2013; Vandenbussche and Zanardi, 2010), which tends to affect a relatively small number of firms. In contrast, we look at the firm-level effects of temporary safeguards that affected about 80% of the universe of importing firms in Ecuador, a dollarized emerging economy.

Following a decade-long oil boom, at the end of 2014, Ecuador's oil price fell to less than half of its 2011-2013 levels, reducing government revenue and threatening a large trade deficit. The Ecuadorian government responded by implementing a broad set of temporary safeguard import tariffs to limit imports. The safeguards came into effect on March 11, 2015 and affected approximately one-third of all imports, including intermediate inputs (capital and raw materials) and final goods (consumption).

The Ecuadorian implementation of safeguards provides an ideal case study because it used tariffs (as opposed to non-tariff barriers), and because of its broad-based, temporary nature. Since it affected around one-third of imports (close to 3,000 HTS 10-digit subheadings), the policy generated heterogeneous exposure across firms and industries. Also, since the safeguards covered final and intermediate goods, they had an effect on firms' activity both as producers and as consumers of goods and services. Finally, the policy was largely unexpected, as it started at most five months after the initial decline in oil prices.

The implementation of the Ecuadorian safeguards also allows us to neatly isolate their effect, without several of the usual confounding factors. First, because the policy was implemented unilaterally under the provision of Article XVIII of the WTO, there was no reciprocation by Ecuador's trading partners. Second, the safeguards were initially designed to last for 15 months, and therefore firms considered them temporary.[1] Third, since Ecuador is a dollarized economy, there were no effects on the nominal exchange rate and the Central Bank did not respond.

We analyze the influence of safeguard import tariffs on the performance of Ecuadorian firms by taking advantage of their varying exposure to the policy. Given that firms and industries have unique import profiles, they were affected differently by the introduction of safeguards. This diversity allows us to evaluate the causal impact of the policy by applying a difference-in-difference approach. Although import surcharges were implemented

[1]The safeguards were extended in April 2016 following a strong earthquake that affected the Ecuadorian Coast. They were fully phased out in June 2017.

between 2015 and 2017, we estimate their immediate (2015), short-run (2016 and 2017), and medium-run (2018-2021) effects, all relative to a 2014 baseline.

Using firm-level variation in exposure, we assess their direct impact on imports and estimate the elasticity of imports with respect to tariffs (direct exposure). Subsequently, we examine how these protective measures have affected various performance indicators of importing firms, including total factor productivity (TFP), sales and the likelihood of firm exit. We also look at the channels through which safeguards might have affected these performance measures, specifically employment, labor costs and material costs.

Likewise, using industry variation at the ISIC 4-digit level, we evaluate the safeguards' impact on the same performance indicators of importing-exporting, local import-competing, and local non-import-competing firms. We estimate the effects of industry-level protection generated by the safeguards (output exposure) and, using ISIC 4-digit total requirements input-output tables, we also estimate the impact of safeguards on downstream industries through their value chain exposure (input exposure).

Figure 1 provides a simple overview of the methodology considering the import dynamics. It shows the monthly percentage variation of the imports value with respect to the average of January 2014–February 2015, separated by whether the HTS subheadings were affected by the safeguards. The figure also shows the percentage variation of total imports. Before the implementation of the safeguards, each group of imports behaved very similarly, but this was not the case during and after the implementation of the safeguards: imports of affected products fell significantly more relative to the January 2014–February 2015 average.

Our results point to a clear short- and medium-term trade-off between reducing a trade deficit by increasing the cost of imports and the firm-level costs of using safeguards to achieve this goal. In 2017, the last year the policy was in place, an additional 1% of direct exposure led to a firm-level decrease of 2.6% in the rate of import growth. Imports elasticity reached -0.15 in this year, a relatively low value consistent with the temporary nature of the safeguards.

This reduction in imports among exposed importing firms was associated with large negative performance results. The mechanism is a reduction in the firms' scale (Head and Ries, 1999): In 2017, an additional direct exposure of 1% was associated with a reduction of 0.86% in sales growth, 0.40% in employment growth, and 0.99% in material costs growth. These effects persisted until 2021, beyond the implementation of the policy.

Along with these results, we find that exposure to the safeguards was associated with a higher probability of firms exiting the market. By 2021, a 1% increase in exposure resulted in a 1.37% higher probability of exit.

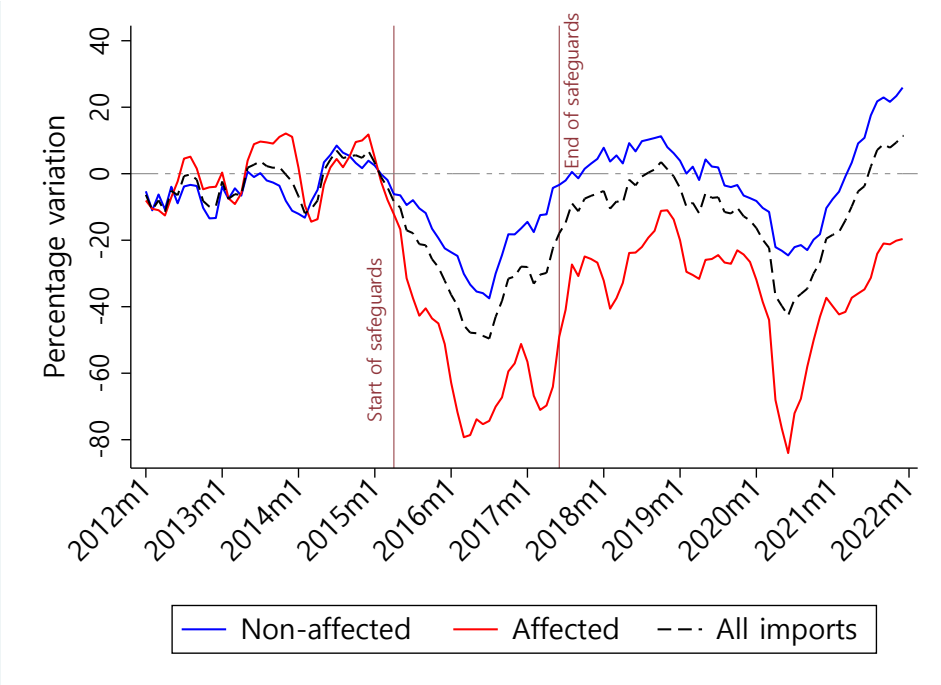


Figure 1: Import Evolution of Affected and Non-affected HTS 10-digit Subheadings
This figure displays the import dynamics of affected and non-affected HTS 10-digit subheadings before (2012-2014), during (2015-2017), and after (2018-2021) the period of implementation of the safeguard import tariffs in Ecuador. It presents percentage changes compared to the average import levels between January 2014 and February 2015. Data for total imports come from the Central Bank of Ecuador's Commerce dataset. Monthly high-frequency variation is smoothed out using a three-period moving average.

We also analyze the effects of safeguard import tariffs on other types of firms using industry-level variation in output and input exposure (Corden, 1966, 1971). Importing-exporting firms and local import-competing firms were not affected. The latter result is important because it shows that the firms that could have benefited from import protection did not obtain any advantage.

Local firms operating in non-import-competing industries were negatively affected by the policy through their value chain exposure. These firms experienced a temporary decline in productivity growth between 2016 and 2018. In the last year, a 1% increase in input exposure led to a 0.71% decrease in the growth rate of TFP. An additional 1% in input exposure was also associated with a persistent decline in the growth rate of sales and material costs, reaching 6.67% and 7.61% in 2021, respectively. The growth of labor costs among these firms also decreased between 2018 and 2020. In the last year, a 1% increase in input exposure implied a reduction of 13.63% in the growth rate of labor costs.

Finally, we show that the safeguards did not have an effect on the share of new firms by industry. Together with an increased probability of exit among importing firms, this result provides evidence of a net negative effect of safeguard import tariffs on firm creation.

The paper contributes to the recent literature that finds that protectionist trade policy has contractionary effects even in the case of a fixed exchange rate (Barattieri et al., 2021). We provide empirical microeconomic evidence of these negative effects in the context of a dollarized emerging economy, which displays some elements of a fixed exchange rate, except for the expansionary policy needed from the Central Bank to sustain the fixed exchange rate. To the best of our knowledge, this is the first paper to provide a systematic evaluation of a broad-based short-term protectionist policy in a dollarized economy.

More generally, our paper contributes to the literature that analyzes the effects of trade policy on firms' performance. However, in contrast to the common focus of the literature on the long-run consequences of permanent tariff *reductions*, we focus on the short- and medium-run effects of a type of temporary trade barriers (TTBs), safeguard import tariffs. This is important because the effects of increasing tariffs are not symmetric with those of falling tariffs (Furceri et al., 2021). The analysis provides evidence on a policy tool that is increasingly used by developing countries facing balance of payments problems, but that has been scantly analyzed.[2]

The paper also contributes to the literature that looks at the effects of trade policy through value chains. Specifically, we provide empirical evidence on the short- and medium-run effects of safeguards through vertical production linkages. Finally, it also contributes to the still-scant literature on trade policy effects at the firm level in Latin America in general, and Ecuador in particular.

Relation to the Literature

This paper is related to the literature that discusses the effects of trade policy under different exchange rate regimes (Auray et al., 2022; Barattieri et al., 2021), focusing on the context of dollarization.

It is also related to the large set of studies that looks at the effects of trade policy on firms' performance, particularly productivity. Caliendo and Parro (2022) and Goldberg and Pavcnik (2016) review the literature on the effects of trade policy in general and De Loecker and Goldberg (2014); Harrison and Rodríguez-Clare (2010) and Melitz and

[2] According to WTO Stats (available at https://stats.wto.org/) since 1996 43 countries have had safeguards in force at some point. In any given year, around 10 countries had at least one measure in force, and in 2015—the peak year and the year that we analyze for Ecuador—17 countries had a total of 43 safeguard measures in force. Since 2001 Ecuador had a total of 9 years with safeguard measures in force.

Redding (2014) provide detailed reviews on the impact of trade policy on firm performance. Although we do not find significant effects of direct exposure to the safeguards on importers' TFP growth, we do find a small temporary reduction in TFP growth among local firms in non-import-competing industries associated with value chain exposure.

We further contribute to this literature by analyzing the effects of safeguard exposure on a series of performance indicators beyond productivity, including labor-related outcomes such as employment and labor costs. These outcomes are related to the literature that looks at labor market adjustments from trade policy (Autor et al., 2014; Dix-Carneiro and Kovak, 2019) but with a focus on firm-level outcomes.

Our research also relates to the literature that looks at the long-run effects of trade liberalization in developing countries (Amiti and Konings, 2007; Topalova and Khandelwal, 2011; Goldberg et al., 2010). However, as pointed out by Barattieri and Cacciatore (2023), temporary protectionism is conceptually different from trade liberalization. First, trade liberalization is a permanent policy change that affects the present discounted value of firms' revenue and profits differently from a temporary increase in TTBs and therefore leads to a different response (see e.g. Décamps et al., 2016).

Second, although qualitatively we can expect trade liberalization to produce the opposite effects of protectionism, these effects are not quantitatively symmetric (Furceri et al., 2021). In this regard, the paper is also related to the recent literature that looks at the effects of trade *protection*. The most notable example is the trade war between the United States and its trading partners (Amiti et al., 2019; Cavallo et al., 2021; Fajgelbaum et al., 2020; Flaaen and Pierce, 2019).

Goldberg and Pavcnik (2016) discuss how the majority of trade policy analyses focus on trade liberalization while, as argued by Bown (2011) and Grübler and Reiter (2021), TTBs have been increasingly used in practice. However, the literature that analyzes TTBs has focused mainly on antidumping (Konings and Vandenbussche, 2013; Vandenbussche and Zanardi, 2010). Our analysis of safeguards thus provides much-needed evidence on a type of TTB about which we still know relatively little.

Our research also relates to the literature on effective protection (output versus input protection) that started with Corden (1966, 1971), and has recently been discussed by Amiti and Konings (2007); Amiti et al. (2019); De Loecker et al. (2016); Topalova and Khandelwal (2011). In our case, input protection generates negative effects on local firms operating in non-import-competing industries. In this way, our paper is also related to the growing literature that analyzes the effects of trade policy through the value chain (Barattieri and Cacciatore, 2023; Bown et al., 2021; Handley et al., 2020).

Finally, our paper is related to the scarce literature that analyzes the impact of trade *policy* in Latin America in general, and Ecuador in particular (Bas, 2012; Fernandes, 2007; Pavcnik, 2002; Wong, 2007, 2009).

2. Background and Data

2.1. Background

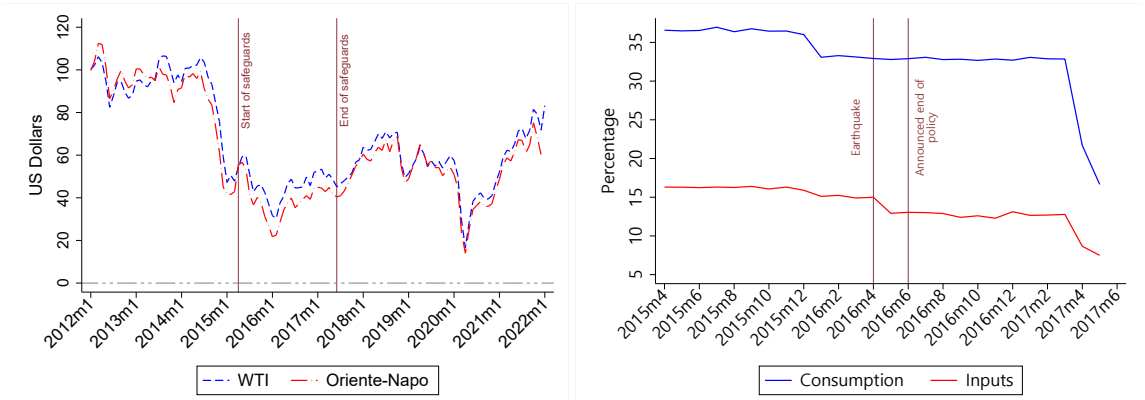
Following a severe macroeconomic crisis in 1998-1999, Ecuador adopted the US dollar as its official currency in 2000. Dollarization restricts the set of policy options to respond to external shocks (Broz et al., 2016). While capital controls and trade restrictions remain viable policy options to address pressures on the balance of payments, interest rates and currency devaluation are no longer available.

Consistent with these limitations, the Ecuadorian government has used capital controls and trade restrictions at different times. In 2007 Ecuador introduced a 5% tax on capital outflows (except for import payments and debt service). The tax remains in place, but its level has been reduced in a stepwise process starting in 2022 and is expected to reach 2% by the end of 2023.

The Ecuadorian government also implemented import safeguards for the first time during the dollarization period in 2009. This followed a deterioration of Ecuador's balance of payments after the 2008 financial crisis. A broad set of instruments comprising *ad valorem* and specific tariffs, as well as quantitative restrictions, affected a total of 630 HTS 10-digit subheadings. However, due to concerns raised by the WTO Committee on Balance of Payments Restrictions, Ecuador phased out all trade measures by July 23, 2010.

Following significant increases in oil prices since 2005, the average Ecuadorian oil price per barrel in 2011, 2012 and 2013 reached USD 96.93, 98.14, and 95.63, respectively. Average oil prices remained high between January and September of 2014 at USD 93.23, but fell to USD 73.36, 61.59, and 45.37 in the months of October, November and December of that year, respectively. This marked the end of the oil boom, as average Ecuadorian oil prices remained below USD 50 per barrel until 2017 and below USD 65 per barrel until 2021 (Panel a, Figure 2).

The Ecuadorian government introduced the surcharges in March 11, 2015 and informed other WTO members in June that they would be phased out by June 2016. Following the 7.8 magnitude earthquake in April 2016, however, the government extended the measure for an additional year, partially phasing it out starting in 2016 and fully eliminating it by June 2017.



(**a**) Oil prices (**b**) Average tariffs

Figure 2: Evolution of Average Oil Prices and Average Safeguard Tariffs by Import Types This figure displays the evolution of oil prices (WTI spot price and weighted average of exported Ecuadorian oil production: Oriente and Napo) and average safeguard import tariffs for imported consumption and input goods between March 2015 and May 2017. For each category, we calculate the average safeguard tariff based on the observed imports of goods at the HTS 10-digit code level. The categorization of goods is derived from the International Commerce Dataset provided by the Central Bank of Ecuador. Oil prices are obtained from FRED St. Louis and the Central Bank of Ecuador.

Safeguards were the only formal measure with widespread impact, affecting 2,955 HTS 10-digit subheadings, or 38% of the 7,581 subheadings and 31% of the total import value in 2014. These safeguards were applied in addition to existing tariffs and consisted of an *ad valorem* surcharge of 5%, 15%, 25%, and 45%, calculated based on the corresponding CIF value of imports. Higher rates were applied to consumption goods and lower rates were reserved for raw materials and capital goods. The 45% safeguard tariff was reduced to 40% on January 31, 2016, in line with the original phasing-out schedule, and the 5% tariff was eliminated in April of that year.

Panel (b) in Figure 2 shows the evolution of average safeguard import tariffs of all imported products affected by them, classified by import category: Consumption goods and inputs (capital and raw materials). In each case, we calculate a simple average of the effective safeguard tariff based on import transactions at the 10-digit HTS code level. As is clear from the figure, consumption goods were more heavily affected by the policy. In fact, safeguard import tariffs affected 80% of subheadings classified as consumption goods, and 36% of subheadings classified as inputs.

Ecuador enacted these safeguard tariffs within the framework of the World Trade Organization (WTO) and the Cartagena Agreement.[3] These conditions allowed Ecuador

[3]The General Agreement on Tariffs and Trade (GATT) 1994, under the WTO, allows member nations facing balance-of-payment difficulties to impose import restrictions. Article XII of the GATT permits such

to adopt temporary protectionist measures without provoking countermeasures from its trading partners, thus minimizing potentially confounding factors that could interfere with our analysis.

The safeguards imposed in 2015 followed the common pattern observed in Ecuador with respect to the behavior of the private sector. (Grijalva et al., 2022) argue that the private sector generally *responds* to a policy set by the government, rather than actively exerting influence during the policy-making process. After the government decided that a response was needed to counteract the twin deficit generated by the fall in oil prices, COMEX proposed the specific tariffs subheadings to be affected as well as the tariff levels. They were determined from a fiscal perspective by the Ministry of Finance in terms of how much revenue was expected to be obtained with the safeguards and which products represented the majority of imports. To the best of our knowledge, there were no strategic interactions between the government and the private sector that could have balanced the design of the policy in favor of specific sectors or groups of firms.

2.2. Data and Descriptive Statistics

We compiled administrative data sets obtained from four institutions in Ecuador: the Committee on Foreign Commerce (*Comité de Comercio Exterior* - COMEX), Central Bank of Ecuador, *Superintendencia de Companías* (SuperCias) and the Internal Revenue Service (SRI). The datasets span multiple levels of aggregation and are available at different frequency intervals from 2012 to 2021.

We derived the levels and application periods of the safeguard import tariffs applied to each HTS 10-digit subheading from the resolutions issued by COMEX between 2015 and 2017. With this information, we constructed a dataset that encompasses the highest nominal safeguard import tariffs put into effect in March 2015, along with the monthly progression of tariffs from March 2015 to June 2017.

actions to protect a nation's financial position and its balance of payments. Article XVIII, section B, extends this permission to developing countries, allowing them to maintain or increase import restrictions for the same reasons. Both articles provide flexibility, allowing a country to apply safeguards to specific products or product categories based on their essential nature. Article XII further stipulates that these measures should be temporary, easing off as conditions improve. If these restrictions continue, GATT requires the member to initiate discussions to verify if the restrictions align with Article XII.

At the regional level, the Cartagena Agreement specifically addresses the application of safeguards in Chapter XI. It mandates that any safeguard measures be temporary, nondiscriminatory, and preauthorized by the General Secretary. Such measures can be used to restore balance of payments (Article 95), prevent harm to the local economy due to a liberalization program (Article 96), limit imports in large quantities from another member to prevent harm to the local economy (Article 97), or to lessen the effects of monetary devaluations from another member (Article 98).

The International Trade dataset comes from the Central Bank of Ecuador. This dataset contains transaction-level information on all imports and exports, including product and firm details. Products are classified according to 10-digit Harmonized Tariff Schedule (HTS) codes, while importing and exporting firms are identified by their fiscal identification number (RUC).

We used data from two sources provided by SuperCias. The first is the firms' balance-sheet information recorded in their annual tax returns. Firms are required by law to submit this information to SuperCias, and it is publicly available. This dataset identifies firms by their RUC and provides details on firms' assets, sales revenue, labor costs, material costs, and tax payments. In addition, firms' industries are identified using 6-digit International Standard Industrial Classification (ISIC) codes. The second source is the Ranking of Firms (*Ranking de empresas*), which includes information on sales, assets, employment, and financial indicators computed for all active firms in a given year.

Finally, we obtained information from three SRI datasets. The first is the official registry of Economic Groups, which are groups of local firms and individuals linked by their shareholder composition and their ownership and/or shares in offshore firms. Information related to economic groups is made public according to Ecuadorian law. The network corresponding to each economic group is created using information declared to the SRI in the Shareholders, Stakeholders, Partners, Directory Members, and Managers Appendix (APS), which is updated in February of each year with information on each specific group's composition as of December of the previous year. The tax administration updates the classification of economic groups each year, and the current classification includes more than 2,200 local firms. The number of economic groups increased from 17 in 2007 to 125 in 2015, and to 302 in 2023.

The second dataset is the official registry of Big Corporations (*Grandes Contribuyentes*). The designation of a particular firm as a *Big Corporation* is made directly by the Tax Administration and includes firms that SRI considers *important* due to the amount of their paid taxes and their market shares within each specific sector. Big corporations also correspond to the main members of each Economic Group. Currently, there are 700 firms classified as big corporations.

The third SRI dataset is the Transactions Annex (*Anexo Transaccional*) for 2014 and 2015.[4] This dataset records all buying and selling transactions between firms. Although we do not observe actual firms' invoices, we do have access to the aggregate transactions between firms within a year. These data allow us to identify each firm's value chain and

[4]Access to these data is restricted. We thank Pablo Astudillo and SRI for granting access to these data through an institutional agreement.

Year	Importer	Importer-exporter	Local, import competing	Local, non-import competing
2012	2982	539	1283	3083
2013	2982	539	1283	3083
2014	2982	539	1283	3083
2015	2891	521	1207	2821
2016	2826	502	1155	2672
2017	2795	499	1126	2596
2018	2730	485	1068	2469
2019	2581	468	1009	2325
2020	2506	443	941	2135
2021	2461	427	898	2034

Table 1: Distribution of Firms by Year and Trade Status This table shows the number of observations in our estimation sample for each year (from 2012 to 2021) and firm's trade status: importer, importer-exporter, local in import-competing industries, and local in non-import competing industries. The panel is fully balanced for the prepolicy period (2012-2014), and the baseline year is 2014. From 2015 onward, the panel shows the attrition driven by firms exiting the market or reporting as zero either their sales or part of their costs.

compute technical coefficients (in the sense of input-output analysis) at the firm and industry levels.

For the estimations, we built a panel of firms that is fully balanced during the prepolicy period (2012 to 2014) and then allowed for firms' attrition from 2015 onward. The distribution of firms by year and trade status is presented in Table 1. Each category corresponds to the firm's trade status at baseline (2012 to 2014). We specify how we defined each category in Section 3. The distribution of firms in categories resembles the economic structure of the Ecuadorian economy. Most of the firms in the country are importers or belong to Wholesale & retail, which corresponds to all local firms in non-import competing industries in our sample. A small proportion of firms imports goods to transform them into exportable goods.

Table 2 shows the mean and standard deviations of imports, exports, total factor productivity (TFP), sales, labor costs, employment, and materials, considering the trade status of the firm. We estimate TFP using the method developed by Ackerberg et al. (2015), which overcomes the potential limitations with the identification of the labor coefficient in the production function under the assumptions made by Olley and Pakes (1996) or Levinsohn and Petrin (2003). Sales refer to goods and services sold in local markets.

We focus on labor costs because they represent a more comprehensive concept. In addition to wages, they also include payments for invoiced professional services, such as

Variable	Importer	Importer-exporter	Local, import competing	Local, non-import competing
Imports	2.38M	2.32M	101.14K	73.08K
	(8.12M)	(8.92M)	(782.80K)	(777.88K)
Exports	61.77K	11.51M	78.87K	20.01K
	(1.07M)	(29.93M)	(1.55M)	(739.70K)
TFP	4.63	24.72	12.91	1.63
	(12.03)	(44.56)	(20.46)	(4.38)
Sales	8.13M	19.46M	2.68M	3.90M
	(41.37M)	(60.50M)	(9.44M)	(24.33M)
Wages	757.60K	2.09M	429.88K	265.91K
	(2.93M)	(4.65M)	(1.38M)	(1.38M)
Employment	63	263	50	30
	(295)	(626)	(142)	(191)
Materials	5.00M	11.94M	1.48M	3.05M
	(28.25M)	(28.57M)	(5.68M)	(19.30M)

Table 2: Descriptive Statistics for Full Sample Period (2012-2021) by Firm's Trade Status
This table presents the mean and standard deviation of imports, sales, TFP, wages, employment, and cost of materials by firm's trade status for the entire panel of firms used for the estimation. Standard deviations are presented in parentheses. M is millions, K is thousands.

temporary work or consulting activities directly related to the production process. Labor costs also include costs related to regulations such as mandatory social security contributions made by the employer on behalf of the employee, and the payment of the 15% share of profits that the firm is required to pay to employees on an annual basis. Employment only considers workers hired under formal contracts.

Importer-exporter firms are much larger than the rest of the firms in the economy in terms of sales, number of workers, or purchase of materials. They are also the most productive, followed by local firms in import-competing industries (see Table 2). This result highlights the relevance of foreign competition. Importer-exporter firms face competition in international markets, while local firms in import-competing industries face competition from imported goods.

3. Firms' Exposure to Trade Policy

Trade policy affects economic activity through different channels. Therefore, firms' exposure to trade policy is highly heterogeneous. To see why, we propose a broad classification of firms according to their engagement with international markets: firms that are

importers, those that are importer-exporters, local firms that sell their products in import-competing markets, and local firms that sell their products in non-import-competing markets.

In our classification, firms are designated as *importers* if they maintain an imports-to-sales ratio of at least 0.05 for three consecutive years.[5] We posit that these firms use their imported goods either for direct sales to final consumers or to sell as intermediate goods to other firms. Consequently, safeguard import tariffs have an immediate impact on these firms' business operations. We classify these firms as *directly exposed*, indicating that safeguard import tariffs significantly influence their *output*.

Firms are classified as *importer-exporter* if they maintain import- and export-to-sales ratios of no less than 0.05 over a span of three years. We postulate that these firms directly import materials as inputs for their production, purchase additional inputs locally, and subsequently distribute their products domestically and internationally.

These firms can be affected through two channels. First, they are *directly exposed* via the *output* purchased internationally for use in their manufacturing processes. Second, they face an *indirect exposure* due to their dependence on locally sourced inputs from other domestic firms, which may themselves be directly affected by the policy. This affects the firm through the exposure of its value chain to the safeguard import tariffs, something that we call *input exposure*.

It should be noted that, for both groups of firms (importers and importer-exporters), protectionist trade policies are expected to exert adverse effects, primarily through increased production costs (refer to Konings and Vandenbussche, 2013, for an analysis on exporters).

Assessing the impact of protectionist trade policies on local firms presents a complex challenge. For firms operating in markets that compete with imports, safeguard import tariffs can lead to two potential indirect effects. The first is *output protection*, stemming from tariffs imposed on competing foreign goods. This effect is indirect because, while the firm itself is not subject to tariffs, the market for its products is influenced by the policy. Consequently, trade protection measures are likely to confer a competitive advantage on these firms relative to foreign suppliers.

This group of firms could also experience an increase in production costs if they rely on inputs from import-dependent firms affected by safeguard import tariffs. In such scenarios, a decline in firm performance is anticipated due to their *input exposure*. This concept aligns with the notion of *effective protection*, as developed by Corden (1966, 1971), which

[5]The rationale for using a three-year period to define firms' trade status is associated with the establishment of our baseline sample for the pre-policy period in the empirical analysis.

highlights the dual impact of protectionist trade policies. Amiti and Konings (2007), in their empirical analysis of the Indonesian context, introduced the terms *output exposure* and *input exposure* to describe these distinct but interrelated effects.

Firms operating in markets that do not directly compete with imports are not immediately subject to the direct effects of protectionist policies. Indirectly, however, these firms can be affected through their supply chains. Specifically, they may face substantial increases in production costs due to their suppliers' susceptibility to protectionist measures (*input exposure*). Consequently, we anticipate observing detrimental impacts of such policies on these firms' performance, primarily driven by the increased operational costs associated with their input procurement.

4. Identification Strategy

Based on the previous discussion, our empirical strategy exploits firms' heterogeneous exposure to safeguard import tariffs and the different channels through which trade policy can affect economic activity. In this section, we discuss the design of the measures of exposure and their distributions across firms and years, followed by the details of our identification strategy.

4.1. Measures of Exposure

In Section 3, we delineated three measures of exposure to capture the impacts of the safeguard import tariffs. For clarity, consider $t = 0$ as the immediate pre-policy period. The policy is implemented in period $t = 1$ and persists during $t = [1, \tilde{T}]$, where $\tilde{T} > 1$. We observe firm activities for a total of $T > \tilde{T}$ periods. Denote $\tau_{i,t}$ as the safeguard import tariff levied on good i in period t. According to the policy framework, it is evident that $\tau_{i,t} = 0 \; \forall i$ at $t = 0$, $\tau_{i,t} \geq 0$ for $t = [1, \tilde{T}]$, and then it reverts to $\tau_{i,t} = 0 \; \forall i$ at $t > \tilde{T}$.

Extending the work of previous studies (Corden, 1966, 1971; Amiti and Konings, 2007) that evaluated output and input exposure at the industry level, we introduce a measure of *direct exposure* at the firm level. This measure serves as a treatment indicator defined only for importers and importer-exporters. Let $M_{i,j,0}$ be the value of imports of product i by firm j immediately preceding the implementation of the policy. The cumulative direct exposure of firm j up to period t is expressed as:

$$e^{d}_{j,t} = \frac{1}{M_{j,0}} \sum_{s=1}^{t} \sum_{i=1}^{I_{j,0}} \tau_{i,s} M_{i,j,0}, \tag{1}$$

where $I_{j,0}$ represents the total number of imported varieties by firm j in the pre-policy period, and $M_{j,0}$ is the total value of imports by firm j in the same period.

This exposure metric reflects the potential effective rate that a firm would face under the current safeguard import tariff regime $\tau_{i,t}$, considering its import structure prior to the change in policy. Assuming no anticipation effects, direct exposure is deemed exogenous. The range of values for $e^d_{j,t}$ spans from zero to the highest tariff rate established in the policy.

Incorporating the framework of Amiti and Konings (2007), our analysis also includes measures of output and input exposure, calculated at the industry level. *Output exposure* captures the level of protection that an industry receives against international products that directly compete with its output. Following (Corden, 1966, 1971), output exposure constitutes the initial aspect of what is termed *effective protection*.

Let $M_{i,k,0}$ represent the total value of imports of product i by industry k. The accumulated output exposure for industry k up to period t is formulated as:

$$e^o_{k,t} = \frac{1}{M_{k,0}} \sum_{s=1}^{t} \sum_{i=1}^{I_{k,0}} \tau_{i,s} M_{i,k,0}, \tag{2}$$

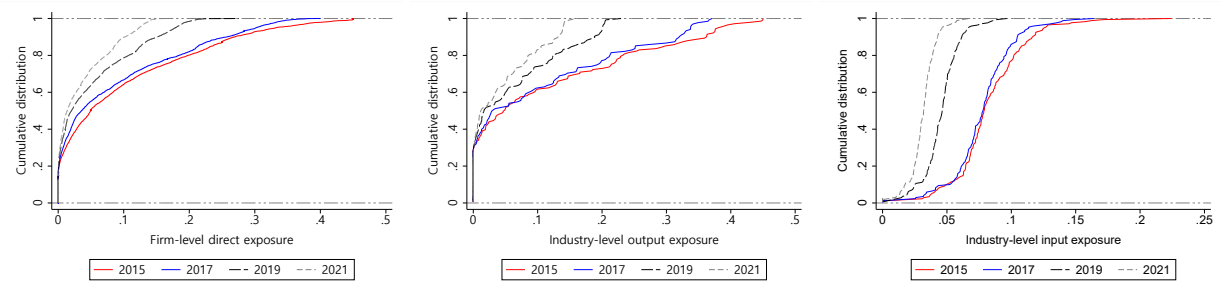
where $I_{k,0}$ denotes the spectrum of products within industry k before the start of the policy.

The concept of *effective protection* extends to a second layer, reflecting the potential rise in production costs for firms that source inputs from those affected by the policy. The *input exposure* for industry k is defined as the weighted average of output exposure endured by its supplier industries. Formally:

$$e^x_{k,t} = \sum_m \omega_{k,m,0} \cdot e^o_{k,t}, \quad \text{where} \quad \omega_{k,m,0} = \frac{y_{k,m,0}}{y_{k,0}}. \tag{3}$$

Here, $\omega_{k,m,0}$, the weight in the equation, reflects the proportion of products that industry k procures from industry m ($y_{k,m,0}$) in relation to its total acquisitions ($y_{k,0}$) in the pre-policy period. These weights are set before the policy's implementation to avoid endogeneity and ensure the validity of the treatment variable.

To get a sense of the structure of the measures of exposure, Figure 3 presents the cumulative annual distributions of firms and industries corresponding to direct, output, and input exposures. Each distribution is conditional on the relevant group of firms. Direct exposure is conditional on importers; output exposure is conditional on importer-exporters and local firms in import-competing industries; and input exposure is conditional on importer-exporters and local firms in import- and non-import-competing industries. The distribution of direct exposure is at the firm level, while the distributions of output and input exposures are at the industry level (ISIC 4-digits).



(**a**) Direct (**b**) Output (**c**) Input

Figure 3: Distribution of Measures of Exposure This figure shows the distributions of the three measures of exposure: direct, output, and input. Each distribution is conditional on the relevant group of firms. Direct exposure is conditional on importers and importer-exporters; output exposure is conditional on importer-exporters and local firms in import-competing industries; and input exposure is conditional on importer-exporters and local firms in import- and non-import-competing industries. The distribution of direct exposure is at the firm level, while the distributions of output and input exposures are at the industry level (ISIC 4-digits).

A substantial proportion of firms and industries are not exposed to the safeguard import tariffs. Approximately 20% of firms have zero direct exposure, while around 17% of industries show no output exposure.

Input exposure, however, presents a different pattern. Due to the inter-industrial linkages within value chains, almost all industries experience some level of exposure to safeguard import tariffs. Despite this, the magnitude of input exposure is generally lower compared to direct and output exposures. While direct and output exposures can reach up to 45% (aligned with the policy's maximum tariff rate) in the initial year of implementation, input exposure seldom exceeds about 20%.

The dynamic nature of the policy and the cumulative design of the exposure indices mean that the exposure distributions evolve over time. Since imports are kept constant at baseline levels, exposure to the policy gradually diminishes due to the phasing-out of safeguard import tariffs. This trend is evident in the evolution of our three exposure measures over time.

By 2017, the overall reduction in exposure is modest, yet some stochastic dominance is observable in Figure 3. By 2019, even though the policy is no longer active, the accumulated nature of our measures still allows us to track the exposure of firms and industries. As expected, a marked decrease in exposure levels is apparent, becoming more pronounced by 2021, which marks the last year of our analysis.

4.2. Empirical Specifications

Our specifications are based on the linear difference-in-difference models previously used by Machin et al. (2003); Draca et al. (2011) and Harasztosi and Lindner (2019) in the labor market literature.[6] We use different specifications for each type of firm in line with the exposure that they face.

To determine the effects of safeguard import tariffs on importers, we use our measure of direct exposure $e^d_{j,t}$ as a treatment variable, where j denotes firms and t denotes years. Our regression can be written as

$$z_{j,t} - z_{j,0} = \alpha_t + \beta_t e^d_{j,t} + \boldsymbol{\gamma}_t \mathbf{X}_{j,0} + \varepsilon_{j,t}, \tag{4}$$

where the left-hand-side is the log-variation in outcome z, α_t are time-specific fixed effects, and γ_t measures the effects of firm-specific characteristics. Our parameter of interest is β_t, which quantifies the effect of direct exposure to the import safeguards on each specific outcome.

We are technically computing a weighted average of the average treatment effect (ATE). However, as pointed out by Callaway et al. (2021), there are several caveats that must be taken into account when using the two-way fixed-effects estimator to summarize the effect of a continuous treatment variable. One major concern is the possibility of bias arising even if the classical parallel trends assumption is satisfied. However, in our setting, we are confident that we can invoke the strong parallel trends assumption established by Callaway et al. (2021) due to the way we constructed our measures of exposure. Specifically, any bias resulting from some units receiving a dose different from the one specified in the original treatment design should not be problematic. Consequently, we interpret β_t (and the relevant coefficients in the subsequent models) as a weighted average of the ATE effects across expected tariffs.

If the firm-level impact of the policy is profound enough, it will affect importing firms' decisions on the extensive margin of their activities, i.e., some firms may shut down their operations due to the increased production costs. To evaluate this effect, we use a modified version of (4), where the outcome variable is a binary variable, $d_{j,t}$, that takes the value of 1 if a firm shuts down in period t while it was open in period 0. Mathematically,

$$d_{j,t} = \Phi(\theta_t + \xi_t e^d_{j,t} + \boldsymbol{\nu}_t \mathbf{X}_{j,0} + \epsilon_{j,t}), \tag{5}$$

[6] Handley et al. (2020) use a similar strategy to estimate the effect of import tariffs on exports in the United States through the lens of value chain linkages.

where $\Phi(\cdot)$ represents the cumulative distribution function of the Normal distribution. Here, ξ_t captures the impact of the safeguard import tariffs on firms' exposure, which may result in them shutting down.

As we discussed in Section 3, identifying the effect on the rest of firms in the economy is more complex. In the case of importer-exporter firms, they suffer direct exposure to the policy because of their importing activity, but they also face input exposure, because they might still buy inputs from firms in industries that were affected by the policy. The model we estimate to measure these effects can be written as:

$$z_{j,k,t} - z_{j,k,0} = \alpha_t + \beta_t e^d_{j,t} + \theta_t e^x_{k,t} + \boldsymbol{\gamma}_t \mathbf{X}_{j,0} + \varepsilon_{j,k,t}, \tag{6}$$

where θ_t measures the effect of input exposure, which is measured at the industry level.

The exposure of local firms in import-competing industries occurs through two channels. First, these firms have local sales that might be competing with imports. Thus, the first channel is the protection triggered by output exposure. The second channel is, again, through the exposure of these firms' supplier chain, which is captured by input exposure. The model for this group becomes the following:

$$z_{j,k,t} - z_{j,k,0} = \alpha_t + \beta_t e^o_{k,t} + \theta_t e^x_{k,t} + \boldsymbol{\gamma}_t \mathbf{X}_{j,0} + \varepsilon_{j,k,t}, \tag{7}$$

where both measures of exposure are measured at the industry level.

Finally, local firms in non-import competing industries are mainly affected by the exposure faced by their supply chain. The model in this case simplifies to:

$$z_{j,k,t} - z_{j,k,0} = \alpha_t + \theta_t e^x_{k,t} + \boldsymbol{\gamma}_t \mathbf{X}_{j,0} + \varepsilon_{j,k,t}, \tag{8}$$

where, again, exposure is measured at the industry level.

Because of the differentiated effects that the policy design can have on firms and industries depending on their import structure, we include a wide set of firm and industry characteristics set at baseline (2014) as controls for all our specifications. In particular, we include industry-level fixed effects, dummy variables that identify firms' size according to their sales, Herfindahl indexes for sales and imports (computed at the ISIC 3-digit level), and firms' capital stock. Additionally, we consider the degree of import penetration at the industry level (ISIC 3-digits), province-level fixed effects (defined according to the firms' fiscal identification number), a dummy that identifies big corporations, and one that identifies firms that belong to business groups. The last two dummy variables are key to

controlling for variation in the policy that could be explained by the degree of lobbying power that large firms might have in the design of the policy (Bombardini, 2008).

5. Results

We present the results of our analysis in three sections. First, we examine the impact of safeguard import tariffs on importers. We start with an assessment of the direct effects on imports, then explore the implications on firm performance, and conclude with an analysis of the potential channels of influence. Additionally, this section incorporates a placebo test to assess the robustness of our identification strategy. We further expand our baseline analysis by extending the study period to evaluate the long-term effects induced by the policy.

Subsequently, we turn our attention to non-importing firms. Mirroring our approach with importers, we study the performance effects on non-importing firms and delve into the underlying mechanisms driving these results. We conclude the results section by examining how safeguard import tariffs may have influenced the emergence of new firms in industries with higher exposure levels.

5.1. Effects on Importers

In this section, we focus on the effect of safeguard import tariffs on importers. We see these results as the main effects of the policy because importing firms are the ones facing the safeguards directly. In this case, the treatment variable corresponds to the measure of *direct exposure* defined in equation (1).

5.1.1. Effects on Imports

The primary objective of the safeguard import tariffs is to protect the balance of payments by reducing imports. We estimate equation (4) using firm-level total imports as the outcome variable. The results can be found in Panel A of Table 3, which shows the effect of the safeguards on cumulative total imports for the three years that the policy was in place.

Safeguard import tariffs were highly effective in limiting imports throughout their implementation. To guide the interpretation, recall from Figure 1 that the period of safeguard implementation was characterized by a general decline in imports, with a deeper contraction on affected products. Our results show that this effect found at the product-level filters its way up to the firm level: an additional 1% increase in firm-level direct exposure is associated with a 1.4% reduction in the growth rate of imports during 2015.

	Changes in outcome between t and 2014		
	2015	*2016*	*2017*
Panel A: Change in firm-level imports			
Expected tariff	-1.429 ***	-3.010 ***	-2.649 ***
	(0.257)	(0.553)	(0.571)
Mean Δz	-0.081	-0.307	-0.144
Observations	2891	2826	2795
Panel B: Imports elasticity			
Expected tariff	-0.088 ***	-0.188 ***	-0.147 ***
	(0.021)	(0.045)	(0.036)
Observations	2891	2826	2795

Table 3: Effects of Safeguards on Imports and Imports Elasticity This table shows, in Panel A, the relationship between firm-level output exposure to safeguards and the change in imports. In Panel B, the table presents the estimate of imports elasticity to changes in safeguard import tariffs. The estimates in panel A correspond to equation (4). To obtain the estimates of imports elasticity, we estimate (4) separately for the change in imports and the change in paid safeguards. Then, we use the seemingly unrelated regression framework to estimate the non-linear combination of the β_t coefficients of both regressions. In all cases, standard errors are clustered at the industry level (ISIC 3-digits). The estimations for each year include controls for economic sector (ISIC 1-digit), firm size (CAN classification), whether or not the firm belongs to a business group (identified by SRI), Herfindahl indexes for sales and imports, the logarithm of the firm-level capital stock, province-level fixed effects, and the firm-level share of imports and exports to the European Union. The variation in the outcome variable is winsorized at the bottom and top 0.5%.

To get a better sense of the magnitude of the effect, note that the average firm-level import contraction between 2014 and 2015 was 8%. Therefore, a 1% additional exposure to safeguard import tariffs implies a further reduction of 0.1 percentage points in this growth rate. This effect more than doubles during the second year of implementation and persists during the third year, when a 1% additional exposure is associated with a 2.6% decrease in imports growth. All these results are significant at the 1% level.

Recall that our results provide information on the cumulative changes between the baseline year (2014) and each of the years reported. The larger effect in 2016 is consistent with an additional full year of safeguard import tariffs, while the lower coefficient in 2017 is consistent with the fact that firms were only partially exposed to safeguards in 2017, as they were phased out by June of that year.

Next, we estimate equation (4) for effective paid tariffs and imports as outcomes in a set of seemingly unrelated regressions, following Harasztosi and Lindner (2019). The ratio between the β_t coefficients for imports and effectively paid tariffs represents the import elasticity with respect to ad valorem safeguard import tariffs. We calculate two types of elasticity: impact elasticity, which captures firms' responses to the policy during its first

year of implementation, and short-term elasticity, which accumulates the effects for 2016 and 2017. These parameters are relevant for policy design since they enable the parameterization of models capable of estimating trade policy effects ex ante. We present these estimations in Panel B of Table 3.

The elasticity of imports with respect to the safeguard rate is -0.088 on impact. This elasticity reaches its lowest point in 2016 (-0.188) and then increases to -0.147 in 2017. The elasticity on impact represents 47% of the strongest response of imports to the increase in tariffs.

Our findings reveal a range of elasticities that is lower than recent estimates in the literature. Specifically, Boehm et al. (2023) report an impact elasticity of -0.26 and a short-run elasticity of -0.76. A key factor driving these discrepancies is likely the distinct policy designs considered in each analysis. Ours is based on the escalation in tariff rates induced by safeguard import tariffs, which due to policy restrictions must be temporary. Accordingly, we expect firms' response to be smaller, as they expect the surcharges to be short-lived. In contrast, Boehm et al. (2023) utilize exogenous variation resulting from changes in most favored nation tariffs, which tend to influence trade over more prolonged time periods.

5.1.2. Effects on Performance

In this section, we discuss the effects of safeguard import tariffs on the performance of importing firms. To gauge this impact, we track annual changes in total factor productivity (TFP), sales, and the number of firms during the policy implementation period (2015 to 2017), using 2014 as a reference point. The results are summarized in Table 4, offering a comprehensive view of how import surcharges influenced the operational metrics of importing firms during the specified time frame.

Contrary to previous research (e.g. Amiti and Konings, 2007; De Loecker et al., 2016; Topalova and Khandelwal, 2011), we find that increased trade protection is not associated with a reduction in the productivity growth of directly exposed firms. Although the coefficients are consistently negative, the observed decrease in productivity is never statistically significant (Panel A).

Regarding sales, our data reveal a clear relationship between greater direct exposure and reduced sales growth. Specifically, a 1% rise in direct exposure is associated with a 0.27% decrease in sales growth in the first year of policy implementation. This negative trend becomes more pronounced over the next two years, with sales growth declining by 0.55% in 2016 and 0.86% in 2017. These findings are statistically significant at the 1% level (Panel B). The large decline in sales is the first sign of the negative scale effect associated with increased trade protection (Head and Ries, 1999).

	Changes in outcome between t and 2014		
	2015	*2016*	*2017*
Panel A: Change in firm-level productivity			
Expected tariff	−0.064	−0.065	−0.062
	(0.051)	(0.062)	(0.083)
Mean Δz	−0.008	−0.044	−0.032
Observations	2859	2783	2755
Panel B: Change in firm-level sales			
Expected tariff	−0.265 ***	−0.554 ***	−0.855 ***
	(0.078)	(0.107)	(0.223)
Mean Δz	0.004	−0.127	−0.059
Observations	2891	2826	2795
Panel C: Change in number of firms (exit)			
Expected tariff	−0.026 *	0.045	0.061 *
	(0.016)	(0.043)	(0.032)
Mean Δz	0.031	0.052	0.063
Observations	2982	2982	2982

Table 4: Effects of Safeguards on the Performance of Importers This table shows the relationship between firm-level direct exposure to safeguards and the change in firm-level TFP (Panel A), sales (Panel B) and firm exit (Panel C). TFP estimates are obtained following Ackerberg et al. (2015) at the most disaggregated level possible, depending on the number of observations available for estimation. Sales consider both local sales and exports (if applicable). The estimates in panels A and B correspond to equation (4). To obtain the estimates in Panel C, we estimate a different version of equation (4) in which: i) we follow all the firms that were open between 2012 and 2014, giving as a result a perfectly balanced panel, and ii) the outcome variable corresponds to a dummy variable that identifies firms that exit the dataset in year t but were in the dataset in 2012-2014. The estimations for Panels A and B are made using OLS, while the estimations shown in Panel C come from a Probit model. In all cases, standard errors are clustered at the industry level (ISIC 3-digits). The estimations for each year include controls for economic sector (ISIC 1-digit), firm size (CAN classification), whether or not the firm belongs to a business group (identified by SRI), Herfindahl indexes for sales and imports, the logarithm of the firm-level capital stock, province-level fixed effects, and the firm-level share of imports and exports to the European Union. The variations in the outcome variables in Panels A and B are winsorized at the bottom and top 0.5%.

In terms of firms' exit probability, the policy initially does not seem to affect this metric significantly. However, over the course of the three-year implementation period, we observe a gradual increase in the likelihood of firm exits. By 2017, with a significance level of 10%, we find that a 1% increase in direct exposure is related to a 0.6% increase in the probability of a firm exiting the market. The weak results on firm exit may occur due to the Ecuadorian regulatory framework, which makes closing a firm highly onerous.

5.1.3. Channels

Head and Ries (1999) show that trade liberalization enhances efficiency via increased scale, leading to higher sales, employment, and material purchases. We anticipate that our findings will mirror these results as we examine the effects of temporary trade *protection*. Previous results in our analysis lend preliminary support to this notion: firms with greater exposure to safeguard import tariffs experience a notable reduction in sales growth relative to their less exposed counterparts.

This section further analyzes this hypothesis by examining the impact of safeguard import tariffs on firms' input demand. We specifically analyze the policy's effects on three key outcomes: formal employment, labor costs, and material costs. In Table 5 we show the results of estimating equation (4) using these outcome variables in the group of importing firms.

Our findings indicate that, initially, safeguard import tariffs do not significantly impact employment or labor costs. However, by 2017, which marks the end of the policy, a notable negative effect on employment growth emerges. Specifically, a 1% increase in direct exposure produces a 0.40% decrease in employment growth.

In contrast, material costs are significantly affected from the first year of the policy's implementation. In 2015, a 1% rise in direct exposure leads to a 0.28% reduction in the growth of material costs. This effect gradually intensifies, resulting in a 0.63% decline by 2016 and a 0.99% decrease by 2017.

These outcomes align with the competitive structures of input markets in Ecuador. The labor market, characterized by extensive regulation and adjustment costs (including hiring and firing expenses linked to the minimum wage), has become increasingly rigid, particularly since the substantial minimum wage hikes post-2008. As a result, labor has become a difficult input for firms to adjust.

Material inputs, however, are subject to more competitive market conditions, allowing firms greater flexibility in adjusting their material demand. Consequently, material costs tend to align more closely with sales dynamics, reflecting the significant contraction observed in this area. This differential response between labor and material inputs underlines the nuanced impacts of trade policies on various facets of firm operations.

5.1.4. Placebo Treatment

To verify the robustness of our findings, this section is dedicated to evaluating the results of a placebo treatment. The findings of this placebo analysis are presented in Table 6. Through this exercise, we aim to reinforce the validity of our conclusions and demon-

	Changes in outcome between t and 2014		
	2015	*2016*	*2017*
Panel A: Change in firm-level employment			
Expected tariff	−0.137	−0.073	−0.397 ***
	(0.106)	(0.075)	(0.138)
Mean Δz	0.124	0.203	0.263
Observations	2891	2826	2795
Panel B: Change in firm-level labor costs			
Expected tariff	−0.035	−0.344 *	−0.116
	(0.075)	(0.175)	(0.244)
Mean Δz	0.108	0.082	0.145
Observations	2891	2826	2795
Panel C: Change in firm-level material costs			
Expected tariff	−0.275 ***	−0.630 ***	−0.987 ***
	(0.077)	(0.111)	(0.201)
Mean Δz	0.010	−0.156	−0.071
Observations	2891	2826	2795

Table 5: Effects of Safeguards on Channels That Affect Importers' Performance This table shows the relationship between firm-level output exposure to safeguards and the change in firm-level employment (Panel A), labor costs (Panel B), and material costs (Panel C). All estimates correspond to equation (4). Employment corresponds to the headcount of formal workers hired in a given year reported by the firm to the *Superintendencia de Compañías*. Labor costs include all costs related to permanent and temporary workers. Material costs are obtained as the difference between total production costs and labor costs. In all cases, standard errors are clustered at the industry level (ISIC 3-digits). The estimations for each year include controls for economic sector (ISIC 1-digit), firm size (CAN classification), whether or not the firm belongs to a business group (identified by SRI), Herfindahl indexes for sales and imports, the logarithm of the firm-level capital stock, province-level fixed effects, and the firm-level share of imports and exports to the European Union. The variations in the outcome variables are winsorized at the bottom and top 0.5%.

strate that the observed impacts on the various measures of firm performance are directly related to the policy intervention, rather than being the product of confounding factors or random fluctuations in the data.

In our placebo analysis, we apply equation (4) using the direct exposure measure calculated based on the 2015 safeguard import tariffs. We then examine the changes in outcomes between the placebo years (2012 and 2013) and the baseline year (2014). The lack of significant effects in the majority of cases during these placebo years is an encouraging sign, strengthening the likelihood that our analysis aligns with the assumption of parallel trends.

	Changes in outcome between t and 2014					
	Imports	*Productivity*	*Sales*	*Employment*	*Labor costs*	*Materials*
Panel A: Estimations for 2012						
Expected tariff	0.000 (0.082)	0.039 (0.049)	−0.174 ** (0.087)	−0.098 (0.102)	0.096 (0.186)	−0.226 ** (0.094)
Mean Δz	0.200	0.091	0.046	0.167	−0.043	0.100
Observations	2982	2950	2982	2982	2982	2982
Panel B: Estimations for 2013						
Expected tariff	0.227 ** (0.102)	0.034 (0.041)	0.008 (0.051)	0.028 (0.059)	0.225 (0.183)	0.028 (0.059)
Mean Δz	0.205	0.069	0.072	0.099	0.031	0.099
Observations	2982	2952	2982	2982	2982	2982

Table 6: Placebo Estimations for Effects of Safeguards on Importers' Outcomes This table shows the relationship between firm-level output exposure to safeguards and the change in firm-level imports (column 1), TFP (column 2), sales (column 3), employment (column 4), labor costs (column 5) and material costs (column 6) between 2012 and 2014, and 2013 and 2014, that is, the years *before* the safeguard import tariffs were implemented. TFP estimates are obtained following Ackerberg et al. (2015) at the most disaggregated level possible, depending on the number of observations available for estimation. Sales consider both local sales and exports (if applicable). Employment corresponds to the headcount of formal workers hired in a given year reported by the firm to the *Superintendencia de Compañías*. Labor costs include all costs related to permanent and temporary workers. Material costs are obtained as the difference between total production costs and labor costs. All estimates correspond to equation (4) and standard errors are clustered at the industry level (ISIC 3-digits). The estimations for each year include controls for economic sector (ISIC 1-digit), firm size (CAN classification), whether or not the firm belongs to a business group (identified by SRI), Herfindahl indexes for sales and imports, the logarithm of the firm-level capital stock, province-level fixed effects, and the firm-level share of imports and exports to the European Union. The variations in the outcome variables are winsorized at the bottom and top 0.5%.

We do observe some significant coefficients, particularly for imports, sales, and materials, at the 95% confidence level. It is crucial to note, however, that the magnitude of these effects is considerably smaller compared to those observed during the policy implementation years. Consider, for example, the import figures: the placebo treatment indicates that a 1% increase in exposure is associated with a 0.23% increase in import growth. In contrast, during the first year of policy implementation, the same level of exposure results in a 1.43% decrease in import growth. Similar discrepancies in effect sizes are evident in the sales and materials data, further underscoring the distinct effect of the safeguard import tariffs compared to the placebo period.

5.1.5. Dynamic Effects

Our definition of exposure metrics uniquely allows for continued monitoring of affected firms beyond the active duration of the policy. In this section, we leverage this capa-

bility to explore the medium-term effects of safeguard import tariffs on importing firms. Our analysis extends up to 2021, focusing on firms that have persisted through our observation window.

This extended analysis is shown in Figure 4. The dotted lines mark the 95% confidence intervals and we include data from the placebo period for comparison. This helps us understand the lasting effects of the policy by comparing them with a period not influenced by the safeguards. Our aim is to present a clear picture of the policy's long-term effects on the business environment.

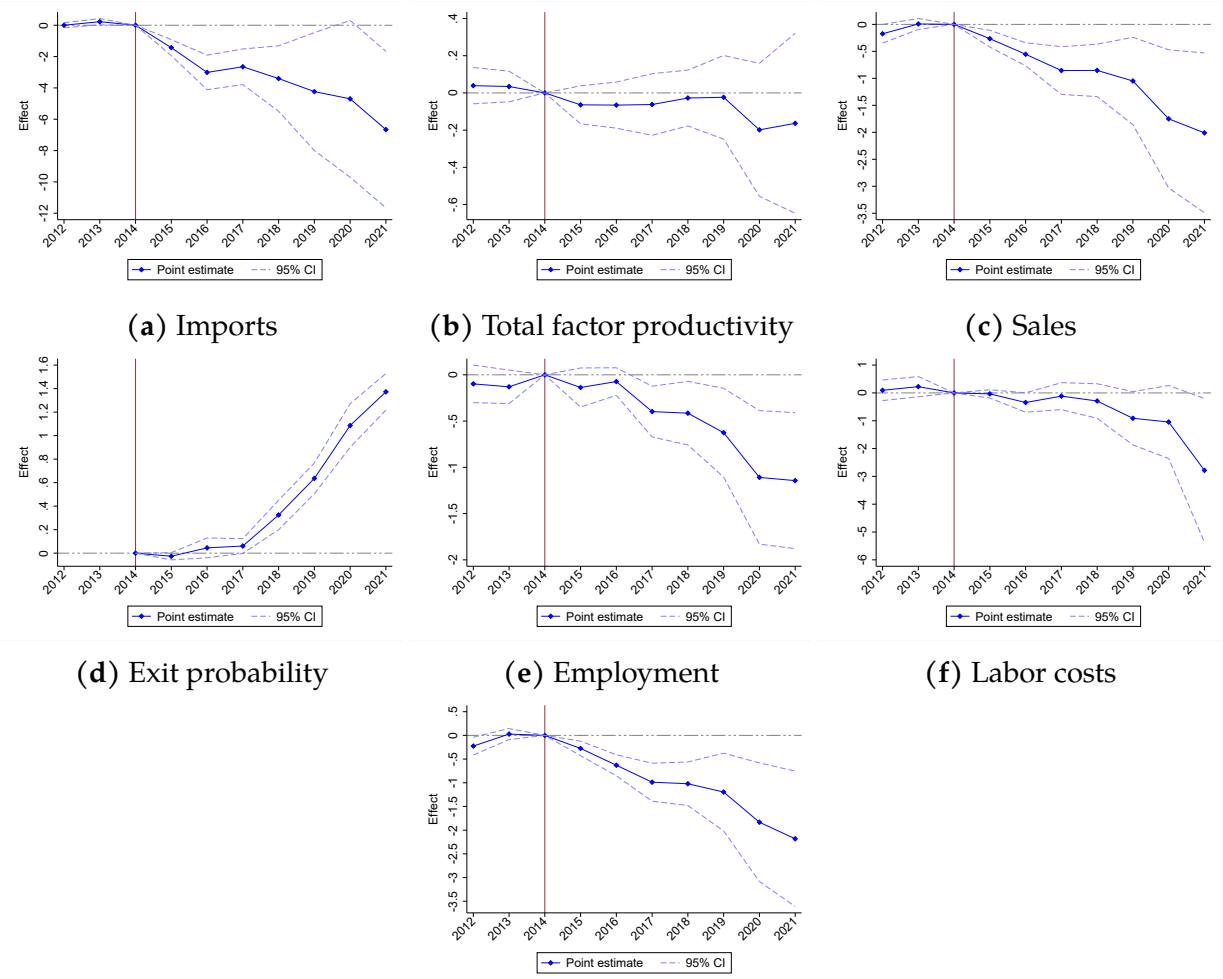
Import restrictions remain strong even four years after the safeguard import tariffs ended. The negative impact of a 1% increase in direct exposure on import growth increases gradually (in absolute value), from -2.65% in 2017 to -6.66% in 2021 (Panel a, Figure 4). This trend aligns with earlier observations at the product level, showing a continuing gap between affected and unaffected products until 2021.

Total factor productivity (TFP) does not show any significant change (panel b, Figure 4). Sales follow a similar pattern to imports, with a 1% increase in direct exposure leading to a 0.85% drop in sales growth by 2017, and a 2.01% decline by 2021, indicating the policy's lasting effect on firm performance (Panel c, Figure 4).

The policy had no immediate effect on the probability of firms exiting the market (Panel d, Figure 4). However, from 2018 onward, the exit probability starts increasing significantly. By 2021, a 1% increase in exposure results in a 1.37% higher exit probability. These findings suggest that firms adapted to the temporary policy, hoping for normality after the tariffs. However, significant sales reductions led to increased market exits in subsequent years.

The decline in sales, coupled with rising exit probabilities, led to a marked decrease in input demand, particularly in the labor market. Panels (e) and (f) of Figure 4 show formal employment and labor costs, respectively. The safeguard import tariffs caused a notable reduction in formal employment. By 2021, formal employment was 12.1% lower than in 2014. Firms with higher exposure reduced employment more rapidly. In 2017, a 1% increase in direct exposure resulted in a 0.40% decrease in formal employment growth, reaching 1.14% by 2021, despite no significant change in labor costs.

This trend likely reflects a response to the overall reduction in business scale, rather than a cost-cutting strategy. The significant drop in material demand confirms this (Panel g, Figure 4). In 2017, a 1% increase in direct exposure led to a 0.98% reduction in material cost growth, which escalated to a 2.18% reduction by 2021. Material costs in 2021 were 32.8% lower than the baseline.



(**a**) Imports (**b**) Total factor productivity (**c**) Sales

(**d**) Exit probability (**e**) Employment (**f**) Labor costs

(**g**) Materials costs

Figure 4: Dynamic Effects of Safeguards on Importers' Outcomes This figure shows the dynamic relationship between firm-level output exposure to safeguards and the change in firm-level imports (Panel a), TFP (Panel b), sales (Panel c), probability of exit (Panel d), employment (Panel e), wages (Panel f) and material costs (Panel g). TFP estimates are obtained following Ackerberg et al. (2015) at the most disaggregated level possible, depending on the number of observations available for estimation. Sales consider both local sales and exports (if applicable). Employment corresponds to the headcount of formal workers hired in a given year reported by the firm to the *Superintendencia de Compañías*. Labor costs include all costs related to permanent and temporary workers. Material costs are obtained as the difference between total production costs and labor costs. To obtain the estimates in Panel d, we estimate a different version of equation (4) in which i) we follow all the firms that were open between 2012 and 2014, giving as a result a perfectly balanced panel; and ii) the outcome variable corresponds to a dummy variable that identifies firms that exit the dataset in year t but were in the dataset in 2012-2014. In all cases, standard errors are clustered at the industry level (ISIC 3-digits). The estimations for each year include controls for economic sector (ISIC 1-digit), firm size (CAN classification), whether or not the firm belongs to a business group (identified by SRI), Herfindahl indexes for sales and imports, the logarithm of the firm-level capital stock, province-level fixed effects, and the firm-level share of imports and exports to the European Union. The variations in the outcome variables are winsorized at the bottom and top 0.5%.

These outcomes are consistent with protectionist trade policies being generally contractionary for directly affected firms. For importing firms, which rely heavily on imports for their operations, import surcharges directly impact their cost structure, leading to the observed scale reduction in line with Head and Ries (1999).

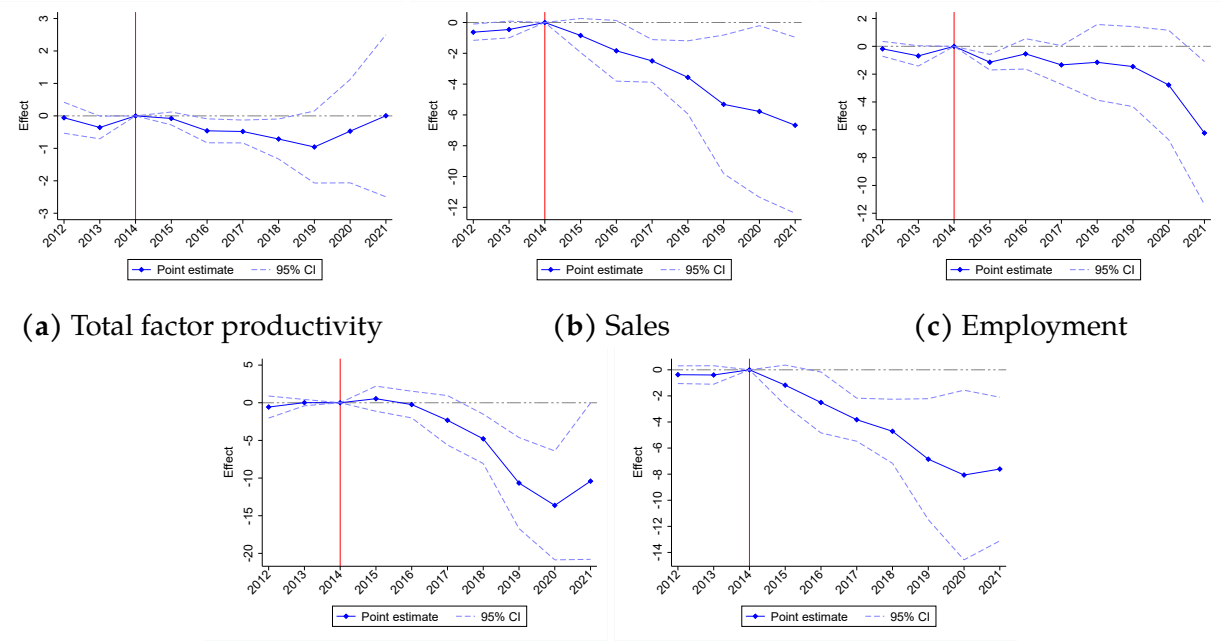
Although the results for 2020-2021 are consistent with those of previous years, it is important to note that these years are affected by the impact of the Covid-19 pandemic. Still, there is no a priori reason to expect that firms that were more exposed to the safeguards based on their 2014 import structure were also more affected by the pandemic, providing support for our analysis.

5.2. Effects on Other Firms

In this section, we estimate the impact of the safeguard import tariffs on the rest of firms, i.e., those that also export in addition to importing and those that do not trade with the rest of the world. We categorize these firms into three groups based on their international trade involvement: importer-exporters, local firms in import-competing industries, and local firms in non-import-competing industries. We assess the effects on five variables: Total factor productivity (TFP), sales, employment, labor costs, and material costs. In addition, for importer-exporters, we examine the impact on exports.

Importer-exporters could be influenced by import surcharges in two ways: direct exposure due to their imports and indirect exposure through local supply chains. However, we find no significant impact on this group through either channel (see Figure 7 in the Appendix). The absence of notable effects on importer-exporters might be attributed to their larger size and international market presence, potentially allowing them to absorb the additional costs induced by the policy. However, it is important to note that the number of observations within this group of firms is rather limited, representing just 7% of our sample firms (Table 1). This small proportion and outcome variability could impact the precision of the estimation.

For local firms in import-competing industries, we apply the concept of *effective protection*. While these firms might benefit from trade protection, they could also face higher input costs due to value chain exposure. We observe no significant effects of the safeguard tariffs on these firms, and our estimates show minimal variation. This finding is important because, as Jabbour et al. (2019) suggest, the group of firms most likely to benefit from short-term protectionism comprises import-competing firms. The fact that we do not find significant effects strongly supports the idea that the benefits of protectionism are minimal or non-existent. The results are detailed in Figure 8 in the Appendix.



(**a**) Total factor productivity (**b**) Sales (**c**) Employment

(**d**) Labor costs (**e**) Materials

Figure 5: Dynamic Effects of Safeguards on Local Firms in Non-import-competing Industries This figure shows the dynamic relationship between industry-level input exposure to safeguards and the change in the outcomes of local firms that operate in non-import-competing industries. The outcomes include firm-level TFP (Panel a), sales (Panel b), employment (Panel c), labor costs (Panel d) and material costs (Panel e). In all cases, standard errors are clustered at the industry level (ISIC 3-digits) and all the control variables from Table 3 are included. The estimations for each year include controls for economic sector (ISIC 1-digit), firm size (CAN classification), whether or not the firm belongs to a business group (identified by SRI), Herfindahl indexes for sales and imports, the logarithm of the firm-level capital stock, province-level fixed effects, and the firm-level share of imports and exports to the European Union. The variations in the outcome variables are winsorized at the bottom and top 0.5%.

Lastly, we analyze the impact on local firms in non-import-competing industries. Most of these firms (93%) belong to wholesale & retail industries. They do not import directly but likely purchase imported goods from local importers for local resale without foreign competition. Therefore, these firms do not face either direct or output exposure, but they may be affected through their value chain. The results are shown in Figure 5.

Safeguard import tariffs consistently harm economic activity among non-import-competing firms. From the second year of the policy, total factor productivity (TFP) begins to decrease. By 2016, a 1% increase in input exposure leads to a 0.45% drop in TFP growth, significant at the 5% level. This negative trend continues through 2017 (-0.48%) and 2018 (-0.71%), even a year after the policy ended, intensifying to -0.95% in 2019, although with less significance due to variability among firms.

Sales are even more adversely affected. Although not significant in 2015 and 2016, by 2017, a 1% increase in input exposure causes a 2.49% decrease in sales growth. This negative impact on sales persists and worsens, reaching a 6.67% decrease by 2021.

We find no significant effects on formal employment, with the exceptions of 2015 and 2021. In the first year of policy implementation, a 1% increase in input exposure corresponded to a 1.14% decrease in formal employment growth. Although this negative effect persisted in subsequent years, it was not statistically significant.

Regarding labor costs, no significant effect was detected during the period of active safeguard import tariffs. However, a notable change occurred between 2018 and 2021, with labor costs decreasing significantly, especially in 2020, the year of the pandemic, where they fell by 13.63% in response to a 1% increase in input exposure.

Material costs also decrease from 2016 onward. A 1% increase in input exposure results in a 2.50% reduction in the growth of material cost in 2016, falling to -8.07% by 2020. These effects are significant at the 1% level from 2016 to 2021.

These findings reflect the broader impact of safeguard import tariffs on the production scale of local non-import-competing firms. Our results also support existing literature on protectionism's negative impact on productivity, especially through input exposure in downstream industries.

Furthermore, our analysis reveals that value chain impacts are more substantial than direct industry protection. This is in line with previous findings that input tariffs have more pronounced effects than output tariffs. Overall, our results show a general negative scale effect, with sales, labor, and material costs declining across various firm groups, particularly noticeable through input exposure among local non-import-competing firms. Contrary to some studies, we find no negative impact on exporters' sales or other performance metrics.

The null effect on importer-exporters and the negative impact on local firms align with the context of the tariff implementation, which was a response to falling oil prices and the resulting aggregate demand shock. Local firms faced reduced demand, with exposed firms hit harder, whereas exporters were less affected.

Contrary to expectations, we find no positive impact on local import-competing firms, though they fare better than non-import-competing firms by not experiencing negative impacts from value chain exposure in labor or material costs.

5.3. New Firms

We conclude this section showing results on the effect of safeguard import tariffs on firm entry. Since we cannot see firms that were willing but did not enter the market, we focus on the change in the share of new firms in each industry.

First, we define *new firms* as those open between 2015 and 2021 but not present in 2014. Unlike previous sections, our benchmark is composed of *all* firms open in 2014 as opposed to only those included in the balanced panel. We then calculate their share at each point in time as a percentage of all active firms in their industry and trade status category.

Second, we adjust our estimation approach. The outcome variable is the share of new firms *by industry* at the ISIC 4-digit level. We consider only output and input exposure, since direct exposure is defined at the firm level. Other controls are industry averages set at the 2014 baseline.

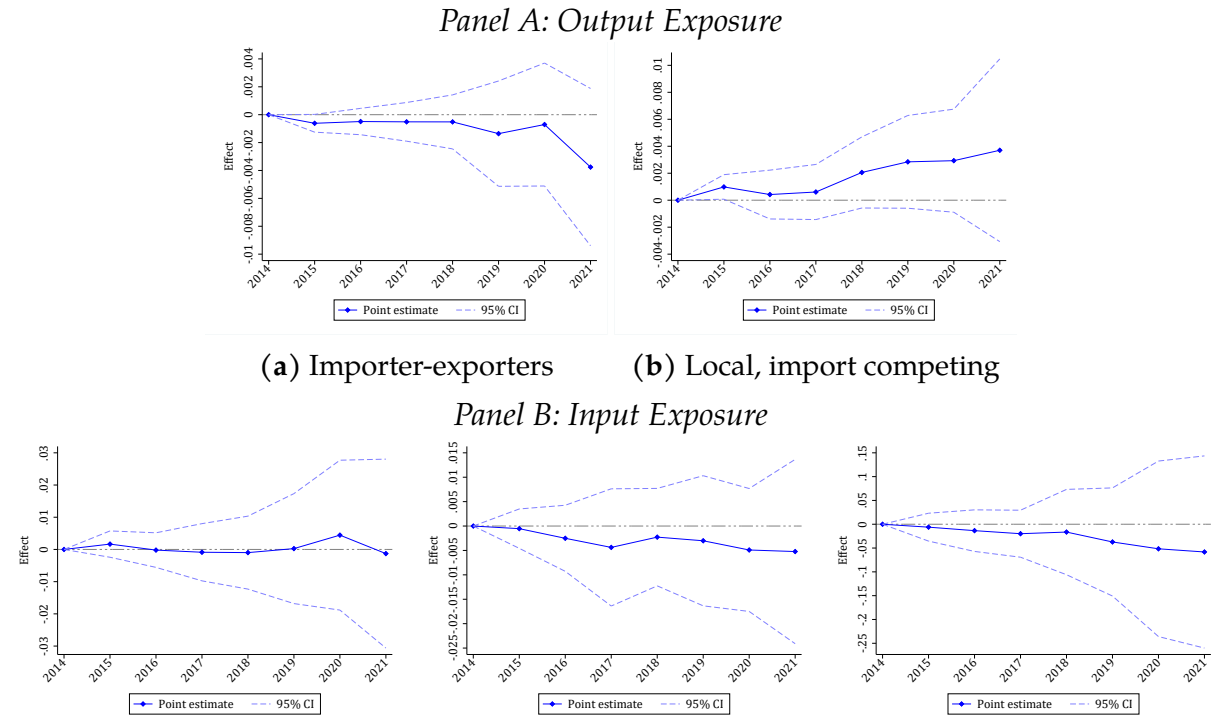
Third, due to limited data on importer-exporters, which causes problems with the computation of standard errors (bootstrapped, with 1,000 repetitions), we include importer-exporters in the same category as importing firms. This results in three trade status categories instead of four. With these adjustments, the results of our estimations are presented in Figure 6.

Protective import tariffs can have varying effects on the share of new firms, depending on their participation in international trade. For importer-exporters, output exposure can act as a barrier to entry, imposing higher tariffs during safeguard periods. In contrast, output exposure might offer a protective advantage for new firms in import-competing industries. Input exposure, however, likely poses an entry barrier for all firms due to increased input costs.

Our estimates for importer-exporters (Panels a and c in Figure 6) indicate no significant impact of safeguard tariffs on the share of new firms. Output exposure shows negligible, non-significant, negative effects, while input exposure's effect is virtually zero.

For local firms in import-competing industries (Panels b and d, Figure 6), the expected trends are observed, although none of the estimates is statistically significant. Output exposure, offering protection, yields positive effects, whereas the raised production costs from input exposure lead to negative point estimates. Local firms in non-import-competing industries see larger (in absolute value) yet non-significant changes due to input cost increases from value chain exposure.

In summary, safeguard import tariffs do not significantly affect the share of new firms in more exposed industries, neither as barriers nor as protective measures. Coupled with our findings of a positive exit probability among importers (Figure 4d), we observe a net negative effect of the policy on firm-level decisions at the extensive margin.



(**a**) Importer-exporters (**b**) Local, import competing

(**c**) Importer-exporters (**d**) Local, import competing (**e**) Local, non-import comp.

Figure 6: Effects of Safeguard Import Tariffs on the Industry Share of New Firms This figure shows the dynamic relationship between industry-level output and input exposure to safeguards and the change in the share of new firms in each industry by trade status. The group of importer-exporters includes importing and importing-exporting firms due to the small number of observations in the second group. In all cases, standard errors are bootstrapped (1,000 repetitions) and all previous controls are included at the industry level (ISIC 4 digits). The estimations for each year include controls for economic sector (ISIC 1-digit), firm size (CAN classification), whether or not the firm belongs to a business group (identified by SRI), Herfindahl indexes for sales and imports, the logarithm of the firm-level capital stock, province-level fixed effects, and the firm-level share of imports and exports to the European Union, all aggregated at the industry level. The variations in the outcome variables are winsorized at the bottom and top 0.5%.

6. Conclusion

In this paper, we analyzed the firm-level effects of safeguard import tariffs implemented by the Ecuadorian Government in response to a balance of payments crisis sparked by a sharp drop in oil prices at the end of 2014. The policy is particularly instructive due to its use of tariffs rather than non-tariff barriers, its temporary and largely unforeseen nature, and its impact on a wide range of goods, both final and intermediate.

We employed a quantitative approach, taking advantage of the heterogeneous pre-policy exposure of firms and industries. We analyzed direct exposure for importing firms, and output and input exposure at the industry level, in line with the literature on *effective protection*. Using this framework, we conducted a difference-in-difference analysis at both firm and industry levels.

For importing firms directly affected by the safeguard tariffs, we studied the effects on imports and calculated the tariff elasticity of imports, a crucial metric for policy evaluation. Our findings indicate that despite lower short-term elasticities compared to other studies, the tariffs significantly curbed imports.

We also assessed the impact of the policy on performance metrics such as productivity (TFP), sales, and exit probability of affected firms. The results showed significant, persistent, negative impacts on sales and an increasing likelihood of firm exit post-policy, though no immediate effects were observed during the policy period.

Analyzing the underlying mechanisms, we observed significant, sustained negative impacts on employment and material costs growth rates, with no notable effects on labor costs, possibly due to the specificities of the Ecuadorian labor market.

We extended our analysis to other firm categories, including importer-exporters, local firms in import-competing, and non-import-competing industries. The most adversely affected firms were the local non-import-competing firms, experiencing negative, lasting effects on productivity, sales, labor, and material costs. For other firms, the policy did not have significant effects on these parameters.

Our research offers crucial insights for policymakers. Specifically, it sheds light on how trade policy impacts production scale. We found that protective trade measures often result in a significant decrease in production scale and a corresponding drop in input demand. These measures tend to have a recessionary effect, even in economies without active exchange rate policy. This highlights the need for developing countries to focus on enhancing competitiveness. Policies aimed at facilitating access to international markets and encouraging growth by exposing local businesses to foreign competition are essential.

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A. Effects on Importer-Exporters

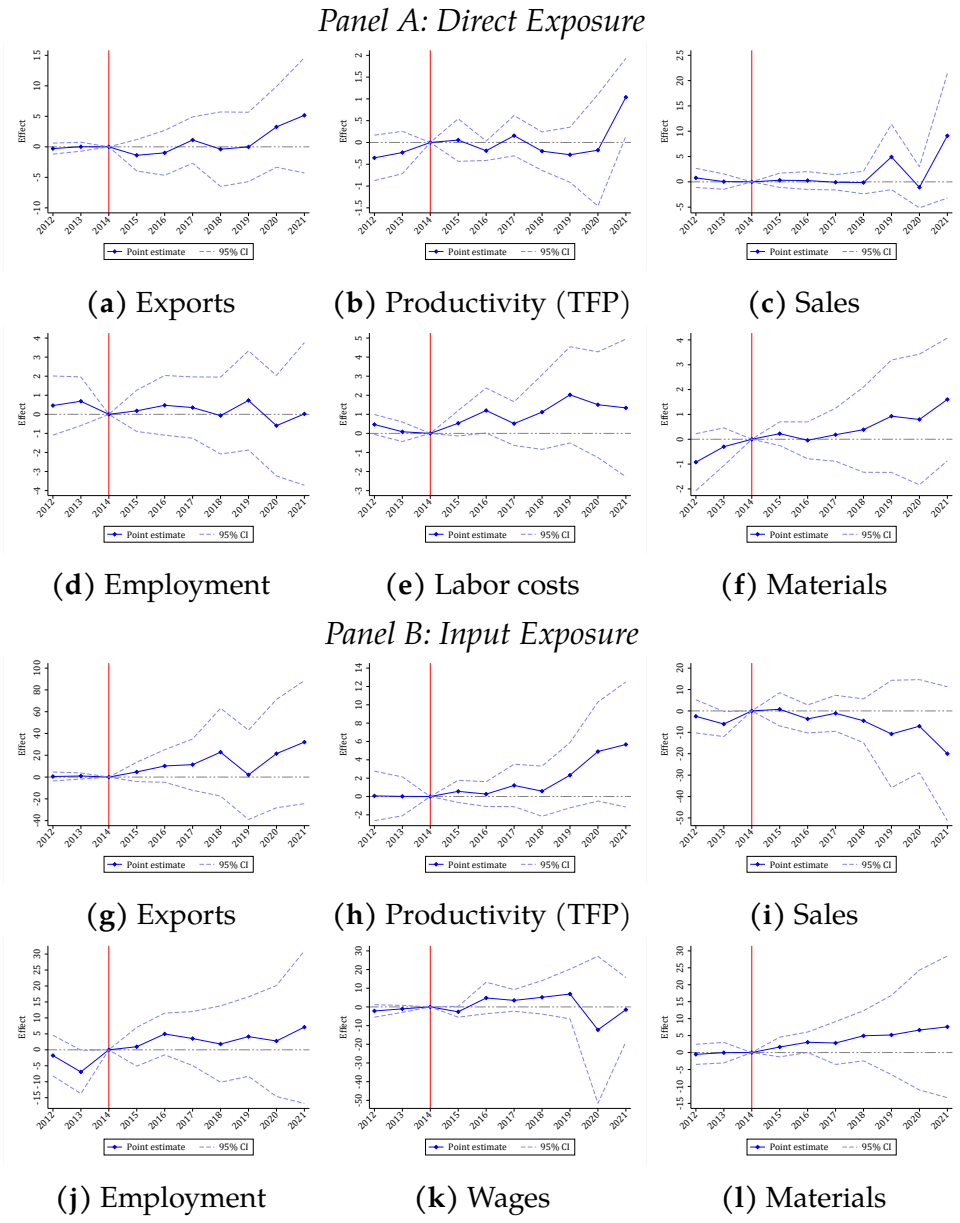

Figure 7: Dynamic Effects of Safeguards on Importer-Exporters' Outcomes This figure shows the dynamic relationship between firm-level exposure to safeguards and the change in exporters' outcomes. Panel A refers to output exposure, while Panel B considers industry-level input exposure defined as the exposure faced by the firm through its value chain. The outcomes include firm-level exports (Panel a), TFP (Panel b), sales (Panel c), employment (Panel d), wages (Panel e) and material costs (Panel f). Panels g to l present the same outcomes for input exposure. In all cases, standard errors are clustered at the industry level (ISIC 3-digits) and all previous controls are included. The estimations for each year include controls for economic sector (ISIC 1-digit), firm size (CAN classification), whether or not the firm belongs to a business group (identified by SRI), Herfindahl indexes for sales and imports, the logarithm of the firm-level capital stock, province-level fixed effects, and the firm-level share of imports and exports to the European Union. The variation in the outcome variables in Panels A and B are winsorized at the bottom and top 0.5%.

B. Effects on Local Firms in Import-competing Industries

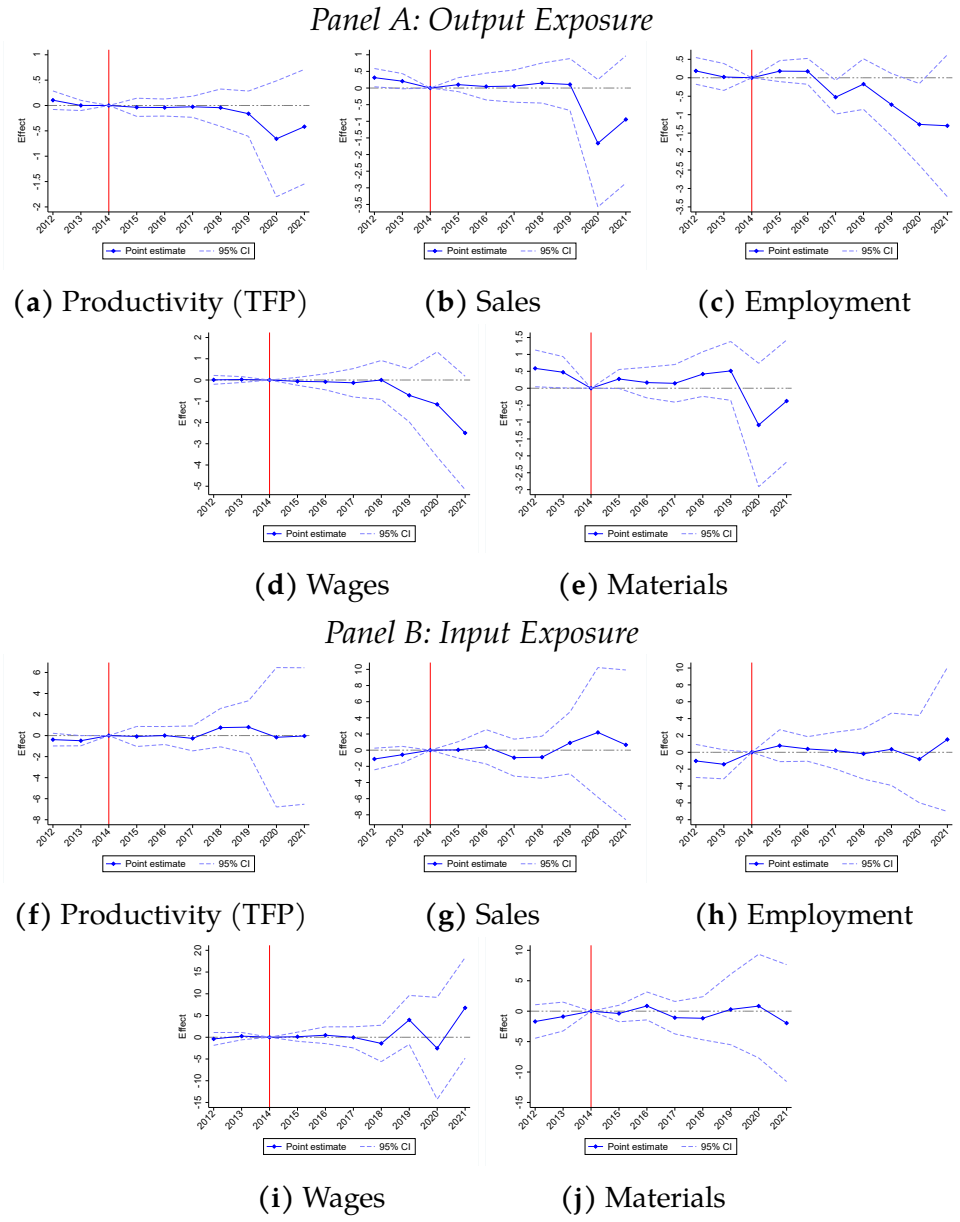

Figure 8: Dynamic Effects of Safeguards on Local Firms in Import-competing Industries
This figure shows the dynamic relationship between industry-level exposure to safeguards and the change in exporters' outcomes. Panel A refers to output exposure, while Panel B considers input exposure defined as the exposure faced by the firm through its value chain. The outcomes include firm-level TFP (Panel a), sales (Panel b), employment (Panel c), wages (Panel d) and material costs (Panel e). Panels f to j present the same outcomes for input exposure. In all cases, standard errors are clustered at the industry level (ISIC 3-digits) and all previous controls are included. The estimations for each year include controls for economic sector (ISIC 1-digit), firm size (CAN classification), whether or not the firm belongs to a business group (identified by SRI), Herfindahl indexes for sales and imports, the logarithm of the firm-level capital stock, province-level fixed effects, and the firm-level share of imports and exports to the European Union. The variation in the outcome variables in Panels A and B are winsorized at the bottom and top 0.5%.