Import Competition, Foreign Inputs, and Labor Adjustment in a Developing Country: Evidence from Colombian Liberalization

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Abstract

We study how import competition and foreign inputs coming from high-income countries affect employment and earnings in less-developed economies. We use administrative data from Colombia, and exploit exogenous tariff reductions that increased Colombian imports from the United States. Import competition decreases employment in a similar magnitude than foreign inputs increase it. The adverse employment effects of import competition are driven by firm exit. Foreign inputs increase non-college educated employment in services by inducing firm entry, but decrease employment in manufacturing by substituting labor demand. Both shocks reduce earnings among college-educated, informal workers. Our results contrast with findings for high-income economies.

JEL Classification: J21, J30, F14, O15
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1. Introduction

Tariff reductions may affect labor markets directly by increasing import competition and indirectly by reducing the costs of intermediate inputs. Multiple studies find that import competition induced by trade liberalization, especially from China, have detrimental effects on labor markets among low and high income countries.[1] Such negative effects are mostly explained by declines in manufacturing employment, although more recent studies also show that import competition can have positive spillovers on other economic sectors, especially among non-tradable goods.[2]

Most of these results do not account for potential gains due to reductions in the prices of foreign inputs, which have shown to foster economic development, especially in emerging economies.[3] Firms in the developing world benefit from such decreases by increasing productivity and output quality.[4] In addition, input linkages affect a larger share of the economy (industries that produce tradable and non-tradable goods) compared to import competition, which exclusively applies to the tradable goods sector.[5] Tariff decreases might be, thus, particularly useful for developing economies, which can leverage lower prices to import cheaper or higher-quality intermediate goods and increase productivity using foreign technologies. This topic is particularly relevant for developing countries, many of whom have adopted policies over recent decades to increase trade with developed countries to increase productivity and employment. Multiple free trade agreements, for instance, have been signed between developing countries

[1]For the effects of trade liberalization see: Dix-Carneiro and Kovak (2017); Hanson and Harrison (1999); and Attanasio, Goldberg, and Pavcnik (2004). For effects among Chinese imports on high-income countries, see Autor, Dorn, and Hanson (2013), Autor, Dorn, Hanson, and Song (2014), Bernard, Jensen, and Schott (2006) and Pierce and Schott (2016). For the effects of Chinese imports among low-income countries, see: Jenkins, Peters, and Moreira (2008); Moreira (2007); and Wood and Mayer (2011).

[2]See: Bloom, Handley, Kurman, and Luck (2019); and Costa, Garred, and Pessoa (2016).

[3]See, for instance Blaum, Lelarge, and Peters (2018), Caliendo, Dvorkin, and Parro (2019) for the effects on France and the United States. For the effects among developing countries see: Goldberg, Khandelwal, Pavcnik, and Topalova (2010); Edmonds and Pavcnik (2006); Topalova and Khandelwal (2011); Amiti and Konings (2007); Bustos (2011); and Halpern, Koren, and Szeidl (2015).

[4]See, among others: Melitz (2003); Melitz and Ottaviano (2008) Fieler, Eslava, and Xu (2018); Eslava, Haltiwanger, Kugler, and Kugler (2004); Pavcnik (2002); Forlani (2017); Halpern, Koren, and Szeidl (2015); Olper, Curzi, and Raimondi (2017); Medina (2018); Bas and Strauss-Kahn (2015); and Egger and Kreickemeier (2009).

[5]For instance, in Colombia, the tradable sectors (agriculture, mining, and manufacturing) account for 14 percent of formal employment. Even in more developed countries, such as France, the tradable sectors represent only 23% of employment (Frocrain and Giraud, 2018).

and the United States to induce a more dynamic trade. At the same time, tensions over free trade between countries of different economic development levels have emerged, as evidenced by the U.S.-China tariff wars.

This paper analyzes how employment and earnings in Colombia are affected by import competition and foreign inputs, particularly from the United States. In contrast to previous work (such as Autor, Dorn, and Hanson (2013) or Dix-Carneiro and Kovak (2017)) that focuses on the competition effect, we analyze the impact of import competition and intermediate foreign inputs separately, in a setting in which imports from a high-income country affect the labor market of a lower-income country. We provide an alternative perspective from a vision of international trade as having created "winners" in the developing world and "losers" in the developed world (Pavcnik, 2017). Our work reveals greater complexity, showing that the effects of imports within the emerging economies are highly heterogeneous, just as it has been suggested by theoretical papers since the seminal work of Stolper and Samuelson (1941). While we do not assess the aggregated welfare effects, our reduced-form estimates provide compelling evidence about such heterogeneity in developing countries.

Previous literature has struggled to analyze the effect among developing economies of import competition and inputs prices coming from high-income countries due to two impediments. First, data restrictions have limited the ability to link input and competition measures. This issue has particularly hindered the analysis among developing countries where data quality is usually lower. To surmount such limitation, we use detailed administrative imports registers to compute the baseline share of foreign inputs by industry. The industry-level input shock is the sum of tariff cuts in inputs, weighted by their baseline share.[6] We combine the foreign input shock with a traditional measure of import competition, and link them with the universe of formal employer-employee administrative records from the social security registry and household surveys. Merging all these data sources allows us to analyze changes in overall (formal and informal) employment and earnings and contrast our results across different data sets.

[6]Our main specification uses industry inputs weights based solely on imported inputs to better exploit the granularity of the data. We compute an alternative measure of foreign inputs shock based on the nationwide input-output matrix, finding similar results.

Second, empirical difficulties have impeded the identification of import shocks coming from high-income countries. We isolate these effects by exploiting the exogenous variation induced by two unexpected tariff reductions in Colombia. The first reduction, implemented in 2010, unilaterally reduced tariffs charged on the prices of intermediate foreign inputs. The second, which took effect in 2012, decreased the tariffs charged on imports from the United States, as part of the implementation of a free trade agreement between the two countries. Neither of the reforms affected Colombian exports, making it possible for us to isolate the effect of imports from that of exports. Both tariff reforms exclusively increased imports from the United States, leaving those from other countries mainly unaffected. Therefore, most of the identifying variation comes from changes in imports from a high-income country.

Our empirical strategy uses across industry variation that combines the unexpected timing of the reductions in tariffs in 2010 and 2012 with their exogenous magnitudes in a differences-in-differences framework that provides reduced form estimates of the effects of import competition and foreign inputs. We use dynamic event-study estimates to test the common-trends assumption, finding balanced point estimates before 2010 in most cases. We also present robustness of our specification to address potential threats stemming from the definition of the treatment, its timing, and potential heterogeneous treatment effects (Callaway and Sant'Anna, 2021; de Chaisemartin and D'Haultfœuille, 2020; Goodman-Bacon, 2021; Sun and Abraham, 2020). While in most cases, the common trends assumption is satisfied, we find some small pre-trends in 2008 when we use social security records. These may stem from problems with data quality in that year.[7] We thus implement a matching estimator that eliminates these differences and show that our results are robust. To eliminate potential confounders due to strong fluctuations in oil prices and exchange rate during our analysis period, we also drop the mining sector. Our results remain unchanged.

We find that the Colombian tariff reductions increased imports coming almost exclusively from the United States, and raised mainly the inflow of capital (including construction goods) and consumption goods. We find no detectable effects on raw materials. Overall, the tariff reductions increased import competition among agricultural and manufacturing industries, but

[7] Reporting has been mandatory since 2008 but not all the firms reported employment in the first six months after implementation of this requirement.

additionally benefited manufacturing and services firms, who profit from the situation to access cheaper foreign inputs.

Our main results suggest that a one-percentage-point reduction in Colombian tariffs (i.e., an increase in import competition) *decreases* Colombian employment by an estimated 1.4 percent. In contrast, a one-percentage-point reduction in the prices of foreign inputs *increases* employment by an estimated 1.2 percent, although this result is slightly imprecise and only significant at the 10 percent level. The sum of both effects is not statistically different from zero. While our estimated competition effects are similar to those found in previous studies, we show that the reduction in foreign inputs prices has employment effects of similar magnitude. These results are in line with previous evidence on employment reallocation across industries (Bloom, Handley, Kurman, and Luck, 2019; Costa, Garred, and Pessoa, 2016). We also find that foreign inputs decrease earnings exclusively among workers employed in informal jobs, which is consistent with these workers being more flexible.

We then explore some of the mechanisms behind our main results by estimating heterogeneous effects across industries and workers' education levels and analyzing the impact on the number of firms and the average firm size (measured by formal employment in the social security records). While some of our findings resemble the evidence from high-income countries, others strongly contrast. The first set of results concerns the import competition shock. The negative employment effect of import competition is mostly driven by firm exit in the manufacturing and agricultural sectors. We compute effects at the two-digit sector level and observe a reduction in the number of firms among industries where employment significantly decreased. This result is in line with the theoretical predictions in Melitz (2003). We also find that import competition reduces employment for both college- and non-college-educated individuals. However, competition only reduces earnings for college-educated workers, especially those working in informal jobs. These results contrast with previous evidence from developed countries where low-skill workers seem to be the most affected (e.g. the effects of Chinese imports on the U.S. labor market) (Autor et al., 2013; Bloom, Draca, and Van Reenen, 2016).

As for the foreign inputs shock, we find that it has two opposing effects on employment.

First, lower input prices induce firm entry and increase employment in the services sector, especially for non-college educated workers. The complementarity between labor demand and foreign inputs is consistent with previous findings Fieler et al. (2018); Kamal, Lovely, and Mitra (2019); Leblebicioğlu and Weinberger (2021). However, to the best of our knowledge, we are the first to document that foreign inputs from high-income countries complement non-college-educated employment in the developing world. Second, lower input prices reduce employment and the average firm size in the manufacturing sector, reflecting a substitution between local employment and imported inputs. While this substitution has been less documented in developing countries, it echoes the results of Pierce and Schott (2016), who argue that Chinese imports reduce manufacturing employment in the United States by increasing the capital intensity of firms. These results also showcase the relationship between technology adoption in the United States and the effects of such technologies on the Colombian labor market, as shown by Kugler, Kugler, Ripani, and Rodrigo (2020).

The paper contributes to the literature in at least two specific ways. First, we quantify the effects of the decreases in the prices of foreign inputs, and contrast them with the effects of import competition. Most of the existing empirical literature emphasizes on import competition, which not only limits the analysis to a restricted number of sectors in manufacturing and agriculture, but also omits a key mechanisms through which trade liberalization affects productivity and employment.

Second, we study how imported products from high-income countries affect developing economies. Most of the existing research has focused on analyzing the effects of import competition from developing countries, such as China and Mexico, on high-income countries in North America and Europe.[8] The papers studying the effect of trade in developing countries, also include imports from developing countries. This is the case of Dix-Carneiro and Kovak (2017), Dix-Carneiro (2014), and Attanasio, Goldberg, and Pavcnik (2004), who study how unilateral liberalization – that applies to imports from every country – decreases employment

[8]The effect on the United States see Autor, Dorn, and Hanson (2013), Autor, Dorn, and Hanson (2015); Pierce and Schott (2016); Autor, Dorn, Hanson, and Song (2014); Feenstra and Hanson (1999); Bloom, Handley, Kurman, and Luck (2019); and Bernard, Jensen, and Schott (2006). For the effect on Europe, see: Bloom, Draca, and Van Reenen (2016); Branstetter, Kovak, Mauro, and Venancio (2019); and Hummels, Jørgensen, Munch, and Xiang (2014)

and earnings in Brazil and Colombia. Similarly, Moreira (2007), and Wood and Mayer (2011) focus on the effects of Chinese imports in developing countries. Our results indicate that imports for high-income countries, more intensive in high-skilled human capital, can also affect labor markets in less developed countries, and this relationship has not been previously highlighted.

The rest of the paper is organized as follows. Section 2 presents some conceptual considerations on the substitution of foreign inputs and local employment. Section 3 describes the background and data. Section 4 details the empirical strategy that identifies the causal effect of import competition and foreign inputs on Colombian labor market outcomes. Section 5 presents the results, whereas in Section 6 we present results that explain the mechanisms behind our main results. Finally, Section 7 concludes.

2. Conceptual Framework

Consider J economic sectors and a representative firm in each sector $j \in J$. The representative firm combines labor (L_j), and foreign (X_j) inputs to produce a final good Y_j. Foreign inputs are priced with an ad valorem tariff τ, in addition to their regular price. Firms produce using a constant elasticity of substitution (CES) technology:

$$Y_j = \left[\theta L_j^{\frac{\sigma_j - 1}{\sigma_j}} + (1-\theta) X_j^{\frac{\sigma_j - 1}{\sigma_j}}\right]^{\frac{\nu_j \sigma_j}{\sigma_j - 1}},$$

where σ_j corresponds to the input elasticity of substitution in sector j, and $\nu_j < 1$ denotes the degree of homogeneity of the production function with decreasing returns to scale. A profit maximization – where firms chose the amount of labor and foreign inputs– implies that the demand for labor is given by:

$$\ln L_j = \varepsilon_j \ln \nu_j P_j(\tau) + \alpha \ln \left[\theta^{\sigma_j} W_j^{1-\sigma_j} + (1-\theta)^{\sigma_j} [Q_j(1+\tau)]^{1-\sigma_j}\right] - \sigma_j \ln \left(\frac{W_j}{\theta}\right), \quad (1)$$

where W_j stands for wages, Q_j for the foreign input prices, $\varepsilon_j = \frac{1}{1-\nu_j}$ is the price elasticity of demand, and $\alpha = \frac{\sigma_j - \nu_j\sigma_j - 1}{(1-\nu_j)(1-\sigma_j)}$. Taking the derivative with respect to τ yields:

$$\frac{\partial \ln L}{\partial \tau} = \underbrace{\frac{\varepsilon_j P_j'(\tau)}{\nu_j P_j(\tau)}}_{\text{Competition Shock}} \underbrace{+ \left(\sigma_j - \varepsilon_j\right) \frac{(1-\theta)}{(1+\tau)} \left(\frac{X_j}{Y_j^{\frac{1}{\nu_j}}} \right)^{\frac{\sigma_j - 1}{\sigma_j}}}_{\text{Input Shock}}. \tag{2}$$

Equation (2) implies that a decrease in tariffs will affect employment through two mechanisms, regardless of whether we assume perfect or monopolistic competition. Consider first the case of perfect competition in which the firms take the price (P_j) as given. A decrease in tariffs will, first shift the demand of good j down by increasing competition and, thus, reducing prices (i.e. $P_j'(\tau) > 0$ because bigger tariffs imply less competition or, in other words, higher prices). We call this the *competition shock*, that is always negative after a tariff reduction. Second, a reduction in the tariffs charged for foreign inputs will substitute or complement labor with foreign inputs. We call this the *input shock*, and its magnitude depends on the elasticity of substitution (σ_j) – which can range from zero (perfect complements) to infinity (perfect substitutes)– and the price elasticity of demand (ε_j). If labor complements foreign inputs, then an increase in tariffs will decrease the quantity of foreign inputs and labor (i.e. $\sigma \to 0$ and the input shock term is negative). However, if foreign inputs substitute for labor then an increase in tariffs will increase labor (i.e., $\sigma \to \infty$ and the input shock term will be positive).

If we assume monopolistic competition (i.e., firms are able to determine their selling prices), then we will also have the same types of effects. The input shock will again depend on the elasticity of substitution in the same fashion as in the case with perfect competition. Nevertheless, the decrease in tariffs for intermediate goods directly benefits the firm by reducing its production costs, and it also affects the firm indirectly by reducing the costs of its competitors. A reduction in costs generates incentives to substitute labor for imported inputs but also increases the optimal production scale of the firm, which increases the demand for both imported inputs and labor. The effect of competition depends on the relative effect of tariffs on competitors, including competitors that import final goods directly. In equilibrium, costs go down and firms increase their scale, but the size of the increase in scale depends not only on the elasticity of demand captured by ε but also on how much competition is now faced by the firm.

We have so far assumed that the labor market adjustment occurs via employment and that wages are non-flexible. In developing countries, this assumption is particularly reasonable for formal jobs (i.e., jobs in which the worker contributes to health insurance and pension plans), in which wages are governed by formal contracts and bounded by minimum salaries. However, a big share of workers in developing countries are employed in informal jobs, in which wages are much more flexible. In these cases, we expect that the labor market adjusts via wages rather than by employment. Thus the equilibrium wage of informal jobs will also depend on the *competition* and *input* shocks, separately, in the same fashion as the demand for labor in Equation (1).

This relatively simple framework suggests that trade policies can have two main effects on trade and employment. On the one hand, tariff reductions increase import competition and decrease employment (or wages, depending on the labor market flexibility). On the other hand, tariff reductions reduce the prices of foreign inputs, with ambiguous effects on employment. In this paper, we causally estimate Equation (1), and evaluate both of these effects simultaneously. In Section 4 we discuss the details of the empirical implementation.

3. Trade reforms in Colombia

Recent Colombian tariff reductions provide an excellent setting to study the labor market effects of imports in developing countries. The first reduction was implemented in 2010, with a unilateral tariff decrease, and the second in 2012, under the free trade agreement signed between Colombia and the United States.

Before the Free-Trade Agreement: Over the last decades of the twentieth century, Colombia undergone a liberalization process that reduced tariffs, irrespective of their origin, from around 50 percent in the 1970s to 12 percent in 2006 (Nieto, 2016). From 1970 to 1990, Colombian tariffs decreased continuously, from an average of 50 percent in 1970 to 29 in 1989, as part of government efforts to liberalize the country. During the 1990s, the country then embarked on a second liberalization wave that further reduced tariffs to around 12 percent on average.[9] In 1995, the country joined the *Comunidad Andina de Naciones* (CAN), which enforced a common tariff scheme for all participating Andean countries.[10] Under this scheme, the members of CAN charged a common tariff that was not altered until 2008, when the common tariff scheme ended.

In 2010, a newly elected Colombian government unexpectedly decided to decrease further tariffs on imported products passing from an average of 12 percent to 8.3 percent. The tariff cuts were implemented under the Colombian Decree 4114 of 2010, signed on November 5th, 2010. The decree, which mandated immediate cuts on tariffs for manufacturing imports, aimed to cut the prices of inputs and, thus, reduce costs and boost employment and production. The reductions applied to all incoming products irrespective of their country of origin. The agriculture sector remained mostly unaffected as agricultural products were not considered as essential inputs.

The Free Trade Agreement: Since the 1990s, the United States has been Colombia's biggest trade partner, accounting for around 25 to 30 percent of Colombia's imports.[11] Trade between both countries grew remarkably after the beginning of the 1990s when both countries took measures to facilitate the flow of products. In 1991 the United States, under the Andean Trade Preference Act (ATPA), eliminated tariffs on a large number of Colombian products.[12] At the same time, Colombia's own liberalization decreased tariffs charged to the United States to around 15 percent. Later, in 2003, both countries started negotiations on the free trade agreement, which were officially concluded with a final text in 2006, after 15 rounds and more than 100 meetings (Romero, 2013).

The agreement required approval from both the U.S. and Colombian congresses before

[9] A more detailed discussion about Colombian liberalization in the 1990s can be found in Eslava, Haltiwanger, Kugler, and Kugler (2004).

[10] The CAN is the union of the Andean countries (Colombia, Ecuador, Peru, and Bolivia) who came together to achieve development by the integration of trade in 1995.

[11] Colombian imports from the United States are mainly composed of manufacturing products. Appendix Figure A.1a, which plots U.S. imports according to their one-digit sector codes, shows that manufacturing represents 93 percent (6,273 products) of the U.S. products Colombia imports, accounting for 92 percent of the total import dollar value. By contrast, agriculture represents 8 percent of the dollar value (367 products), and mining and services account for less than one percent (126 products).

[12] ATPA was established to promote Colombia's export industries, as well as to help fight drug production. It was continuously renewed after 2002 when it was called the Andean Trade Promotion and Drug Eradication Act (ATPDEA).

implementation. However, the process took much longer than expected because of the strong opposition faced in both countries. In Colombian, the agreement was approved by Congress in 2007 and declared constitutional in 2008. The process faced strong opposition by syndicalists, indigenous associations, left and center-left parties, and pharmaceuticals, among others. The opposition persists nowadays with multiple political parties claiming that it should be revoked because its implementation was not approved by the popular vote.

On the U.S. side, the process was even more complicated. After George Bush presented the final text to Congress in 2006, its voting was postponed after 2008 due to the opposition by Nancy Pelosi and the democratic party. Moreover, during the presidential campaign of 2008, Barack Obama claimed as irresponsible to implement an agreement with a government where human rights were violated, referring to Colombia. The opposition in the United States ended up being much stronger than expected because of the political elections, the change in government, and strong opposition by the democratic party. However, almost six years after the text was officially signed, in 2011, the U.S. Senate approved the agreement after the Colombian president manifested that if the agreement was not approved in 2011, then Colombia would stop insisting and will start negotiating in other markets. The agreement was then legally implemented in May 2012 under the Colombian Decree 730 of 2012, again receiving strong opposition in Colombia from political leaders asking for the agreement to be postponed until Colombia enforced tighter labor protection laws.[13]

The free trade agreement renewed the existing tariff exemptions granted to Colombian products under the ATPA. In return, Colombia reduced tariffs on products from the United States. Tariffs were dropped for most manufacturing, services, and mining products. Some other goods, most of which agricultural products, remained protected for some additional years (in most cases for five years, but for some products such as rice, the tariffs were set to continue for another 20 years), allowing local producers to adapt progressively to the incoming competition.[14]

[13] More information about the negotiation process can be found in Iragorri (2008) and *TLC entre Colombia y EE.UU. entra en vigor casi 6 años después de su firma* (2012).

[14] The main protected products were rice, chicken, milk, cheese, butter, corn, meats, motorcycles (between 1500 and 3000 cc.), paper, ink, iron and steel products, glass, and plastics. The agreement additionally regulated competition, customs, environmental rights, intellectual property, and investment procedures.

Figure I presents the evolution of the tariffs charged by Colombia to the United States (Panel Ia), and the evolution of tariffs charged by the United States to Colombia (Panel Ib). Panel Ia shows that tariffs on manufacturing and service goods decreased after 2010, whereas tariffs on agricultural and mining goods decreased with the free trade agreement. Even though an important share of the agriculture goods remained protected for some additional years, the sector was strongly liberalized in 2012. Panel Ib shows that tariffs for Colombian products entering the United States were minimal, largely renewing the already low tariff rates that were in place years before. Nonetheless, these minor changes were officially referred to as cuts and were implemented with the 2012 agreement.

Tariff reductions considerably increased Colombian imports from the United States. Between 2010 and 2014, the value of U.S. products subject to the reduced tariffs grew from approximately 9 billion to 15 billion dollars (USD). Starting 2015, there was a generalized drop of Colombian imports starting 2015, irrespective of their origin, triggered by a strong devaluation of the Colombian peso.[15] Imports coming from the United States fell less for products facing larger tariff cuts between 2010 and 2012. We present causal estimates of this in Section 5.1.

No-anticipatory Effects: Both reforms were overall unexpected and were very difficult to anticipate. The tariff reduction in 2010 was implemented by a newly installed government as part of its strategy to boost employment by decreasing input prices. The 2012 cuts were part of the free-trade agreement that was only implemented after a five-year-long wait for the approval of the U.S. Senate, given the opposition in both countries. Firms and consumers in Colombia could have hardly predicted whether the agreement was going to be approved or, even more difficult, the timing of the implementation. We plot the evolution of employment and earnings for industries affected or not by changes in tariffs and changes in inputs prices in Figure II. Both employment and earnings are re-scale dividing by the value in 2008 to present relative gains.

[15] In Appendix Figure A.1b, we present the dollar value of imports from the United States by the year of tariff reduction. The solid line depicts products for which tariffs were cut in both years (3,621 products); the dashed line shows products for which tariffs dropped due to the 2012 free trade agreement (2,716 products). Tariffs for the remaining 150 products either did not change or decreased only in 2010. We observe a continuous increase in the value of imports from the moment of liberalization until 2014, when they decrease drastically. The trend is similar for total imports. The decline was triggered by a strong Colombian peso devaluation, which resulted from a shock in international oil prices (see Appendix Figures A.1a, A.1b, and A.2).

Overall, we observe no important differences in trend before 2010, indicating no anticipatory effects before this date.

Isolating imports from exports: These reforms had no significant effect on Colombian exports. The reduction of 2010 applied only for imported products and, therefore, had no direct impact on exports. The implementation of the free-trade agreement in 2012 did not considerably reduce the tariffs placed on Colombian products by the United States to Colombian products. We test this and show the results in Appendix Table A.1. We observe small and statistically insignificant effects from the U.S. tariff cuts on Colombian exports to the United States. These results are consistent with the fact that most of the tariffs were already close to zero by the time the free-trade agreement was implemented.

4. Data and Empirical Strategy

4.1. Data

Our empirical analysis is based on rich administrative data from multiple Colombian authorities. First, we use official Colombian tariff records to measure the trade reforms. We use the Colombian Decree 4589 of 2006 that stipulated the level of tariffs charged on every incoming product after January 1st of 2007. This decree does not reflect actual tariff changes but was published to adapt Colombian tariffs to the nomenclature established under the "NANDINA" 2007.[16] We combine this information with data provided under the Colombian Decree 4114 of 2010, which contemplated the unilateral tariff cuts of 2010, and with the Colombian Decree 730 of 2012, that regulated the free trade agreement between Colombia and the United States.[17] The three decrees provide information at the 10-digit product-code level, and, thus, they constitute a very detailed source of variation. We complement these with information about tariffs charged by the United States to Colombia from the U.S. International Trade Commission.

[16]NANDINA nomenclature, which resembles quite closely the harmonized system, was designed by the CAN to help with the identification and classification of commodities and to conform with international trade statistics. Decision 653 of the CAN ordered Andean countries to adapt their nomenclature. The Colombian government Decree 4589 of 2006 was adopted for this purpose.

[17]The data for the mentioned decrees can be found in `http://www.suin-juriscol.gov.co`

Second, we use detailed records on imports and exports from the Colombian Tax and Customs Department (DIAN for its Spanish initials) and the Colombian Central Bank. Imports and exports are measured between 2007 and 2018 at the product level (using 10-digit industry codes). We complement this information with two additional sources of data. First, we use the Economic Commission for Latin America and the Caribbean official classification of product by economic destination (CUODE) to classify the imported products as capital (which also includes construction), consumption, or raw materials.[18] Second, we complement the product-level data with individual records on imports at the product and firm-level in 2008. We collapse the data at the industry level (four-digit industry code) to create a matrix that measures the foreign inputs used by every industry before the tariff reductions took place. As a complementary source of information regarding inputs, we use the official two-digit input-output matrix built by the Colombian statistical offices. We use both of these measures, combined with the tariff data, to compute the foreign input shock. More details are given in subsection 4.2.

Third, we use social security records providing matched employer-employee earnings records from 2008 to 2018. This administrative dataset includes the universe of formal workers in the country, with over 10 million registries in any given month. One limitation of the data is that it contains only formal-sector workers, representing about 60 percent of Colombian workers. A second limitation is that compliance increased gradually, and therefore data from 2008 should be interpreted with caution. We collapse these records at the four-digit industry and year level.

Due to the limitations, we complement the social security records with the Colombian household survey, *Gran Encuesta Integrada de Hogares* (GEIH). The survey is administered monthly and includes approximately 8.7 million observations between 2008 and 2018. The main advantage of the surveys is that they include informal workers and provide additional information, such as their education level. However, there are limitations in the representativeness of the surveys when we break the results into two-digit industries. In these cases, we base

[18] The CUODE classifies merchandise by its economic destination at the three digit level. More information can be found in: https://www.dian.gov.co/dian/cifras/AvancesComEx/Avance_Comercio_Exterior_786_30_enero_2020.pdf

our analysis on the social security records.

We merge all the data sets and create two different estimating samples. The first is a product-balanced panel built by merging trade and tariff information at the 10-digit level. The panel includes information on 6,663 imported products observed during 12 years (2007-2018). The second is a four-digit industry-code panel that matches data from the employer-employee records, the household surveys, and the tariffs. This data set follows 416 four-digit ISIC sectors for 11 years. We built this panel by keeping sectors with at least one employee observed or information about trade (either imports or exports). The panel at the industry-year includes 4,576 observations, but the household survey only has information for 402 industries, which correspond to 4,422 observations. Appendix Table A.2 presents descriptive statistics for both samples.

Mining Sector: We drop the mining sector from the analysis because of potential confounders due to variation in oil prices and exchange rates. This sector encompasses 21 industries, including oil and coal, constituting less than 0.5 percent of Colombia's imports. Including this sector in the estimations does not alter the paper's main conclusions; however, adding it may bias the estimates.

4.2. Competition and Input Shocks

The *competition* and *input* shocks quantify the increase in competition and the decrease in the prices of foreign inputs, respectively, induced by the tariff reductions. We define the competition shock as the direct change of tariffs at year t with respect to the value before the reductions of tariffs in industry j. Formally, the competition shock is defined as:

$$\tilde{\tau}_{jt} = \tau_{j,2010} - \tau_{jt}, \tag{3}$$

where τ_{jt} represents the tariff charged by Colombia to imports from the United States of industry j at year t. This measure quantifies the degree of liberalization per industry. Before 2010, $\tilde{\tau}_{jt}$ is equal to zero since the tariffs did not change. After 2010, the tariffs start to decrease continuously. Notice that $\tilde{\tau}_{jt}$ between 2010 and 2012 is equal to the tariff change that applied to all the countries, but, after 2012 it takes the value charged exclusively to the United States. A bigger value for $\tilde{\tau}_{jt}$ implies a larger decrease in tariffs and, therefore, a larger increase in import competition.

We use information on imports per firm at the product level in 2008 to quantify the input shock in industry j. We aggregate the firm-level data to compute the shares of the different imported inputs by industry j, before the tariff reductions. We then multiply the respective share with the tariff reduction of each input k, and sum across inputs. Formally, the input shock is expressed as follows:

$$\tilde{q}_{jt} = \sum_k w_{jk}^{2008} \tilde{\tau}_{kt}, \tag{4}$$

where $w_{jk}^{2008} = \frac{X_{jk}^{2008}}{\sum_k X_{jk}^{2008}}$, and X_{jk}^{2008} corresponds industry j's imports of input k in 2008. Therefore, the input shock is the weighted reduction in tariffs of the imported inputs of sector j in year t. The weights are measured in 2008, before the tariff reforms, to eliminate any potential bias due to endogenous changes in inputs. A bigger value of $\tilde{q}_{jt}$ reflects a bigger reduction in the prices of foreign inputs. It is worth noting that this input shock measure is based exclusively on imported inputs. We provide an alternative measure to complement our analysis that derives the weights from the official national input-output matrix at the two-digit level. Since the level of detail of this input-output matrix is not sufficient to build a robust measure of inputs, we use it as a robustness check and focus on the more detailed matrix in the main specification. Our results remain unchanged in magnitude, although they are much more imprecise. This is consistent with the fact that there is considerably less variation at the two-digit industry code level.

The competition and input measures could be potentially collinear, affecting the standard errors of the estimations. However, the import competition shock affects mainly the manufacturing and agriculture sector and is zero among the industries in services. In contrast, the foreign input shock affects all industries. To confirm that collinearity is not a major concern, we present in Appendix Table A.3 the average shocks by industry. The correlation between the two measures is below 0.4.

4.3. Earnings premia

We exploit the granularity of our data to compute a measure of earnings premia at the industry level to quantify the effects on earnings. The raw average measure of earnings per industry is affected by changes in workforce composition induced by the liberalization. Therefore, to estimate the impact on earnings, we follow Dix-Carneiro and Kovak (2017) and compute earnings premia that quantify the log of earnings in an industry, controlling by potential selection in workers' composition. We estimate the following equation, separately for each year $t \in \{2008-2018\}$:

$$\ln(Earnings)_{imsjt} = \theta_{jt} + X_{imsjt}\phi_t + \mu_{st} + \mu_{mt} + \varepsilon_{imsjt}, \tag{5}$$

The dependent variable corresponds to the logarithm of the monthly earnings of individual i, in month m, state s, working in industry j and year t. We condition on the state (μ_{st}) and month (μ_{mt}) fixed effects, as well as on a vector of individual-level controls (X_{imrjt}) that includes gender, age, and age-squared. The coefficients attached to the industry identifiers (θ_{jt}) correspond to the industry premia, which we use as a measure of earnings. Equation (5) is estimated separately by year, so the coefficients vary by year and industry, and they quantify changes in earnings adjusting for potential changes in workforce composition. We additionally recover the standard errors of θ_j to efficiently weight our estimations by the inverse of the standard error.

4.4. Identification

Our identification exploits the across-industry variation of the tariff reductions to estimate the effect of the competition and input shocks. We want to estimate such effects and also aggregate them into a single comparable measure. In what follows, we describe our baseline empirical model and a mechanism to aggregate both shocks into a unique measure.

4.4.1 Baseline Model

We use the sample analog of Equation (1) to estimate the effects of the increase in competition and the reduction of input prices. Formally, our baseline model takes the form of:

$$y_{jt} = \beta^c \tilde{\tau}_{jt} + \beta^i \tilde{q}_{jt} + \mu_j + \mu_t + u_{jt}, \tag{6}$$

Where y_{jt} refers to the logarithm of an outcome y, which are primarily employment and earnings. The parameters of interest β^c and β^i quantify the impact of the competition and input shocks, respectively, on outcome y. We include industry (μ_j) and year (μ_t) fixed effects to control for observed and unobserved heterogeneity across industries and time. Standard errors are clustered at the industry level.

The benchmark model is a reduced-form difference-in-differences with multiple periods and a continuous treatment. Estimates could be biased if the outcome levels vary considerably between treated and untreated units (Kahn-Lang and Lang, 2020). To address this point, we estimate the model in a matched sample that eliminates any preexisting differences in levels between treated and untreated sectors.[19] We present the results for the social security records, where we observe significant differences in levels. In the case of the household surveys, we do not observe any differences. Discrepancies between the longitudinal data and the household survey might stem from data quality in the first years that the longitudinal data was compiled (2008).

The consistency of the estimating parameters depends on the validity of the parallel trends assumption, i.e., industries with and without tariff cuts would have behaved similarly in the absence of the tariff reductions. The absence of any additional policies that exclusively affected the industries in which tariffs were dropped strongly supports our identification strategy. Additional empirical support for our strategy stems from the surprising and non-expected

[19] We apply a Mahalanobis distance measure to match treated observations to their nearest control neighbor. The match is performed using employment, earnings, the share of women, and the share of workers less than 30 in the longitudinal data for 2008, 2009 and 2010. Ryan, Kontopantelis, Linden, and Burgess (2018) show that differences-in-differences in matched samples perform well even when the parallel trend assumption does not hold. More details about the matching procedure are shown in Appendix C.

decrease in tariffs and the absence of knowledge about the timing of their implementation.

We test the parallel-trend assumption by estimating an event-study model reflecting the dynamic effects of both shocks. We define T_j^c as a dummy that takes the value of one if the tariffs for industry j decreased between 2010 and 2012, and zero otherwise. Likewise, T_j^i is a dummy that takes the value of one if the input prices of sector j decreased between 2010 and 2012, and zero otherwise. Using these two measures, we estimate:

$$y_{jt} = \sum_{t \neq 2010} \beta_t^c \left[T_j^c \times 1(\text{year=t}) \right] + \sum_{t \neq 2010} \beta_t^i \left[T_j^i \times 1(\text{year=t}) \right] + \mu_j + \mu_t + \varepsilon_{jt}, \qquad (7)$$

where $1(year = t)$ is a dummy that takes the value of one if the observation is in year t. β_t^c and β_i^c are the time-varying effects of the competition and input shocks, respectively. The rest of the coefficients are the same as in Equation (6). Note that we use 2010 as the excluded category in both interaction terms and that the treatment adoption is not staggered.

This dynamic effect model is particularly helpful to validate our main results in three different ways. First, we test for potential pre-trends in the treatment assignment by testing the coefficients in the pre-period and pose formal evidence against anticipatory effects or violations to the parallel trend assumption. Second, it allows us to assess the impact of the tariff reductions several years after they took place. Third, as opposed to Equation (6), the treatment in Equation (7) is discrete, eliminating potential issues that arise because of the continuous variation of the treatment (Callaway, Goodman-Bacon, and Sant'Anna, 2021; de Chaisemartin and D'Haultfœuille, 2020).

A large part of the identifying variation in Equation (6) comes from cross-industry differences in tariff changes. The event study specification in Equation (7) does not capture such variation because the treatment is binary. We complement our analysis with a dynamic estimation that replaces the binary treatment with the total change in tariffs between 2010 and 2018. Results are very similar to those obtained using the binary treatments. Estimates based on continuous treatment, or setting with staggered adoption, could also lead to bias due to heterogeneous treatment effects (Callaway et al., 2021; Callaway and Sant'Anna, 2021; de

Chaisemartin and D'Haultfœuille, 2020; Goodman-Bacon, 2021; Sun and Abraham, 2020). To address this point, we also apply the de Chaisemartin and D'Haultfoeuille (2021) bias-corrected estimator for intertemporal treatment effects. These results are also similar to the original ones, confirming the robustness of our findings. We provide more details on the alternative specifications of the model and estimations methods in Appendix B.

4.4.2 Contrasting the Competition and Input Shocks

The estimators β^c and β^i in Equation (6) are not entirely comparable because the competition and input shocks have different magnitudes, as shown in Table A.3. We address this point by computing the sum of the parameters in Equation (6), weighted by the average magnitude of the shock in each sector (displayed in Appendix Table A.3). Formally, this measure is equivalent to:

$$\text{Weighted Sum}_j = \underbrace{\bar{\bar{\tau}}_j \times \beta^c_j}_{\text{Competition Shock}} + \underbrace{\bar{\bar{q}}_j \times \beta^i_j}_{\text{Input Shock}}, \tag{8}$$

where $\bar{\bar{\tau}}_j$ and $\bar{\bar{q}}_j$ correspond to the average competition and input shock in industry j. This measure contrasts the magnitudes of both shocks on outcome y, especially because we are able to test the null of the weighted sum equal to zero. Note, however, that these measures do not aggregate the effect of a tariff reduction since this will require a general equilibrium model behind the estimations.

5. Results

5.1. Effect of Tariffs on Imports

The Colombian tariff reductions increased imports, especially those from the United States. Table I presents the results of estimating a differences-in-differences specification using multiple measures of imports as outcomes and at the product level.[20] Formally, the estimations

[20]We estimate this at the product level to better exploit the variation induced by the free trade agreement. However, the results are very consistent when collapsing the data at the four-digit level.

take the form:

$$y_{pt} = \alpha \tilde{\tau}_{pt} + \mu_p + \mu_t + \varepsilon_{pt}, \tag{9}$$

where y_{pt} corresponds to an outcome for product p in year t, and μ_p and μ_t are product and year fixed effects, respectively.[21] Standard errors are clustered at the product level.

Column (1) displays the effect of the tariff reductions on total imports. A one percentage point decrease in tariffs increases imports by around 1.5 percent, and, as shown in column (2), there are no differences before and after 2012. We then test whether the increase in imports is explained exclusively by imports from the United States. In columns (3) and (4) the outcome is the log of U.S. imports, and in columns (5) and (6) it is the share of U.S. imports with respect to total imports. Tariff reductions significantly increase imports from the United States in absolute (measured by the logs) and relative (measured by the percentage) terms, particularly after 2012. As a contrast, columns (7) to (10) present the same estimations for imports from other countries, finding negligible effects and even negative point estimates when considering the imported share from countries different than the United States.[22]

These results imply that tariff reductions led to an increase in U.S. imports, which in turn increased import competition. This competition could have affected differently specific local industries depending on the type of imported goods. To better describe this increase in competition we test whether or not the tariff reductions increased imports of agricultural or manufacturing products. We present the results of estimating Equation (9) using as outcome the log of imports from the United States, and splitting between agriculture and manufacturing products, in Table III. We observe strong and robust increases in imports of both types of products. Recall, nonetheless, that the tariff cuts in 2010 did not include agricultural products. In line with this, we observe an increase of imports of agricultural goods only after 2012, when

[21] We use the logarithm of one plus imports in columns (1)- (4), (7), and (8). We additionally provide estimations using the inverse hyperbolic sine transformation for these columns in Appendix Table A.4.

[22] We additionally present these results in event-study form in Appendix Figure A.3. We use two treatment groups: products that reduced tariffs in both reforms (2010 and 2012) and those that reduced tariffs only in 2012, and estimate a joint model. The control group includes all the products that did not change tariffs during this period. We do not observe any significant differences before 2010, which confirms that the common trends assumption holds. Consistent with the difference-in-differences estimates, imports from the United States started to increase after the tariff reductions.

the free-trade agreement was implemented.

The increase in imports could also vary depending on the use of the goods. They can either be used for consumption or as intermediate inputs. We explore this aspect by splitting the estimations between capital, consumption, and raw material goods. We exploit the CUODE categories to estimate the effect in each subgroup of products, and present the results in Panel A of Table III. The increase in U.S. imports was driven by capital and consumption goods, whereas any sizable effect is observed among raw materials. This result is expected as the United States do not have strong comparative advantage in the production of raw materials but it does have in the production of capital and consumption goods.

Local firms could have profit from the new cheaper access to international products. We also assess such effects by analyzing the effects of the tariff reductions among products that were imported by firms before the tariff reductions (i.e. 2008) from different economic sectors, and present the results in Panels B to D of Table III. Panel B, for instance, computes the effects of tariff reductions among products that we identified as imported by firms in agriculture in 2008. It is possible to observe positive point estimates on consumption goods because firms can also import goods that are destined for individual consumption. It might be the case that a manufacturing firm imported a TV (which is a consumption good) in 2008 and this will enter the estimation as a consumption good for firms in manufacturing. Many of the products imported by firms are also bought by regular consumers.

The tariff reductions induced positive and substantial increases of imports of capital and consumption goods, especially among goods that were previously imported by manufacturing and services firms. We do not observe precise point estimates among goods imported by agricultural firms, although the point estimates on capital and consumption good are positive (especially capital goods between 2010 and 2012). We do observe robust increases among capital and consumption goods imported by firms in manufacturing and services in panel C and D. The point estimates corresponding to raw materials are systematically non-significant indicating that the tariff reductions did not imply an increase in imports of raw materials. These results suggest that the increase in imports was driven by capital and consumption goods consumed by firms in the manufacturing and services sector, which explain the nature of the foreign input shock.

In general, the tariff reductions fostered Colombian imports from the United States, and induced an increase in import competition and a decrease in the prices of foreign inputs. Import competition affected mainly agriculture and manufacturing sectors. Cheaper foreign inputs benefited firms in manufacturing and services by increasing the imports of capital and consumption goods.

5.2. The Effects on Employment and Earnings

We present in Table IV the results of the estimation of Equation (6) using employment (Panel A) and earnings (Panel B) as outcomes. We separate the results using household surveys and the social security records. For the latter, we also show estimates based on the full and the matched sample.[23] In addition to the main estimates, we compute the weighted sum of the effects of the competition and input shocks (Equation (8)).

We observe persistently negative point estimates of the competition shock on employment, and positive, although less precise, effects of the foreign input shock. A one percentage point increase in the competition shock (i.e. a one percentage point reduction in tariffs) *reduces* (formal and informal) employment by 1.4 percent. In contrast, a one percentage point decrease in the prices of foreign inputs *increases* overall employment by around 1.2 percent when using the household survey and 1.1 percent when using the social security data. The effects of inputs are only significant at the 10 percent level. The weighted sum yields statistically insignificant estimates in all specifications; thus, we cannot reject the null hypothesis that the impact of one shock is larger than the other. When we use the national input-output matrix, which also includes domestic inputs to measure the input shock, we find very similar, but more imprecise, results (Appendix Table A.5).

As for earnings, we find no effect for the competition shock and a negative and significant effect of input shock, which is driven exclusively by informal workers. Specifically, a one percentage point decrease in the prices of foreign inputs decreases the earnings of informal workers by 0.4 percent.[24]

[23]More details regarding the matching procedure are presented in Append C.

[24]We also present results splitting the effects before and after 2012 in Appendix Table A.6. In general,

Figure III plots the event study estimates –detailed in Equation (7)– for the competition (Panel IIIa and Panel IIIc) and input (Panel IIIb and Panel IIId) shocks, showing similar results as those in Table IV. We observe, in Panel IIIa, a decline in employment after the 2012 tariff reductions (i.e. those stipulated in the free trade agreement), and not significant differences prior to it. Panel IIIb displays positive employment effects after 2010 (i.e. after the first decrease in foreign inputs prices) among industries in which the prices of foreign inputs were reduced, and no significant differences prior to it. We do not find any significant point estimates on earnings nor evidence of the existence of pre-trends.

We complement our analysis with an event study model that uses a continuous treatment in Appendix Figure B.1. We also apply the de Chaisemartin and D'Haultfoeuille (2021) bias-corrected estimator for intertemporal treatment effects in Appendix Figure B.2, and estimate the event-study specification described in Equation (7) using different data sources and samples in Appendix Figures B.3 and B.4. Overall, the results are similar across specifications, estimation methods, and samples.[25]

The above results suggest that: 1) import competition decreases employment; 2) reductions in input prices increase employment in a comparable magnitude, and 3) foreign inputs decrease earnings of workers employed in informal jobs. The first result is in line with most existing literature, which shows that import competition can have detrimental effects on employment, independently of the country and the trade partners. The second result is consistent with previous studies, including some based on Colombia, showing that there is a complementarity between imported inputs and labor demand (Fieler et al., 2018; Kamal et al., 2019; Leblebicioğlu and Weinberger, 2021). These estimates, nonetheless, are imprecise. We show in the following section that this is due to heterogeneity in the effects among employment in manufacturing versus services. The third result is consistent with the fact that labor informality is prevalent in Colombia and workers employed informally are less likely to have rigid contracts

we observe that the competition shock decreases employment after 2012, whereas the input shock increases employment before 2012. This timing is in line with the results shown in Section 5.1.

[25]We observe some pre-trends in 2008 using the social security records, that are not found in the household survey estimates, even when we focus on formal workers. Data limitations in the first years of the social security records might explain the difference between data sources in this year. The estimation on the matched sample, nonetheless, corrects this imbalance and shows point estimates that are very similar to those of the other specifications.

or be bound by minimum wages. Therefore, their earnings are more adjustable against adverse shocks.

6. Mechanisms

6.1. Heterogeneous Effects by Sector

We estimate heterogeneous effects by sectors to explore potential mechanisms that explain the impact on employment. These estimations shed some light on how the competition and input shocks affect different economic sectors, as described in Section 2. We estimate sector-specific effects by interacting the competition and input shocks with sector dummies in agriculture, manufacturing, and services and present the results in Table V. As in the previous set of results, we estimate the model using multiple data sets and samples.[26]

In column (1), we begin by presenting the effects of import competition without controlling for the foreign inputs shock. While point estimates are negative for both agriculture and manufacturing, they are only statistically significant for the latter. Column (2) shows the effect of the foreign inputs shock without controlling for the import competition shock. In this case, the estimated coefficients are positive and significant for the services sector and non-significant for agriculture and manufacturing. These positive effects on employment in services, along with the increase of imports of capital goods documented in Section 5.1, suggest that foreign inputs are complementary to labor in this sector.

Column (3) presents the joint estimates. There are two main findings. First, the positive employment effects of foreign inputs in services remain unchanged, indicating that the total positive effects displayed in Table IV, are mainly driven by this sector. This result holds for all the other samples (columns (4) to (7)), except for informal workers, for which we do not find any significant effect. Second, the negative effect of import competition in manufacturing decreases to almost zero once we control for the input shock (-0.001). In contrast, the negative point estimate of foreign inputs on manufacturing remains unchanged, although it is not statistically precise. This pattern is similar across samples; point estimates of foreign inputs are

[26] For the sake of completeness, we also present the estimates for earnings in Appendix Table A.7.

negative, although not always significant, while the effect of import competition is either close to zero or positive.[27] Since we also observe an increase in capital and construction imports in the manufacturing sector, these results suggest that foreign inputs could be substitutes of labor demand in this sector.

The imprecision in the estimation of the effect of foreign inputs on total employment, presented in Table IV, is partly explained by the counteracting effects on employment in services versus manufacturing. In fact, the effect of the foreign inputs shock on services is consistently positive and significant, while the effect on manufacturing is negative but, in most cases, statistically insignificant.

As suggested by our conceptual framework in Section 2, we investigate these effects more deeply by exploiting the detailed variation in the competition and input shocks and interacting them with two-digit industry dummies. This analysis is based exclusively on the social security data for two reasons.[28] First, it is representative at the two-digit industry level, whereas the household survey is not. Second, it allows us to decompose employment into the number of firms and the average firm size (measured by the average number of employees) for each four-digit sector, and use these, in logarithms, as outcomes.[29]

Figure IV presents the point estimates and confidence intervals for the competition and inputs shocks.[30] There are three results to highlight, all of which are consistent with our previous findings. First, import competition reduces employment in some manufacturing and agricultural sectors (column (1)), and this is mainly driven by a reduction in the number of firms (column (3)). These results are in line with the theoretical predictions in Melitz (2003).

Second, lower prices of foreign inputs increase employment in some service industries –such as travel agencies, construction, hotels and restaurants, and water transport (black estimates in column (2)). These job gains are explained by an increase in the number of firms in

[27]As can be seen in Appendix Table A.8, which presents separate and joint estimates for all samples, the import competition effect on manufacturing decreases dramatically when we include the foreign inputs shock. In contrast, the effect of foreign inputs on manufacturing remains unchanged.

[28]We present the results using household surveys in Appendix Table A.9 and the results for number of firms and average firm size in the full and matched samples of the social security records in Appendix Table A.10.

[29]Formally, the average firm size is the sum of individuals working in a sector j divided by the number of firms: $\frac{\sum_i L_{ij}}{N_j} = \bar{L}_j$. We use this identity to decompose employment in a measure of the number of firms and a measure of average firm size in sector j.

[30]For clarity purposes, we grouped some of the two-digit industries, ending up with 30 industries.

these sectors (column (4)), whereas the average firm size remains relatively unchanged (column (6)). Cheaper imported inputs stimulate firm creation in services and raise employment, without affecting the average size of firms. This is consistent with the observed increase in imports of capital goods by the services firms, and the potential complementarity between foreign inputs and labor in this sector.

Third, we observe that reductions in the price of foreign inputs decrease employment in some manufacturing sectors (blue estimates in column (2)). In this case, the decline of the average firm size is the primary driver of job losses (column (6)). In contrast, there are small or no significant changes in the number of firms (column (4)).[31] These results suggest that foreign inputs mainly substitute labor in the manufacturing sector through intensive margin adjustments (smaller firms), while extensive margin adjustments (firm exit) are less common. This relates to a broader literature on automation and substituability between capital inputs and labor (Acemoglu and Restrepo, 2018, 2020), where the substitution takes place across countries. For instance, Pierce and Schott (2016) argue that Chinese imports reduce manufacturing employment in the United States by increasing the capital intensity of firms. Likewise, Kugler et al. (2020) find that technology adoption in the United States have negative effects on the Colombian labor market.

6.2. Heterogeneous Effects by Workers Education Level

Import competition and foreign inputs may have differential effects on workers, depending on their education level. This would imply that the degree of complementarity or substitutability between imported goods, foreign inputs, and labor vary by skill. This could happen if imported products from the United States had different skill components than those produced locally in Colombia. We explore this possibility using the household survey to estimate the heterogeneous effects of the shocks for college and non-college-educated workers.

Results for employment and earnings of college-educated (panel A) and non-college-educate workers (panel B) are presented in Table VI. On the one hand, import competition affects employment for all workers, independently of their educational attainment. A one

[31] One of the few exceptions is the the wood, paper, and printed industry, were we find positive and significant estimates in both the average firm size and total employment.

percentage point increase in the competition shock reduces employment of college-educated and non-college-educated workers by 1.0 and 1.1 percent, respectively. In both cases, the effect is driven by formal jobs, which are less flexible due to regulations. We also observe that import competition decreases earnings among the college-educated workers. This negative effect is particularly large for those working in informal jobs. This is consistent with the fact this group of workers is more likely to adjust via wages rather than employment.

On the other hand, we find that the input shock increases employment mainly among non-college-educated, formal workers. A one percentage point reduction in the prices of foreign inputs increases non-college-educated employment by 1.8 percent. We do not find any significant effects of foreign inputs on earnings. However, the imprecise 0.5 percent drop among earnings of college-educated workers is close in magnitude to the 0.4 percent drop displayed in Table IV when considering the overall effect of foreign inputs on earning of informal workers. Despite this imprecision, we can still claim, based on the results on Table IV, that foreign inputs decrease earning of informal workers.

All together, these results by levels of education are in line with the arguments presented in the previous section. Import competition decreases employment in agriculture and manufacturing, and decreases earnings of college-educated workers, by inducing firm exit. Foreign inputs, on the contrary, induce firm entry in services and increase non-college-educated employment. However, they affect the manufacturing sector by substituting labor with foreign inputs.

7. Conclusion

The paper explores how import competition and foreign inputs from high-income countries affect employment in developing economies. We focus on the labor adjustment effects of increases in imports coming from the United States in Colombia. We exploit exogenous tariff reductions in Colombia that decreased the prices of foreign inputs and increased import competition from the United States. We combine these reductions into a differences-in-differences framework, enabling the estimation of reduced form causal effects. We provide strong evidence about the non-existence of preexisting differences across affected and unaffected industries and show event study estimates, which validate our results against other biases posed by potential variation in treatment timing (Callaway and Sant'Anna, 2021; de Chaisemartin and D'Haultfœuille, 2020; Goodman-Bacon, 2021; Sun and Abraham, 2020).

We use administrative records that link competition and inputs at the industry level and household surveys and social security records to track employment and earnings. The detailed features of the employment data allow us to estimate effects across industries and analyze the impact on formal and informal employment. We overcome the limitations of the household survey data and the social security records by estimating our results using both data sources and contrasting them. Each data set has particular limitations but also specific advantages. Regardless of which data set we use, our results are similar.

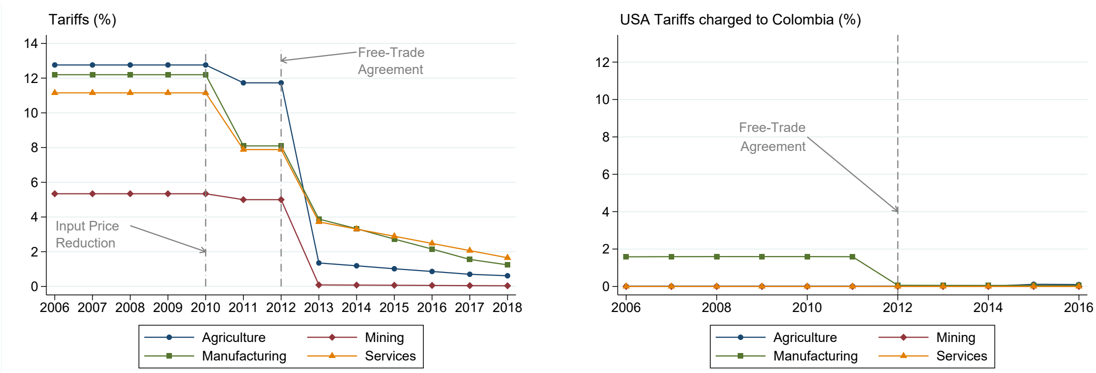
Our results show that import competition reduces employment, whereas foreign inputs increase it, although estimates are less precise for the latter mechanism. The negative effect of import competition is driven by firm exit in manufacturing and agriculture. The imprecision in the impact of foreign inputs results from the counteracting effects in manufacturing and services industries; foreign inputs increase employment in services by inducing firm entry, and decreases employment in manufacturing by substituting labor demand with foreign inputs. The increase in employment in services particularly increases non-college-educated employment. Furthermore, we observe that both shocks tend to reduce earnings among college-educated, informal workers.

This paper provides evidence of the heterogeneity of the effects of international trade with high-income countries within developing countries. This view contrasts with previous studies that suggest that international trade provides benefit to people in developing countries while negatively affecting low-skilled workers in developed countries (Pavcnik, 2017). Our analysis concludes that international trade benefits some while harming others within countries, not just between them, just as previously suggested by Stolper and Samuelson (1941). It also sheds light on the relationship between globalization and the reallocation of workers across economic sectors. The questions regarding the aggregated welfare effects, the longer-term effects of this reallocation on specific workers, and the labor market implications of decreases in the returns to college education remain mainly unanswered and should motivate future research on the topic.

Figures and Tables

FIGURE I
Tariffs Charged by Country

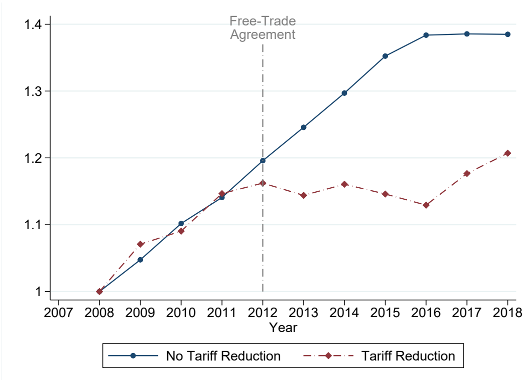
(a) Colombia **(b)** United States



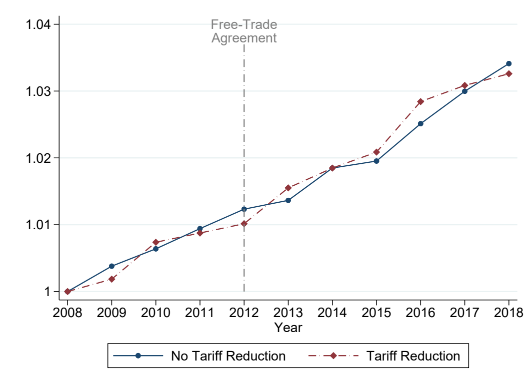
Notes: These graphs present the average tariffs charged by Colombia and the United States among agriculture, manufacturing, mining, and services goods. The values are computed by using simple averages across 10-digit industry codes. The left panel presents the historical tariffs that Colombia charged on products from the United States. The right panel plots the historical tariffs charged by the United States on imports from Colombia.

FIGURE II
Evolution of Employment and Earnings

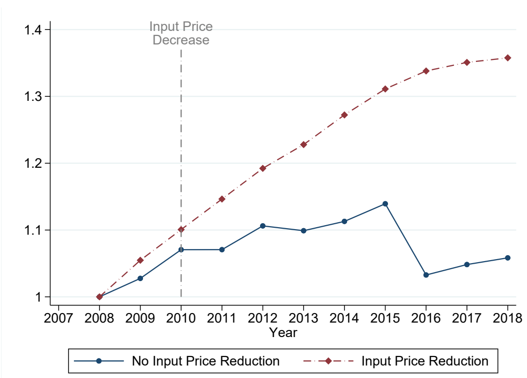
(a) Employment by Changes in Tariffs



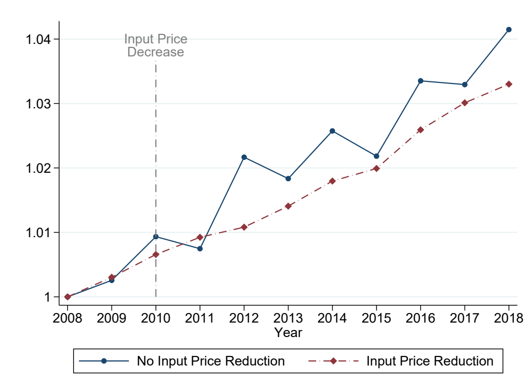
(b) Earnings by Changes in Tariffs



(c) Employment by Changes in Input Prices



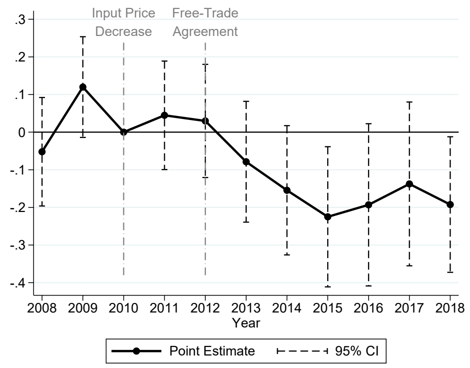
(d) Earnings by Changes in Input Prices



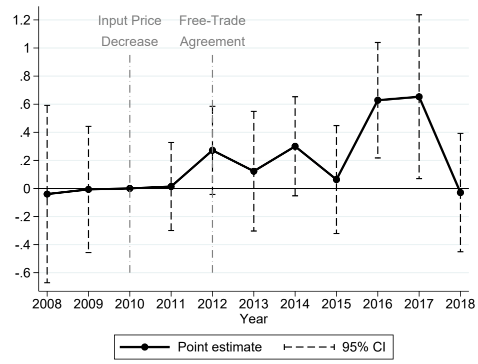
Notes: These graphs present the evolution of overall (formal and informal) employment and earnings with respect to 2008. Panel IIa and panel IIb present separate results by industries that did and did not reduce tariffs. Panel IIc and panel IId present separate results by industries that did and did not reduce the price of inputs. The graphs use household survey data from 2008 to 2018, and divide by the value of the variable in 2008.

FIGURE III
Event Study Estimates using Discrete Treatments

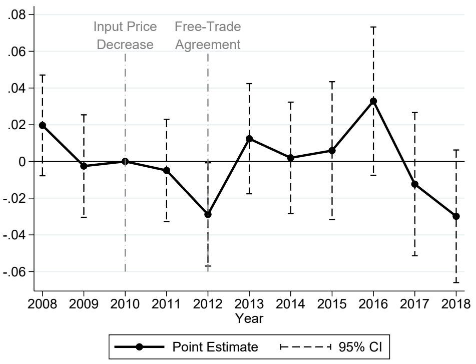
(a) *Competition Shock on Employment*



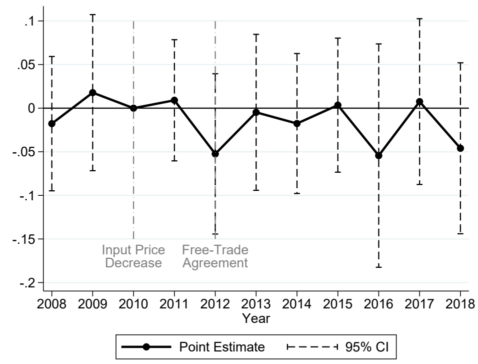
(b) *Input Shock on Employment*



(c) *Competition Shock on Earnings*



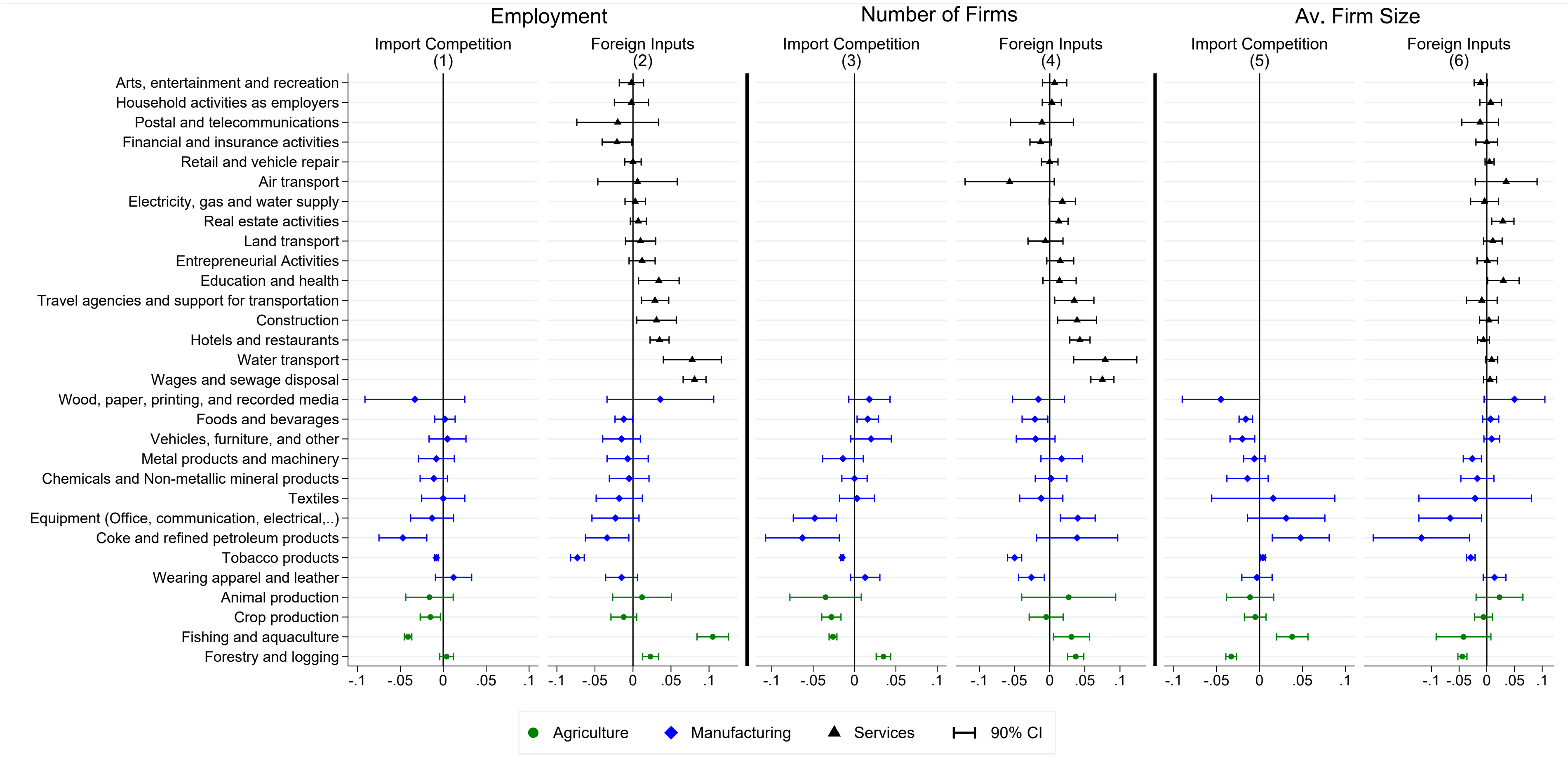
(d) *Input Shock on Earnings*



Notes: N = 4,222 for panels (IIIa) and (IIIb), and N = 4,324 in panel (IIIc) and (IIId). These graphs plot the point estimates and the 95 percent confidence interval of the estimation in Equation (7) but interacting the year dummies with discrete measures of the reduction in tariffs (T_j^c) and the prices of foreign inputs (T_j^i). The outcomes correspond to overall employment (panels A and B) and industry wage premia (panels C and D) as outcomes. We use 2010 as year of reference. Estimations done in the household survey data. Panels (IIIa) and (IIIc) present the coefficients attached to the competition shock T_j^c, and panels (IIIb) and (IIId) the coefficients attached to the input shock T_j^i. The estimation includes industry and year fixed effects, and the standard errors are clustered at the industry level.

FIGURE IV

Competition and Inputs Shocks on Employment by Two-Digit Industries



Notes: N = 4,576. This table presents the results of estimating Equation (6) using the logarithm of the overall employment (columns (1) and (2)), the logarithm of the number of firms (columns (3) and (4)), and the logarithm of the average firm size (columns (5) and (6)) –measured as the average number of employees– as outcomes in the full sample of the social security data. Similar results are presented using the matched sample in Appendix Table A.10.The input and competition shocks are interacted with two-digit sector dummies. The point estimates in odd columns correspond to the coefficients attached to the competition shock, whereas the coefficients in even columns correspond to those attached to the input shock. Standard errors clustered at the industry level. *** p<0.01, ** p<0.05, * p<0.1.

TABLE I

Tariff Reduction on Imports

	Total		*U.S. Imports*				*Non U.S. Imports*			
	Log		Log		Percentage		Log		Percentage	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Δ Import Competition ($\tilde{\tau}$)	0.015***		0.016***		0.242***		0.006		-0.177***	
	(0.005)		(0.005)		(0.030)		(0.004)		(0.038)	
Δ Import Competition$_{t\in\{2010,2012\}}$		0.016***		0.026***		0.144***		0.010*		-0.117**
		(0.005)		(0.006)		(0.045)		(0.005)		(0.056)
Δ Import Competition$_{t\in\{2013,2018\}}$		0.015***		0.015***		0.253***		0.005		-0.184***
		(0.005)		(0.005)		(0.032)		(0.005)		(0.040)
Observations	79,956	79,956	79,956	79,956	79,956	79,956	79,956	79,956	79,956	79,956
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table presents the results of estimating Equation (9) using imports as an outcome at the product level (10-digits). Columns (1) and (2) use the log of total imports, columns (3) and (4) use the log of imports from the U.S, columns (5) and (6) the percentage of import from the U.S, columns (7) and (8) the log of non-U.S imports, and columns (9) and (10) the percentage of non-U.S. imports. Specifications using logarithmic outcomes include a one inside the logarithm in order to include observations with zeroes. Odd columns present the linear effect, whereas even columns split the effect before and after 2012 by interacting the import competition measure with a dummy variable that takes a value of one for 2011 and 2012, and a dummy variable that takes the value of one for years after 2012. *** p<0.01, ** p<0.05, * p<0.1

TABLE II

Tariff Reductions on U.S. Imports by Economic Sector of the Product

	Agriculture		*Manufacturing*	
	(1)	(2)	(3)	(4)
A) Imported Products				
Δ Import Competition ($\tilde{\tau}$)	0.081***		0.013***	
	(0.027)		(0.005)	
Δ Import Competition$_{t\in\{2010,2012\}}$		0.004		0.026***
		(0.052)		(0.007)
Δ Import Competition$_{t\in\{2013,2018\}}$		0.082***		0.011**
		(0.027)		(0.005)
Observations	4,404	4,404	75,276	75,276
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Note: This table presents the results of estimating Equation (9) using imports from the United States as an outcome at the product level (10-digits). Columns (1) and (2) focus on agriculture and columns (3) and (4) on manufacturing. Specifications using logarithmic outcomes include a one inside the logarithm in order to include observations with zeroes. Odd columns present the linear effect, whereas even columns split the effect before and after 2012 by interacting the import competition measure with a dummy variable that takes a value of one for 2011 and 2012, and a dummy variable that takes the value of one for years after 2012. *** p<0.01, ** p<0.05, * p<0.1

TABLE III

Tariff Reductions on U.S. Imports by Type of Product and Economic Sector

	Capital		*Consumption*		*Raw Materials*	
	(1)	(2)	(3)	(4)	(5)	(6)
A) Overall Products by Purpose						
Δ Import Competition ($\tilde{\tau}$)	0.029***		0.039***		-0.002	
	(0.009)		(0.009)		(0.009)	
Δ Import Competition$_{t\in\{2010,2012\}}$		0.034***		0.068***		0.008
		(0.010)		(0.022)		(0.009)
Δ Import Competition$_{t\in\{2013,2018\}}$		0.027**		0.038***		-0.004
		(0.011)		(0.009)		(0.009)
Observations	19,872	19,872	19,632	19,632	40,452	40,452
B) Products Imported by Agricultural Firms in 2008						
Δ Import Competition ($\tilde{\tau}$)	0.017		0.030		-0.008	
	(0.012)		(0.027)		(0.020)	
Δ Import Competition$_{t\in\{2010,2012\}}$		0.030**		0.074		-0.030*
		(0.014)		(0.055)		(0.017)
Δ Import Competition$_{t\in\{2013,2018\}}$		0.012		0.029		0.000
		(0.017)		(0.028)		(0.025)
Observations	5,376	5,376	2,484	2,484	4,104	4,104
C) Products Imported by Manufacturing Firms in 2008						
Δ Import Competition ($\tilde{\tau}$)	0.031***		0.033***		-0.009	
	(0.008)		(0.012)		(0.010)	
Δ Import Competition$_{t\in\{2010,2012\}}$		0.029***		0.097***		0.005
		(0.009)		(0.028)		(0.011)
Δ Import Competition$_{t\in\{2013,2018\}}$		0.032***		0.032***		-0.012
		(0.011)		(0.012)		(0.011)
Observations	16,692	16,692	12,960	12,960	31,428	31,428
D) Products Imported by Services Firms in 2008						
Δ Import Competition ($\tilde{\tau}$)	0.035***		0.039***		-0.012	
	(0.009)		(0.011)		(0.010)	
Δ Import Competition$_{t\in\{2010,2012\}}$		0.034***		0.071***		-0.006
		(0.009)		(0.026)		(0.010)
Δ Import Competition$_{t\in\{2013,2018\}}$		0.035***		0.039***		-0.013
		(0.011)		(0.011)		(0.011)
Observations	18,324	18,324	16,572	16,572	32,232	32,232
R-squared	0.702	0.702	0.737	0.737	0.754	0.754
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table presents the results of estimating Equation (9) using imports from the United States as an outcome at the product level (10-digits), and splitting the sample in multiple subgroups. Columns (1) and (2) focus on capital (that also includes construction) goods, columns (3) and (4) on consumption goods, and columns (5) and (6) on raw materials. Panel A includes all products. Panel B focuses on products imported in 2008 by firms in agriculture. Panel C focuses on products imported in 2008 by firms in manufacturing, and panel D focuses on products imported in 2008 by firms in services. We identify these products using information about the imported products by firm in 2008. Specifications using logarithmic outcomes include a one inside the logarithm in order to include observations with zeroes. Odd columns present the linear effect, whereas even columns split the effect before and after 2012 by interacting the import competition measure with a dummy variable that takes a value of one for 2011 and 2012, and a dummy variable that takes the value of one for years after 2012. *** p<0.01, ** p<0.05, * p<0.1

TABLE IV
Competition and Input Shocks on Employment and Earnings

	HH-Survey			*Social Security Records*	
	Overall	*Formal*	*Informal*	*Full*	*Matched*
	(1)	(2)	(3)	(4)	(5)
A) Employment					
Δ Import Competition ($\tilde{\tau}$)	-0.014***	-0.011**	-0.012**	-0.010***	-0.008*
	(0.005)	(0.005)	(0.006)	(0.004)	(0.004)
Δ Foreign Inputs ($\tilde{q}$)	0.012*	0.011*	0.008	0.001	0.011*
	(0.006)	(0.007)	(0.007)	(0.005)	(0.006)
Weighted Sum	0.021	0.025	0.008	-0.021	0.032
	(0.029)	(0.031)	(0.033)	(0.024)	(0.028)
Observations	4,422	4,422	4,422	4,576	3,476
B) Earnings					
Δ Import Competition ($\tilde{\tau}$)	-0.000	0.001	-0.001	-0.000	0.001
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Δ Foreign Inputs ($\tilde{q}$)	-0.001	-0.000	-0.004**	0.001	-0.001
	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
Weighted Sum	-0.006	-0.000	-0.020**	0.004	-0.003
	(0.007)	(0.008)	(0.010)	(0.008)	(0.011)
Observations	4,324	4,277	4,125	4,565	3,465
Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Note: This table presents the results of estimating Equation (6) using employment (panel A) and wage premia (panel B) as outcomes. Columns (1)-(3) use outcomes measured in the household survey, and columns (4)-(5) in the social security data. Column (5) display an estimation done in a matched sample that uses mahalanobis nearest neighbor using employment, wage premia, average firm size, share of women, and share of workers under 30 as matching variables. The matching variables are included in the pre-treated period (2008 and 2009). The estimations in panel B are efficiency weighted by the inverse of the standard error of the estimated wage premia. Standard errors clustered at the industry level. *** p<0.01, ** p<0.05, * p<0.1

TABLE V
Competition and Input Shocks on Employment by Sector

	HH-Survey					*Social Security Records*	
	Overall			Formal	Informal	*Full*	*Matching*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ Imp. Comp.*1(Agric.)	-0.009		-0.022	-0.011	-0.020	-0.013*	-0.008
	(0.007)		(0.031)	(0.032)	(0.034)	(0.007)	(0.006)
Δ Imp. Comp.*1(Manuf.)	-0.012**		-0.001	0.008	-0.005	-0.001	0.007
	(0.005)		(0.009)	(0.008)	(0.011)	(0.006)	(0.006)
Δ Foreign Inputs*1(Agric.)		0.017	0.037	0.040	0.045	0.007	0.015
		(0.028)	(0.054)	(0.055)	(0.059)	(0.012)	(0.009)
Δ Foreign Inputs*1(Manuf.)		-0.008	-0.007	-0.018	-0.003	-0.013*	-0.011
		(0.008)	(0.012)	(0.012)	(0.016)	(0.008)	(0.008)
Δ Foreign Inputs*1(Serv.)		0.016**	0.015**	0.017**	0.010	0.004	0.022***
		(0.007)	(0.007)	(0.007)	(0.007)	(0.005)	(0.007)
Weighted Sum: Agriculture			0.054	0.105	0.090	-0.023	0.027
			(0.093)	(0.094)	(0.103)	(0.034)	(0.035)
Weighted Sum: Manufacturing			-0.039	-0.036	-0.046	-0.068**	-0.009
			(0.039)	(0.041)	(0.048)	(0.032)	(0.036)
Weighted Sum: Services			0.067**	0.076**	0.044	0.017	0.097***
			(0.030)	(0.032)	(0.030)	(0.024)	(0.031)
Observations	4,422	4,422	4,422	4,422	4,422	4,576	3,476
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table presents the results of estimating Equation (6) using employment as outcome. We interact the input and competition shocks with one-digit sector dummies. Columns (1)-(5) use outcome measured in the household survey, columns (6)-(7) in the social security data. Column (1) includes only the competition shock, and column (2) includes only the input shock. Column (7) presents the point estimates of the estimation performed in a matched sample that uses mahalanobis nearest neighbor using employment, wage premia, average firm size, share of women, and share of workers under 30 as matching variables. The matching variables are included in the pre-treated period (2008 and 2009). Estimates in the bottom panel correspond to the aggregated shock in Equation (8). Standard errors clustered at the industry level. *** p<0.01, ** p<0.05, * p<0.1

TABLE VI

Competition and Input Shocks on Employment and Earnings by Education Level

	Employment			*Earnings*		
	Overall	*Formal*	*Informal*	*Overall*	*Formal*	*Informal*
	(1)	(2)	(3)	(4)	(5)	(6)
A) College-Educated Workers						
Δ Import Competition ($\tilde{\tau}$)	-0.011**	-0.010*	-0.006	-0.004**	-0.003**	-0.007**
	(0.006)	(0.006)	(0.006)	(0.002)	(0.001)	(0.003)
Δ Foreign Inputs ($\tilde{q}$)	0.009	0.010	0.010	-0.002	-0.002	-0.005
	(0.008)	(0.008)	(0.007)	(0.002)	(0.001)	(0.003)
Weighted Sum	0.015	0.020	0.033	-0.018**	-0.016**	-0.036***
	(0.035)	(0.036)	(0.033)	(0.008)	(0.007)	(0.014)
Observations	4,422	4,422	4,422	4,191	4,134	3,798
B) Non College-Educated Workers						
Δ Import Competition ($\tilde{\tau}$)	-0.013**	-0.011**	-0.009	-0.000	0.001	-0.001
	(0.005)	(0.005)	(0.006)	(0.001)	(0.001)	(0.002)
Δ Foreign Inputs ($\tilde{q}$)	0.018**	0.017**	0.006	-0.000	-0.001	-0.001
	(0.008)	(0.008)	(0.007)	(0.001)	(0.001)	(0.002)
Weighted Sum	0.050	0.053	0.008	-0.002	-0.001	-0.005
	(0.034)	(0.034)	(0.035)	(0.006)	(0.007)	(0.008)
Observations	4,422	4,422	4,422	4,219	4,131	3,903
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table presents the results of estimating Equation (6) using employment (columns (1) to (3)) and earnings premia (columns (4) to (6) as outcomes in the household survey. Panel A) presents estimates on workers with college or more, whereas panel B) on workers with less than college education. Industry wage premia computed controlling by age, age-squared, gender, and region and month indicators. Observations in columns (4) to (6) are efficiency weighted by the inverse of the standard error of the estimated industry wage premia. Standard errors clustered at the industry level.*** p<0.01, ** p<0.05, * p<0.1.

References

Acemoglu, D., and Restrepo, P. (2018, June). The Race between Man and Machine: Implications of Technology for Growth, Factor Shares, and Employment. *American Economic Review*, *108*(6), 1488-1542. Retrieved from http://www.aeaweb.org/articles?id=10.1257/aer.20160696 doi: 10.1257/aer.20160696

Acemoglu, D., and Restrepo, P. (2020). Robots and jobs: Evidence from us labor markets. *Journal of Political Economy*, *128*(6), 2188-2244. Retrieved from https://doi.org/10.1086/705716 doi: 10.1086/705716

Amiti, M., and Konings, J. (2007). Trade liberalization, intermediate inputs, and productivity: Evidence from indonesia. *American Economic Review*, *97*(5), 1611-1638. Retrieved from https://www.aeaweb.org/articles?id=10.1257/aer.97.5.1611 doi: 10.1257/aer.97.5.1611

Attanasio, O., Goldberg, P. K., and Pavcnik, N. (2004). Trade reforms and wage inequality in colombia. *Journal of Development Economics*, *74*(2), 331 - 366. Retrieved from http://www.sciencedirect.com/science/article/pii/S0304387804000185 doi: https://doi.org/10.1016/j.jdeveco.2003.07.001

Autor, D. H., Dorn, D., and Hanson, G. H. (2013, October). The China Syndrome: Local Labor Market Effects of Import Competition in the United States. *American Economic Review*, *103*(6), 2121-68. Retrieved from http://www.aeaweb.org/articles?id=10.1257/aer.103.6.2121 doi: 10.1257/aer.103.6.2121

Autor, D. H., Dorn, D., and Hanson, G. H. (2015). Untangling Trade and Technology: Evidence from Local Labour Markets. *The Economic Journal*, *125*(584), 621-646. Retrieved from https://onlinelibrary.wiley.com/doi/abs/10.1111/ecoj.12245 doi: 10.1111/ecoj.12245

Autor, D. H., Dorn, D., Hanson, G. H., and Song, J. (2014). Trade Adjustment: Worker-Level Evidence*. *The Quarterly Journal of Economics*, *129*(4), 1799-1860. Retrieved from http://dx.doi.org/10.1093/qje/qju026 doi: 10.1093/qje/qju026

Bas, M., and Strauss-Kahn, V. (2015). Input-Trade Liberalization, Export Prices and Quality Upgrading. *Journal of International Economics*, *95*(2), 250 - 262. Retrieved from http://www.sciencedirect.com/science/article/pii/S0022199614001500 doi: https://doi.org/10.1016/j.jinteco.2014.12.005

Bernard, A. B., Jensen, J. B., and Schott, P. K. (2006). Survival of the best fit: Exposure to low-wage countries and the (uneven) growth of U.S. manufacturing plants. *Journal of International Economics*, *68*(1), 219 - 237. Retrieved from http://www.sciencedirect.com/science/article/pii/S0022199605000498 doi: https://doi.org/10.1016/j.jinteco.2005.06.002

Blaum, J., Lelarge, C., and Peters, M. (2018, October). The gains from input trade with heterogeneous importers. *American Economic Journal: Macroeconomics*, *10*(4), 77-127. Retrieved from https://www.aeaweb.org/articles?id=10.1257/mac.20160426 doi: 10.1257/mac.20160426

Bloom, N., Draca, M., and Van Reenen, J. (2016). Trade Induced Technical Change? The Impact of Chinese Imports on Innovation, IT and Productivity. *The Review of Economic Studies*, *83*(1), 87-117. Retrieved from http://dx.doi.org/10.1093/restud/rdv039 doi: 10.1093/restud/rdv039

Bloom, N., Handley, K., Kurman, A., and Luck, P. (2019). The impact of chinese trade on us employment: The good, the bad, and the debatable. *Mimeo*.

Branstetter, L. G., Kovak, B. K., Mauro, J., and Venancio, A. (2019, September). *The China*

Shock and Employment in Portuguese Firms (Working Paper No. 26252). National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w26252 doi: 10.3386/w26252

Bustos, P. (2011, February). Trade liberalization, exports, and technology upgrading: Evidence on the impact of mercosur on argentinian firms. *American Economic Review*, *101*(1), 304-40. Retrieved from https://www.aeaweb.org/articles?id=10.1257/aer.101.1.304 doi: 10.1257/aer.101.1.304

Caliendo, L., Dvorkin, M., and Parro, F. (2019). Trade and labor market dynamics: General equilibrium analysis of the china trade shock. *Econometrica*, *87*(3), 741-835. Retrieved from https://onlinelibrary.wiley.com/doi/abs/10.3982/ECTA13758 doi: https://doi.org/10.3982/ECTA13758

Callaway, B., Goodman-Bacon, A., and Sant'Anna, P. H. C. (2021). *Difference-in-differences with a continuous treatment.*

Callaway, B., and Sant'Anna, P. H. (2021). Difference-in-differences with multiple time periods. *Journal of Econometrics*, *225*(2), 200-230. Retrieved from https://www.sciencedirect.com/science/article/pii/S0304407620303948 (Themed Issue: Treatment Effect 1) doi: https://doi.org/10.1016/j.jeconom.2020.12.001

Costa, F., Garred, J., and Pessoa, J. P. (2016). Winners and losers from a commodities-for-manufactures trade boom. *Journal of International Economics*, *102*, 50-69. Retrieved from https://www.sciencedirect.com/science/article/pii/S0022199616300629 doi: https://doi.org/10.1016/j.jinteco.2016.04.005

de Chaisemartin, C., and D'Haultfoeuille, X. (2021). *Difference-in-differences estimators of intertemporal treatment effects.*

de Chaisemartin, C., and D'Haultfœuille, X. (2020, September). Two-way fixed effects estimators with heterogeneous treatment effects. *American Economic Review*, *110*(9), 2964-96. Retrieved from https://www.aeaweb.org/articles?id=10.1257/aer.20181169 doi: 10.1257/aer.20181169

Dix-Carneiro, R. (2014). Trade Liberalization and Labor Market Dynamics. *Econometrica*, *82*(3), 825-885. Retrieved from https://onlinelibrary.wiley.com/doi/abs/10.3982/ECTA10457 doi: 10.3982/ECTA10457

Dix-Carneiro, R., and Kovak, B. K. (2017, October). Trade Liberalization and Regional Dynamics. *American Economic Review*, *107*(10), 2908-46. Retrieved from http://www.aeaweb.org/articles?id=10.1257/aer.20161214 doi: 10.1257/aer.20161214

Edmonds, E. V., and Pavcnik, N. (2006). Trade liberalization and the allocation of labor between households and markets in a poor country. *Journal of International Economics*, *69*(2), 272-295. Retrieved from https://www.sciencedirect.com/science/article/pii/S002219960500084X (Trade and Labour Perspectives on Worker Turnover) doi: https://doi.org/10.1016/j.jinteco.2005.05.010

Egger, H., and Kreickemeier, U. (2009). Firm Heterogeneity and the Labor Market Effects of Trade Liberalization. *International Economic Review*, *50*(1), 187-216. Retrieved from https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1468-2354.2008.00527.x doi: 10.1111/j.1468-2354.2008.00527.x

Eslava, M., Haltiwanger, J., Kugler, A., and Kugler, M. (2004, December). The effects of structural reforms on productivity and profitability enhancing reallocation: evidence from Colombia. *Journal of Development Economics*, *75*(2), 333-371. Retrieved from https://ideas.repec.org/a/eee/deveco/v75y2004i2p333-371.html

Feenstra, R. C., and Hanson, G. H. (1999). The Impact of Outsourcing and High-Technology Capital on Wages: Estimates For the United States, 1979–1990. *The Quarterly Journal* *of Economics*, *114*(3), 907-940. Retrieved from https://ideas.repec.org/a/oup/qjecon/v114y1999i3p907-940..html

Fieler, A. C., Eslava, M., and Xu, D. Y. (2018, January). Trade, Quality Upgrading, and Input Linkages: Theory and Evidence from Colombia. *American Economic Review*, *108*(1), 109-46. Retrieved from http://www.aeaweb.org/articles?id=10.1257/aer.20150796 doi: 10.1257/aer.20150796

Forlani, E. (2017). Irish Firms' Productivity and Imported Inputs, journal = The Manchester School. , *85*(6), 710-743. Retrieved from https://onlinelibrary.wiley.com/doi/abs/10.1111/manc.12169 doi: 10.1111/manc.12169

Frocrain, P., and Giraud, P.-N. (2018). The evolution of tradable and non-tradable employment: Evidence from france. Retrieved from https://www.persee.fr/doc/estat_0336-1454_2018_num_503_1_10857 doi: 10.24187/ecostat.2018.503d.1959

Goldberg, P. K., Khandelwal, A. K., Pavcnik, N., and Topalova, P. (2010, 11). Imported Intermediate Inputs and Domestic Product Growth: Evidence from India*. *The Quarterly Journal of Economics*, *125*(4), 1727-1767. Retrieved from https://doi.org/10.1162/qjec.2010.125.4.1727 doi: 10.1162/qjec.2010.125.4.1727

Goodman-Bacon, A. (2021). Difference-in-differences with variation in treatment timing. *Journal of Econometrics*, *225*(2), 254-277. Retrieved from https://www.sciencedirect.com/science/article/pii/S0304407621001445 (Themed Issue: Treatment Effect 1) doi: https://doi.org/10.1016/j.jeconom.2021.03.014

Halpern, L., Koren, M., and Szeidl, A. (2015). Imported Inputs and Productivity. *The American Economic Review*, *105*(12), 3660–3703. Retrieved from http://www.jstor.org/stable/43821389

Hanson, G. H., and Harrison, A. (1999). Trade liberalization and wage inequality in mexico. *Industrial and Labor Relations Review*, *52*(2), 271–288. Retrieved from http://www.jstor.org/stable/2525166

Hummels, D., Jørgensen, R., Munch, J., and Xiang, C. (2014, June). The Wage Effects of Offshoring: Evidence from Danish Matched Worker-Firm Data. *American Economic Review*, *104*(6), 1597-1629. Retrieved from http://www.aeaweb.org/articles?id=10.1257/aer.104.6.1597 doi: 10.1257/aer.104.6.1597

Iragorri, J. (2008). *Obama vuelve a objetar tlc con colombia.* Retrieved 2018-15-10, from https://www.semana.com/mundo/estados-unidos/articulo/obama-vuelve-objetar-tlc-colombia/96284-3/

Jenkins, R., Peters, E. D., and Moreira, M. M. (2008). The Impact of China on Latin America and the Caribbean. *World Development*, *36*(2), 235 - 253. Retrieved from http://www.sciencedirect.com/science/article/pii/S0305750X07001994 (The Impact of Asian Drivers on the Developing World) doi: https://doi.org/10.1016/j.worlddev.2007.06.012

Kahn-Lang, A., and Lang, K. (2020). The promise and pitfalls of differences-in-differences: Reflections on 16 and pregnant and other applications. *Journal of Business and Economic Statistics*, *38*(3), 613-620. Retrieved from https://doi.org/10.1080/07350015.2018.1546591 doi: 10.1080/07350015.2018.1546591

Kamal, F., Lovely, M. E., and Mitra, D. (2019). Trade liberalisation and labour shares in china. *The World Economy*, *42*(12), 3588-3618. Retrieved from https://onlinelibrary.wiley.com/doi/abs/10.1111/twec.12857 doi: https://doi.org/10.1111/twec.12857

King, G., and Nielsen, R. (2019, 2019). Why propensity scores should not be used for matching. *Political Analysis*, *27*(4), 435-454. Retrieved from https://doi.org/

10.1017/pan.2019.11
Kugler, A. D., Kugler, M., Ripani, L., and Rodrigo, R. (2020, October). *U.s. robots and their impacts in the tropics: Evidence from colombian labor markets* (Working Paper No. 28034). National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w28034 doi: 10.3386/w28034
Leblebicioğlu, A., and Weinberger, A. (2021). Openness and factor shares: Is globalization always bad for labor? *Journal of International Economics*, *128*, 103406. Retrieved from https://www.sciencedirect.com/science/article/pii/S0022199620301215 doi: https://doi.org/10.1016/j.jinteco.2020.103406
Medina, P. (2018). Import Competition, Quality, Upgrading and Exporting: Evidence from the Peruvian Apparel Industry. *Mimeo*.
Melitz, M. J. (2003). The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity. *Econometrica*, *71*(6), 1695-1725. Retrieved from https://onlinelibrary.wiley.com/doi/abs/10.1111/1468-0262.00467 doi: 10.1111/1468-0262.00467
Melitz, M. J., and Ottaviano, G. I. P. (2008, 01). Market Size, Trade, and Productivity. *The Review of Economic Studies*, *75*(1), 295-316. Retrieved from https://doi.org/10.1111/j.1467-937X.2007.00463.x doi: 10.1111/j.1467-937X.2007.00463.x
Moreira, M. M. (2007). Fear of China: Is There a Future for Manufacturing in Latin America? *World Development*, *35*(3), 355 - 376. Retrieved from http://www.sciencedirect.com/science/article/pii/S0305750X06002026 doi: https://doi.org/10.1016/j.worlddev.2006.11.001
Nieto, V. M. (2016). A Note on Structure Evolution Colombia Tariff of 2002-2014. *tiempo y economía*, *3*(2), 79-113.
Olper, A., Curzi, D., and Raimondi, V. (2017). Imported Intermediate Inputs and Firms' Productivity Growth: Evidence from the Food Industry. *Journal of Agricultural Economics*, *68*(1), 280-300. Retrieved from https://onlinelibrary.wiley.com/doi/abs/10.1111/1477-9552.12164 doi: 10.1111/1477-9552.12164
Pavcnik, N. (2002). Trade liberalization, exit, and productivity improvements: Evidence from chilean plants. *The Review of Economic Studies*, *69*(1), 245–276. Retrieved from http://www.jstor.org/stable/2695960
Pavcnik, N. (2017, September). *The impact of trade on inequality in developing countries* (Working Paper No. 23878). National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w23878 doi: 10.3386/w23878
Pierce, J. R., and Schott, P. K. (2016, July). The Surprisingly Swift Decline of US Manufacturing Employment. *American Economic Review*, *106*(7), 1632-62. Retrieved from http://www.aeaweb.org/articles?id=10.1257/aer.20131578 doi: 10.1257/aer.20131578
Romero, A. (2013, may). El tlc colombia-usa. *Tendencias*, *7*(2), 29-68. Retrieved from https://revistas.udenar.edu.co/index.php/rtend/article/view/652
Ryan, A., Kontopantelis, E., Linden, A., and Burgess, J. (2018). Now trending: Coping with non-parallel trends in difference-in-differences analysis. *Statistical Methods in Medical Research*, 962280218814570. doi: 10.1177/0962280218814570
Stolper, W. F., and Samuelson, P. A. (1941). Protection and real wages. *The Review of Economic Studies*, *9*(1), 58–73. Retrieved from http://www.jstor.org/stable/2967638
Sun, L., and Abraham, S. (2020). *Estimating dynamic treatment effects in event studies with heterogeneous treatment effects*.

Tlc entre colombia y ee.uu. entra en vigor casi 6 años después de su firma. (2012). Retrieved 2012-05-10, from https://www.elespectador.com/economia/tlc-entre-colombia-y-eeuu-entra-en-vigor-casi-6-anos-despues-de-su-firma-article-345137/

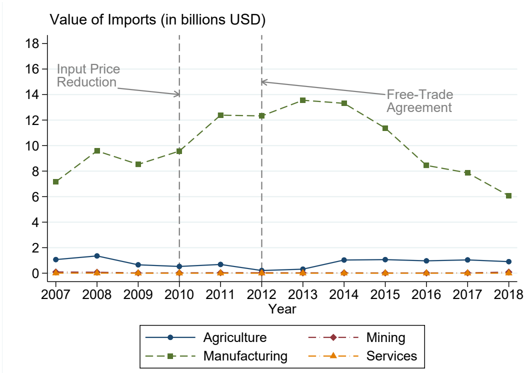
Topalova, P., and Khandelwal, A. (2011). Trade liberalization and firm productivity: The case of india. *The Review of Economics and Statistics*, *93*(3), 995-1009. Retrieved from https://doi.org/10.1162/REST_a_00095 doi: 10.1162/REST_a_00095

Wood, A., and Mayer, J. (2011, Jun 01). Has China de-industrialised other developing countries? *Review of World Economics*, *147*(2), 325–350. Retrieved from https://doi.org/10.1007/s10290-011-0088-8 doi: 10.1007/s10290-011-0088-8

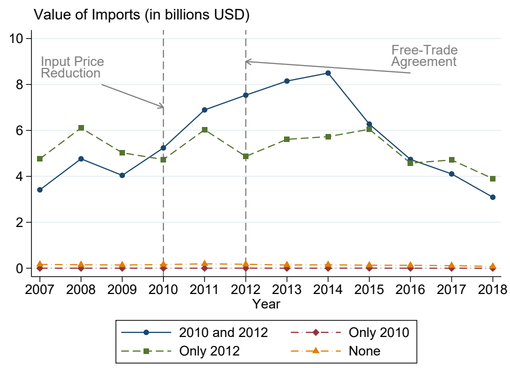
A. Appendix Figures and Tables

FIGURE A.1
Colombian Imports from the United States

(a) By Economic Sector



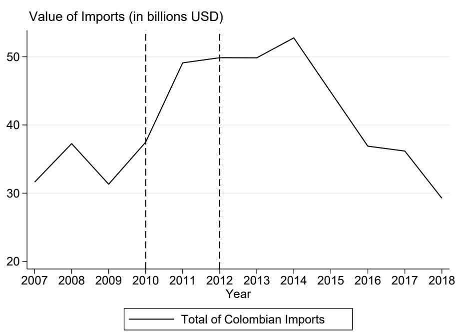
(b) By year of Tariff Reduction



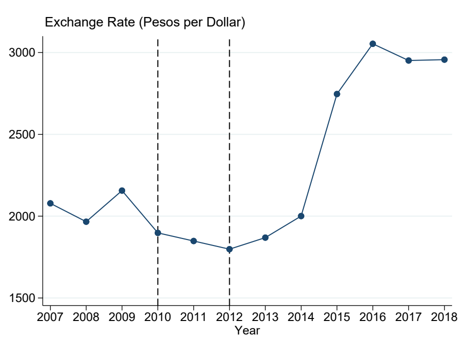
Notes: This graph plots the value of imports in billions USD. Panel A.1a plots the evolution of Colombian imports from the United States by industry. Panel A.1b plots the evolution of Colombian imports from the United States by the year in which the product's tariff was decreased. Vertical gray lines depict the years in which the two tariff reductions took place.

FIGURE A.2
Macroeconomic Environment

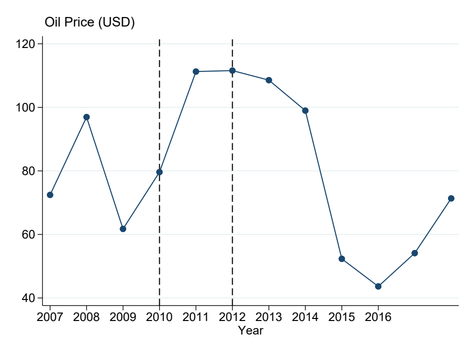
(a) Total Imports



(b) Exchange Rates



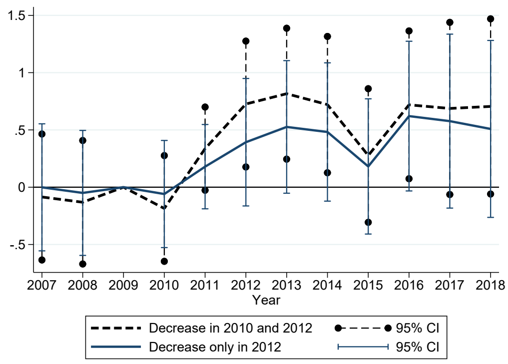
(c) Oil Prices



Notes: These graphs describe the macroeconomic environment around the implementation of the free-trade agreement. Panel A.2a presents the evolution of total imports in billions USD. Panel A.2b presents the evolution of the exchange rate of U.S. dollars to Colombian pesos. Panel A.2c presents the evolution of the price of oil (in dollars). The vertical dashed lines correspond to the years of tariffs reductions.

FIGURE A.3

Event Study Estimates on log Imports from the U.S.



Notes: N = 79,956. The figure plots the point estimates of Equation (7) including exclusively those associated to the tariff reductions (i.e. β_j^c), and excluding reductions on the prices of inputs (i.e. β_j^i). The dependent variable corresponds to the log imports from the United States. We use 2010 as year of reference, and split the treatment indicator (T_j^c) into two separate dummies: one for tariff reductions in 2010 and 2012, and the other for only 2010. These two dummy variables are interacted with year identifiers, and estimated jointly conditioning on year and industry fixed effects. The group of reference are tradable-products that did not change tariffs. The estimations are done at the product-year level. Standard errors are clustered at the industry level.

TABLE A.1
U.S Tariff Reductions on Colombian Exports

	Total	To the U.S.	To All Other
	(1)	(2)	(3)
U.S. Tariff Reduction	-0.008	-0.006	-0.010
	(0.010)	(0.008)	(0.011)
Observations	55,903	55,903	55,903
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Note: This table uses Colombian exports as outcome. Column (1) refers to total exports, column (2) refers to exports to the United States, and column (3) to exports to other countries. Estimations are done at the six-digit industry and year level. Tariff reduction in year *t* is computed as the tariff charged by the United States to Colombian products in 2011 minus the tariff charged in year *t*. All specifications control for Colombian tariff reduction ($\Delta\tau$). *** p<0.01, ** p<0.05, * p<0.1

TABLE A.2
Descriptive Statistics Across Samples

	Count (1)	Mean (2)	S.D. (3)	Min. (4)	Max. (5)
A) Trade Data (10-Digit product)					
Δ Import Competition ($\tilde{\tau}$)	79,956	5.57	6.83	0.00	80.00
1(Ind. Decreased Tariffs)	79,956	0.98	0.15	0.00	1.00
1(Decreased in 2010 and 2012)	79,956	0.56	0.50	0.00	1.00
1(Decreased in 2012)	79,956	0.42	0.49	0.00	1.00
Log(value imports total)	79,956	11.60	5.07	0.00	22.02
Log(value imports USA)	79,956	8.03	5.74	0.00	22.02
Log(value imports AllOther)	79,956	11.09	5.23	0.00	21.23
Perc. value imports USA	79,956	19.10	27.50	0.00	100.00
Perc. value imports AllOther	79,956	68.43	37.03	0.00	100.00
B) Employment Data (4-Digit Industry)					
Δ Import Competition ($\tilde{\tau}$)	4,576	2.34	4.78	0.00	24.10
Δ Foreign Inputs ($\tilde{q}$)	4,576	4.50	4.48	0.00	21.48
1(Ind. Decreased Tariffs)	4,576	0.38	0.49	0.00	1.00
1(Decreased in 2010 and 2012)	4,576	0.34	0.47	0.00	1.00
1(Decreased in 2012)	4,576	0.04	0.20	0.00	1.00
1(Ind. Decreased Input Prices)	4,576	0.90	0.29	0.00	1.00
Number of Workers	4,576	36,025.36	162,065.90	5.00	3,936,561.00
Earnings Premia (HH-Survey)	4,325	0.45	0.52	-1.38	2.76
Earnings Premia Formal (long. data)	4,576	-0.01	0.29	-1.48	1.32
Earnings Premia Formal (HH-Survey)	4,278	0.08	0.45	-2.11	2.54
Earnings Premia Informal (HH-Survey)	4,130	0.50	0.60	-2.13	4.08
Number of Firms	4,576	1,146.32	4,766.26	1.00	97,152.00
Mean Firm Size	4,576	25.79	31.05	1.00	392.49
Employment HH-Survey	4,422	1,794.04	3,779.11	0.00	30,282.53
Formal Employment HH-Survey	4,422	766.60	1,473.93	0.00	13,487.39
Informal mployment HH-Survey	4,422	1,027.45	2,844.04	0.00	24,916.02

Note: This table presents descriptive statistics of the different samples used. Panel A) describes the panel at the product-year level. Panel B) describes the panel at the industry-year level. 1() stands for a dummy variable that takes the value of one if the condition inside parentheses is met.

TABLE A.3

Descriptive Statistics of Competition and Input Shocks by Sector

		Competition Shock				Input Shock			
		Mean	Min	Median	Max	Mean	Min	Median	Max
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A) Overall		2.34	0.00	0.00	24.10	4.50	0.00	4.55	21.48
B) Agriculture	Animal Production	2.39	0.00	0.00	9.80	2.35	0.00	0.33	8.54
	Forestry and logging	1.97	0.00	0.00	7.40	4.18	0.00	3.66	11.96
	Crop production	4.89	0.00	0.00	15.00	5.03	0.00	4.67	14.14
	Fishing and aquaculture	6.73	0.00	5.80	17.60	3.47	0.00	5.01	7.10
C) Manufacturing	Vehicles, furniture, and other	4.61	0.00	4.50	20.00	4.64	0.00	4.29	18.56
	Metal products and machinery	4.37	0.00	5.00	17.30	4.13	0.00	5.05	10.95
	Chemicals and Non-metallic mineral products	5.69	0.00	5.65	15.60	4.63	0.00	5.14	12.41
	Wearing apparel and leather	8.50	0.00	5.00	20.00	5.82	0.00	5.32	18.85
	Tobacco products	11.05	0.00	18.80	18.80	7.32	0.00	10.18	12.72
	Textiles	9.73	0.00	9.95	20.00	8.11	0.00	8.39	17.06
	Foods and bevarages	8.85	0.00	5.20	24.10	4.81	0.00	3.29	18.08
	Wood, paper, printing, and recorded media	4.87	0.00	4.40	15.00	4.41	0.00	4.68	12.44
	Coke and refined petroleum products	3.13	0.00	4.40	7.40	2.18	0.00	0.82	6.46
	Office, communication, electrical and medical equipment	4.95	0.00	6.10	13.30	4.72	0.00	5.42	12.65
D) Services	Travel agencies and support activities for transportation	0.00	0.00	0.00	0.00	4.71	0.00	4.96	11.90
	Land transport	0.00	0.00	0.00	0.00	4.41	0.00	3.14	14.57
	Retail	0.00	0.00	0.00	0.00	5.37	0.00	5.41	21.48
	Financial and insurance activities	0.00	0.00	0.00	0.00	3.48	0.00	0.00	18.03
	Air transport	0.00	0.00	0.00	0.00	1.91	0.00	1.05	6.28
	Water transport	0.00	0.00	0.00	0.00	2.21	0.00	0.02	8.88
	Construction	0.00	0.00	0.00	0.00	4.87	0.00	5.53	11.85
	Education and health	0.00	0.00	0.00	0.00	2.11	0.00	0.00	9.02
	Activities of households as employers and organizations	0.00	0.00	0.00	0.00	3.60	0.00	0.00	18.92
	Entrepreneurial Activities	0.00	0.00	0.00	0.00	4.32	0.00	5.02	14.58
	Real estate activities	0.00	0.00	0.00	0.00	5.65	0.00	6.05	13.38
	Electricity, gas and water supply	0.00	0.00	0.00	0.00	4.88	0.00	4.82	9.99
	Postal and telecommunications	0.00	0.00	0.00	0.00	3.47	0.00	3.18	12.97
	Hotels and restaurants	0.00	0.00	0.00	0.00	4.44	0.00	3.95	15.38
	Arts, entertainment and recreation	0.00	0.00	0.00	0.00	5.02	0.00	4.78	19.31
	Wages and sewage disposal	0.00	0.00	0.00	0.00	3.78	0.00	4.79	7.93

Note: This table presents descriptive statistics for the competition and input shocks by two-digit sector dummies. Panel A) presents the overall statistics, whereas panels B), C) and D) presents the values at the two-digit sector in agriculture, manufacture, and services, respectively.

TABLE A.4

Tariff Reduction on Imports using Inverse Hyperbolic Sine

	Total		*U.S. Imports*		*Non U.S. Imports*	
	(1)	(2)	(3)	(4)	(5)	(6)
A) All Imports						
Δ Import Competition ($\tilde{\tau}$)	0.016***		0.017***		0.006	
	(0.005)		(0.005)		(0.005)	
Δ Import Competition$_{t\in\{2010,2012\}}$		0.016***		0.027***		0.010*
		(0.005)		(0.007)		(0.006)
Δ Import Competition$_{t\in\{2013,2018\}}$		0.016***		0.015***		0.005
		(0.005)		(0.005)		(0.005)
Observations	79,956	79,956	79,956	79,956	79,956	79,956
B) Imported Inputs						
Δ Import Competition ($\tilde{\tau}$)	0.014***		0.012**		0.006	
	(0.005)		(0.006)		(0.005)	
Δ Import Competition$_{t\in\{2010,2012\}}$		0.014***		0.021***		0.011**
		(0.005)		(0.007)		(0.005)
Δ Import Competition$_{t\in\{2013,2018\}}$		0.014***		0.011*		0.006
		(0.005)		(0.006)		(0.005)
Observations	71,496	71,496	71,496	71,496	71,496	71,496
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table presents the results of estimating Equation (9) using the inverse hyperbolic sine (IHS) transformation of imports as an outcome at the product level (10-digits). We are unable to compute the input shock at the product level due to the nonexistence of an input-output matrix at such level. Imported inputs correspond to the products imported by Colombian firms in 2008, which constitute 71,592 10-digit codes. Columns (1) and (2) use the IHS of total imports, columns (3) and (4) use the IHS of imports from the U.S, and columns (5) and (6) the IHS of non-U.S imports. Odd columns present the linear effect, whereas even columns split the effect before and after 2012 by interacting the import competition measure with a dummy variable that takes a value of one for 2011 and 2012, and a dummy variable that takes the value of one for years after 2012. *** p<0.01, ** p<0.05, * p<0.1

TABLE A.5

Competition and Input Shocks on Employment and Earnings using I-O Matrix

	Employment					Earnings				
	HH-Survey			*Longitudinal*		*HH-Survey*			*Longitudinal*	
	Overall	*Formal*	*Informal*	*Full*	*Matched*	*Overall*	*Formal*	*Informal*	*Full*	*Matched*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Δ Import Competition ($\tilde{\tau}$)	-0.016**	-0.015**	-0.014*	-0.008**	-0.003	0.000	0.001	-0.000	-0.001	0.001
	(0.006)	(0.007)	(0.007)	(0.004)	(0.005)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Δ Foreign Inputs ($\tilde{q}$) using I-O Matrix	0.014	0.018	0.013	-0.004	-0.009	-0.002	-0.003	-0.004	0.004*	0.000
	(0.014)	(0.014)	(0.016)	(0.007)	(0.009)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Weighted Sum	0.022	0.045	0.022	-0.037	-0.047	-0.008	-0.008	-0.017	0.016	0.002
	(0.052)	(0.054)	(0.060)	(0.029)	(0.039)	(0.009)	(0.008)	(0.011)	(0.010)	(0.009)
Observations	4,367	4,367	4,367	4,499	3,454	4,269	4,222	4,070	4,488	3,443
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table presents the results of estimating Equation (6) using employment (columns (1) to (5)) and wage premia (columns (6) to (10)) as outcomes, and computing the foreign input measure using an input-output matrix. Columns (1)-(3) use employment measured in the household survey, columns (4)-(5) in the social security data, columns (6)-(9) use the premia measured in the household survey, whereas columns (10)-(11) in the social security data. Columns (5) and (10) perform the estimation in a matched sample that uses mahalanobis nearest neighbor using employment, wage premia, average firm size, share of women, and share of young as matching variables. The matching variables are included in the pre-treated period (2008 and 2009). Observations in columns (5) to (10) are efficiency weighted by the inverse of the standard error of the estimated wage premia. Standard errors clustered at the industry level. *** p<0.01, ** p<0.05, * p<0.1

TABLE A.6
Competition and Input Shocks on Employment and Earnings Before and After 2012

	HH-Survey			*Social Security Records*	
	Overall	*Formal*	*Informal*	*Full*	*Matched*
	(1)	(2)	(3)	(4)	(5)
A) Employment					
Δ Import Competition$_{t\in\{2010,2012\}}$	-0.000	-0.006	0.015	-0.006*	-0.004
	(0.008)	(0.009)	(0.011)	(0.004)	(0.004)
Δ Import Competition$_{t\in\{2013,2018\}}$	-0.014***	-0.012**	-0.011**	-0.009**	-0.007*
	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
Δ Foreign Inputs$_{t\in\{2010,2012\}}$	0.033***	0.029**	0.017	0.002	0.003
	(0.011)	(0.012)	(0.011)	(0.004)	(0.006)
Δ Foreign Inputs$_{t\in\{2013,2018\}}$	0.009	0.009	0.005	0.000	0.012*
	(0.007)	(0.007)	(0.007)	(0.006)	(0.007)
Weighted Sum$_{t\in\{2010,2012\}}$	0.149***	0.117**	0.114**	-0.006	0.002
	(0.047)	(0.049)	(0.050)	(0.017)	(0.024)
Weighted Sum$_{t\in\{2013,2018\}}$	0.007	0.015	-0.003	-0.022	0.036
	(0.030)	(0.032)	(0.035)	(0.026)	(0.031)
B) Earnings					
Δ Import Competition$_{t\in\{2010,2012\}}$	-0.004*	-0.002	-0.003	0.001	0.001
	(0.002)	(0.002)	(0.003)	(0.001)	(0.001)
Δ Import Competition$_{t\in\{2013,2018\}}$	-0.000	0.001	-0.001	-0.000	0.001
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Δ Foreign Inputs$_{t\in\{2010,2012\}}$	-0.000	-0.002	0.001	-0.000	-0.002
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Δ Foreign Inputs$_{t\in\{2013,2018\}}$	-0.001	0.000	-0.005**	0.001	-0.001
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Weighted Sum$_{t\in\{2010,2012\}}$	-0.009	-0.012	-0.001	0.003	-0.008
	(0.008)	(0.009)	(0.013)	(0.009)	(0.010)
Weighted Sum$_{t\in\{2013,2018\}}$	-0.006	0.002	-0.024**	0.004	-0.002
	(0.007)	(0.008)	(0.010)	(0.008)	(0.011)
Observations	4,324	4,277	4,125	4,565	3,465
Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Note: This table presents the results of estimating Equation (6) using employment (panel A) and wage premia (panel B) as outcomes. The independent variables are interacted with a dummy for years 2010 to 2012 and a dummy for 2013 to 2018. Columns (1)-(3) use outcomes measured in the household survey, columns (4)-(5) in the social security data. Column (5) display an estimation done in a matched sample that uses mahalanobis nearest neighbor using employment, wage premia, average firm size, share of women, and share of young as matching variables. The matching variables are included in the pre-treated period (2008 and 2009). The estimations in panel B are efficiency weighted by the inverse of the standard error of the estimated wage premia. Standard errors clustered at the industry level. *** p<0.01, ** p<0.05, * p<0.1

TABLE A.7
Competition and Input Shocks on Earnings by Sector

	HH-Survey					*Social Security Records*	
	Overall			Formal	Informal	*Full*	*Matching*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ Imp. Comp.*1(Agric.)	-0.000		-0.004	-0.001	-0.005	-0.006	-0.000
	(0.002)		(0.003)	(0.003)	(0.004)	(0.005)	(0.003)
Δ Imp. Comp.*1(Manuf.)	-0.000		0.002	0.001	0.001	-0.001	-0.001
	(0.001)		(0.002)	(0.001)	(0.003)	(0.001)	(0.001)
Δ Foreign Inputs*1(Agric.)		0.001	0.005	-0.003	-0.001	0.009	-0.002
		(0.002)	(0.004)	(0.005)	(0.005)	(0.008)	(0.003)
Δ Foreign Inputs*1(Manuf.)		-0.002	-0.005	-0.001	-0.007	0.002	0.001
		(0.002)	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)
Δ Foreign Inputs*1(Serv.)		-0.001	-0.001	-0.000	-0.004**	0.001	-0.002
		(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)
Weighted Sum: Agriculture			0.004	-0.016*	-0.022*	0.010	-0.007
			(0.008)	(0.009)	(0.012)	(0.014)	(0.011)
Weighted Sum: Manufacturing			-0.010	0.004	-0.024*	0.004	0.001
			(0.011)	(0.012)	(0.014)	(0.013)	(0.016)
Weighted Sum: Services			-0.004	-0.002	-0.018**	0.003	-0.009
			(0.005)	(0.006)	(0.008)	(0.007)	(0.009)
Observations	4,324	4,324	4,324	4,277	4,125	4,565	3,465
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table presents the results of estimating Equation (6) using wage premia as outcome. We interact the input and competition shocks with one-digit sector dummies. Columns (1)-(5) use outcome measured in the household survey, columns (6)-(7) in the social security data. Column (1) includes only the competition shock, and column (2) includes only the input shock. Column (7) presents the point estimates of the estimation performed in a matched sample that uses mahalanobis nearest neighbor using employment, wage premia, average firm size, share of women, and share of workers under 30 as matching variables. The matching variables are included in the pre-treated period (2008 and 2009). Industry wage premia computed controlling by age, age-squared, gender, and region and month indicators. Estimates in the bottom panel correspond to the aggregated shock in Equation (8). Estimations are efficiently weighted by on over the standard error of the estimate. Standard errors clustered at the industry level. *** p<0.01, ** p<0.05, * p<0.1

TABLE A.8

Competition and Input Shocks on Employment by Sector in All Samples

	HH-Survey									Earnings					
	Overall			*Formal*			*Informal*			*Full*			*Matched*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Δ Imp. Comp.*1(Agric.)	-0.009		-0.022	0.003		-0.011	-0.000		-0.020	-0.010**		-0.013*	-0.007		-0.008
	(0.007)		(0.031)	(0.007)		(0.032)	(0.007)		(0.034)	(0.005)		(0.007)	(0.005)		(0.006)
Δ Imp. Comp.*1(Manuf.)	-0.012**		-0.001	-0.011**		0.008	-0.012**		-0.005	-0.010**		-0.001	-0.007		0.007
	(0.005)		(0.009)	(0.005)		(0.008)	(0.006)		(0.011)	(0.004)		(0.006)	(0.004)		(0.006)
Δ Foreign Inputs*1(Agric.)		0.017	0.037		0.029	0.040		0.027	0.045		-0.005	0.007		0.006	0.015
		(0.028)	(0.054)		(0.028)	(0.055)		(0.030)	(0.059)		(0.010)	(0.012)		(0.010)	(0.009)
Δ Foreign Inputs*1(Manuf.)		-0.008	-0.007		-0.009	-0.018		-0.008	-0.003		-0.014**	-0.013*		-0.004	-0.011
		(0.008)	(0.012)		(0.008)	(0.012)		(0.010)	(0.016)		(0.006)	(0.008)		(0.007)	(0.008)
Δ Foreign Inputs*1(Serv.)		0.016**	0.015**		0.017**	0.017**		0.011	0.010		0.004	0.004		0.021***	0.022***
		(0.007)	(0.007)		(0.007)	(0.007)		(0.007)	(0.007)		(0.005)	(0.005)		(0.007)	(0.007)
Weighted Sum: Agriculture			0.054			0.105			0.090			-0.023			0.027
			(0.093)			(0.094)			(0.103)			(0.034)			(0.035)
Weighted Sum: Manufacturing			-0.039			-0.036			-0.046			-0.068**			-0.009
			(0.039)			(0.041)			(0.048)			(0.032)			(0.036)
Weighted Sum: Services			0.067**			0.076**			0.044			0.017			0.097***
			(0.030)			(0.032)			(0.030)			(0.024)			(0.031)
Observations	4,422	4,422	4,422	4,422	4,422	4,422	4,422	4,422	4,422	4,576	4,576	4,576	3,476	3,476	3,476
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table presents the results of estimating Equation (6) using employment in all the samples. We interact the input and competition shocks with one-digit sector dummies. Columns (1)-(3) use overall employment, columns (4)-(6) formal employment, and columns (7)-(9) informal employment. Columns (10)-(12) use employment in the social security records, and columns (13)-(15) in a matched sample that uses mahalanobis nearest neighbor using employment, wage premia, average firm size, share of women, and share of workers under 30 as matching variables. The matching variables are included in the pre-treated period (2008 and 2009). Estimates in the bottom panel correspond to the aggregated shock in Equation (8). Standard errors clustered at the industry level. *** p<0.01, ** p<0.05, * p<0.1

TABLE A.9

Competition and Input Shocks on Employment by Detailed Sector in All Samples

		Social Security Records				*HH-Survey*					
		Full		*Matched*		*Overall*		*Formal*		*Informal*	
		$\tilde{\tau}$	$\tilde{q}$	$\tilde{\tau}$	$\tilde{q}$	$\tilde{\tau}$	$\tilde{q}$	$\tilde{\tau}$	$\tilde{q}$	$\tilde{\tau}$	$\tilde{q}$
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
A) Agriculture	Forestry and logging	0.004	0.023***	0.017***	0.040***	0.037***	-0.125***	0.057***	-0.083***	0.050***	-0.138***
	Fishing and aquaculture	-0.041***	0.105***	-0.042***	0.133***	0.030***	-0.101***	-0.063***	0.194***	0.052***	-0.144***
	Animal Production	-0.015**	-0.012	-0.010	0.014	-0.006	0.072	0.028*	0.027	-0.001	0.084*
	Crop production	-0.016	0.012	0.002	0.001	-0.077	0.109	-0.076	0.122	-0.083	0.129
B) Manufacturing	Wearing apparel and leather	0.012	-0.015	0.017	-0.009	-0.008	0.031	0.015	0.002	-0.012	0.037
	Tobacco products	-0.008***	-0.073***	-0.009***	-0.058***	-0.014***	-0.012	-0.025***	-0.011	-0.006	-0.002
	Coke and refined petroleum products	-0.047***	-0.034*	-0.024	-0.027*	0.208	-0.193	0.183	-0.175	0.133	-0.031
	Office, commun., electrical and medical equipment	-0.013	-0.023	-0.006	-0.009	-0.064	0.058	-0.075	0.070	-0.050	0.028
	Textiles	-0.000	-0.018	0.010	-0.020	0.047	-0.068*	0.041	-0.070**	0.036	-0.051
	Chemicals and Non-metallic mineral products	-0.011	-0.005	-0.009	0.014	-0.014	0.020	-0.007	0.017	-0.041	0.032
	Metal products and machinery	-0.008	-0.007	0.007	-0.003	0.003	-0.030	0.003	-0.029	0.024	-0.020
	Vehicles, furniture, and other	0.005	-0.015	0.025*	-0.021	-0.042	0.036	-0.010	0.000	-0.051	0.040
	Foods and bevarages	0.002	-0.012*	0.009	-0.007	0.005	-0.011	0.012	-0.010	-0.001	-0.013
	Wood, paper, printing, and recorded media	-0.033	0.036	-0.017	0.032	-0.018	-0.033	-0.025	-0.018	-0.004	-0.029
C) Services	Wages and sewage disposal		0.081***		0.105***		0.048***		0.059***		-0.028**
	Water transport		0.078***		0.081***		0.019		0.072		0.013
	Hotels and restaurants		0.035***		0.042***		0.030**		0.042**		0.033**
	Construction		0.031*		0.062***		0.063***		0.074***		0.065***
	Travel agencies and support for transportation		0.029***		0.035***		0.056		0.052*		0.044
	Education and health		0.034**		0.022**		0.031		0.038		0.008
	Entrepreneurial Activities		0.012		0.033***		0.030**		0.034**		0.023
	Land transport		0.010		0.042***		0.033**		0.049***		0.011
	Real estate activities		0.007				0.051***		0.056***		0.016
	Electricity, gas and water supply		0.003		0.016*		0.042***		0.045***		-0.025
	Air transport		0.006		0.271***		0.032		0.037		0.045
	Retail and vehicle repair		0.000		0.010		0.001		0.001		0.004
	Financial and insurance activities		-0.021*		0.015		0.010		0.010		0.021
	Postal and telecommunications		-0.020		0.015		-0.053		-0.041		-0.048
	Arts, entertainment and recreation		-0.002		0.042**		0.023*		0.027**		0.016
	Activities of households (employers, organizations)		-0.002		0.039		0.008		0.011		-0.026

Note: This table presents the results of estimating Equation (6) using employment as an outcome and interacting the input and competition shocks with two-digit sector dummies. Columns (1)-(4) use the social security data. Columns (5) to (10) use the household survey. Columns (1)-(2) use the social security records, whereas columns (3)-(4) use a matched sample that uses mahalanobis nearest neighbor using employment, wage premia, average firm size, share

TABLE A.10

Aggregated Shocks on Number of Firms and Size by Detailed Sector

		Number of Firms				*Average Firm Size*			
		Full		*Matched*		*Full*		*Matched*	
		$\tilde{\tau}$	$\tilde{q}$	$\tilde{\tau}$	$\tilde{q}$	$\tilde{\tau}$	$\tilde{q}$	$\tilde{\tau}$	$\tilde{q}$
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A) Agriculture	Forestry and logging	0.035***	0.037***	0.046***	0.052***	-0.033***	-0.044***	-0.030***	-0.039***
	Fishing and aquaculture	-0.026***	0.031**	-0.026***	0.056***	0.038***	-0.042	0.038***	-0.034
	Animal Production	-0.028***	-0.005	-0.023***	0.017	-0.005	-0.006	-0.007	0.007
	Crop production	-0.035	0.027	-0.010	0.003	-0.011	0.023	-0.020	0.041*
B) Manufacturing	Wearing apparel and leather	0.013	-0.026**	0.018*	-0.020*	-0.003	0.014	-0.002	0.016
	Tobacco products	-0.015***	-0.050***	-0.016***	-0.037***	0.004**	-0.029***	0.003	-0.025***
	Coke and refined petroleum products	-0.063**	0.039	-0.042*	0.045	0.048**	-0.118**	0.054***	-0.116**
	Office, communication, electrical and medical equipment	-0.048***	0.040***	-0.041***	0.052***	0.031	-0.066*	0.032	-0.062*
	Textiles	0.003	-0.012	0.028**	-0.036	0.016	-0.021	-0.057	0.083
	Chemicals and Non-metallic mineral products	0.000	0.002	0.002	0.018	-0.014	-0.017	-0.013	-0.013
	Metal products and machinery	-0.014	0.017	0.001	0.018	-0.006	-0.026***	-0.004	-0.022**
	Vehicles, furniture, and other	0.020	-0.020	0.049**	-0.041*	-0.020**	0.009	-0.018*	0.011
	Foods and bevarages	0.016**	-0.021*	0.022***	-0.017	-0.016***	0.007	-0.014***	0.008
	Wood, paper, printing, and recorded media	0.018	-0.016	0.036***	-0.024	-0.045	0.050	-0.042	0.051
C) Services	Wages and sewage disposal		0.075***		0.097***		0.006		0.012*
	Water transport		0.079***		0.076***		0.009		0.014***
	Hotels and restaurants		0.043***		0.048***		-0.006		-0.007
	Construction		0.039**		0.068***		0.004		0.011
	Travel agencies and support activities for transportation		0.035**		0.074***		-0.009		-0.047***
	Education and health		0.014		0.020**		0.030*		0.011*
	Entrepreneurial Activities		0.015		0.028**		0.001		-0.003
	Land transport		-0.006		0.033**		0.011		0.019**
	Real estate activities		0.013				0.029**		
	Electricity, gas and water supply		0.018		0.042***		-0.004		-0.016
	Air transport		-0.057		-0.176***		0.035		0.303***
	Retail and vehicle repair		-0.000		0.006		0.005		0.013**
	Financial and insurance activities		-0.013		0.008		-0.000		0.019
	Postal and telecommunications		-0.011		-0.015		-0.012		0.066***
	Arts, entertainment and recreation		0.003		0.041***		0.007		0.018*
	Activities of households as employers and organizations		0.007		0.066		-0.011		-0.063***

Note: This table presents the results of estimating Equation (6) using the log of number of firms (columns (1)-(4)) and the log of the average firm size (columns (5) and (8)) as outcomes. Firm size is computed as the average of the number of employees per firm. All the estimations are performed in the social security data. The input and competition shocks are interacted with two-digit sector dummies. Columns (1),(2),(5), and (6) use

B. Robustness of Event Study Estimations

In this appendix we address the robustness of the event study estimates displayed in the main text. Figure III, in the main paper, plots the estimates of Equation (7), where the treatment is binary and both shocks occur at the same time. However, a great deal of the variation in the paper comes by across-industry differences in the magnitudes of the treatment, constituted by a continuous treatment. We address this variation by estimating the following specification:

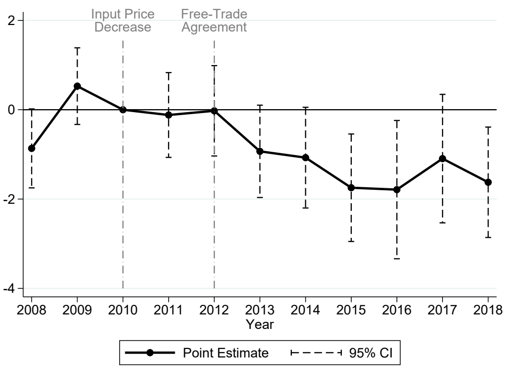
$$y_{jt} = \sum_{t \neq 2010} \beta_t^c \left[\tilde{\tau}_{j,2018} \times 1(\text{year=t})\right] + \sum_{t \neq 2010} \beta_t^i \left[\tilde{q}_{j,2018} \times 1(\text{year=t})\right] + \mu_j + \mu_t + \varepsilon_{jt}, \quad \text{(B.1)}$$

where $\tilde{\tau}_{j,2013}$ corresponds to a time-invariant measure equal to the change in tariffs from 2010 and 2018, and $\tilde{q}_{j,2018}$ corresponds to the time-invariant measure of the decrease in the prices of foreign inputs from 2010 to 2018. Both measures quantify the intensity of tariff reductions throughout the period 2010 to 2018, so we interact them with year dummies, and drop the category for 2010. The results are presented in Appendix Figure B.1. We observe very similar results as those presented in Figure III, in the main text.

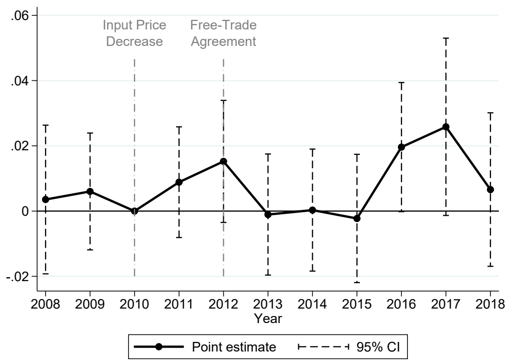
FIGURE B.1

Event Study Estimates using Continuous Treatment

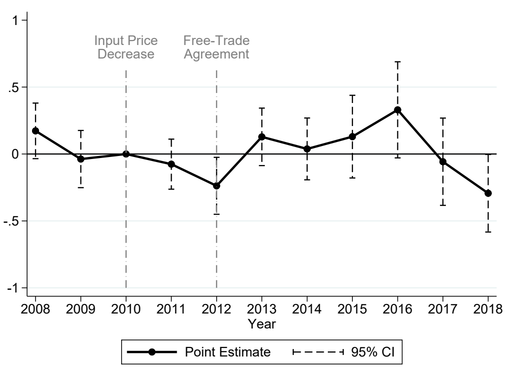
(a) *Competition Shock on Employment*



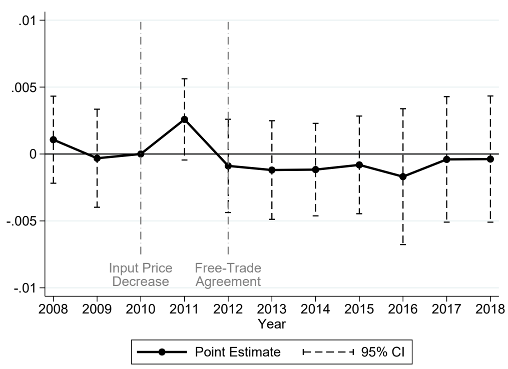
(b) *Input Shock on Employment*



(c) *Competition Shock on Earnings*



(d) *Input Shock on Earnings*



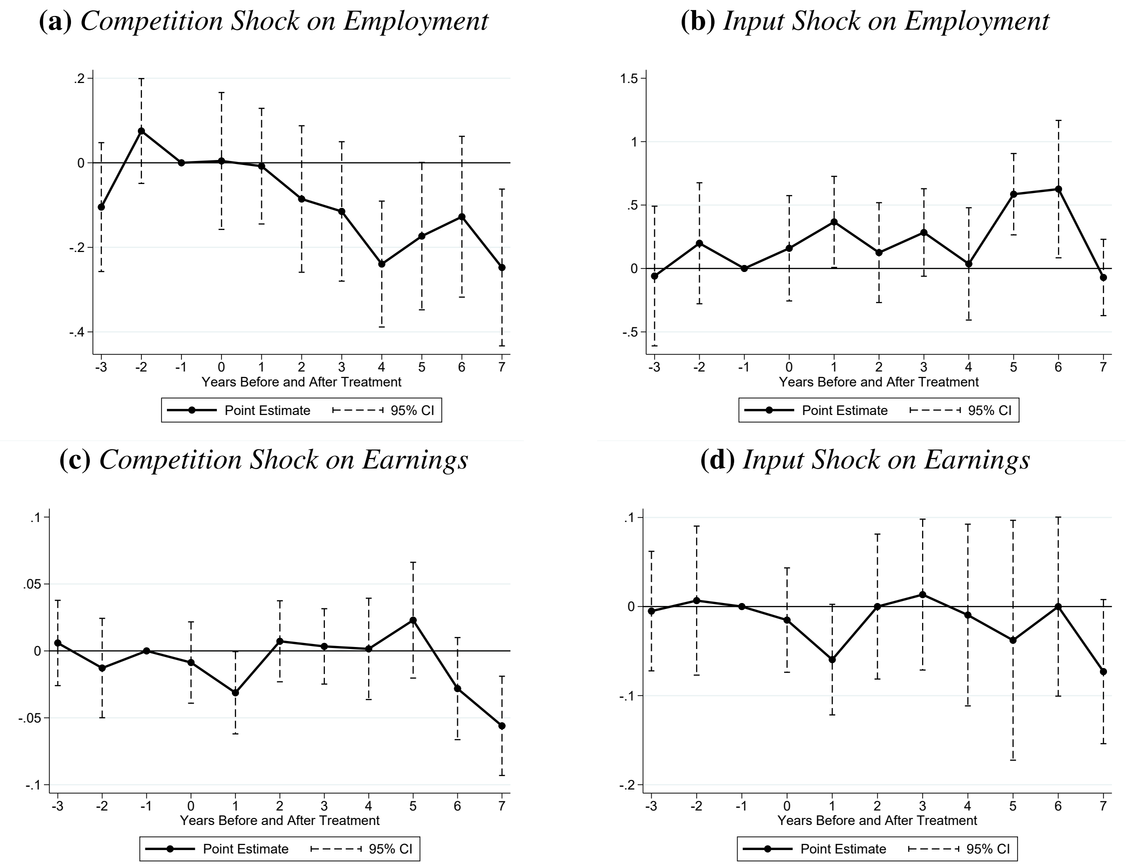
Notes: N = 4,222 for panels (B.1a) and (B.1b), and N = 4,324 in panel (B.1c) and (B.1d). These graphs plot the point estimates and the 95 percent confidence interval of the estimation in equation (B.1) using overall employment (panels A and B) and industry wage premia (panels C and D) as outcomes. We use 2010 as year of reference. Estimations done in the household survey data. Panels (B.1a) and (B.1c) present the coefficients attached to the competition shock $\tilde{\tau}^c_{j,2018}$, and panels (B.1b) and (B.1d) the coefficients attached to the input shock $\tilde{\tau}^c_{j,2018}$. The estimation includes industry and year fixed effects, and the standard errors are clustered at the industry level.

Recent developments in the differences-in-differences literature suggest that the linear regression estimators could be biased if the treatment is continuous or assigned in different periods of time (Callaway et al., 2021; Callaway and Sant'Anna, 2021; de Chaisemartin and D'Haultfœuille, 2020; Goodman-Bacon, 2021; Sun and Abraham, 2020). Therefore, we use the de Chaisemartin and D'Haultfoeuille (2021) bias-corrected estimator for intertemporal treatment effects. Results are presented in Appendix Figure B.2.

(Callaway et al., 2021; Callaway and Sant'Anna, 2021; de Chaisemartin and D'Haultfœuille, 2020; Goodman-Bacon, 2021; Sun and Abraham, 2020). To address this point, we also apply the **?**

FIGURE B.2

Event Study Estimates using Correction in de Chaisemartin and D'Haultfoeuille (2021)



(a) *Competition Shock on Employment*

(b) *Input Shock on Employment*

(c) *Competition Shock on Earnings*

(d) *Input Shock on Earnings*

Notes: These graphs plot the point estimates and the 95 percent confidence interval of the estimator suggested in de Chaisemartin and D'Haultfoeuille (2021) for continuous treatments in staggered adoptions. The dependent variable corresponds to the overall employment (panels A and B) and industry wage premia (panels C and D) as outcomes. We use 2010 as year of reference. Estimations done in the household survey data. Panels (B.2a) and (B.2c) present the coefficients attached to the competition shock, and panels (B.2b) and (B.2d) the coefficients attached to the input shock. The estimation includes industry and year fixed effects, and the standard errors are clustered at the industry level.

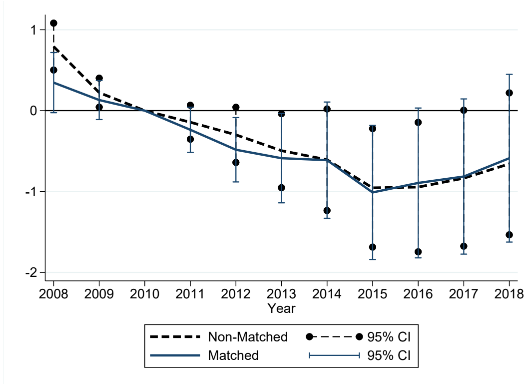
We observe once again very similar patterns as those shown in Figure III. Furthermore, these estimates provide a formal test for anticipatory effects and for the existence of pre-trends in the years before the treatment adoption. We do not see any significant point estimates, posing strong evidence about the validity of our research design.

Finally, we present the event studies using our main specification in Equation 7, but using the outcomes measured in the different samples. We present the results for employment in Appendix Figure B.3 and for earnings in Appendix Figure B.4. We again observe similar patterns, and no-existence of pre-trends. An exception, however, is the point estimate for 2008 displayed in Figure B.3b for the full sample in the social security records, where we observe a small positive coefficient. The quality of the administrative records is low for this year because compliance was progressive, and some firms were still missing. Therefore, we employ the matching algorithm, detailed in Section C, to find a more comparable sample. When we estimate with the matched sample, we do not observe any statistical difference in the pre-treatment period.

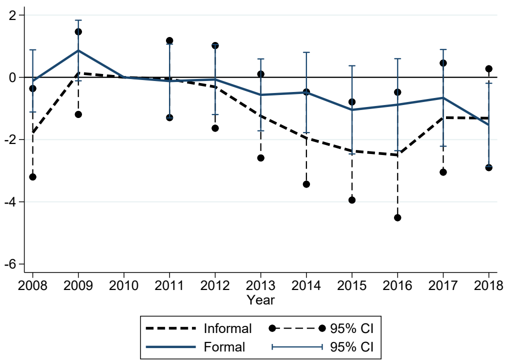
FIGURE B.3

Event Study Estimates of the Competition and Input Shocks on Employment

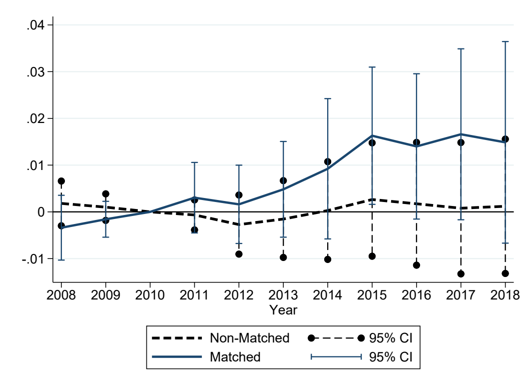
(a) *Competition Shock on Social Security Data*



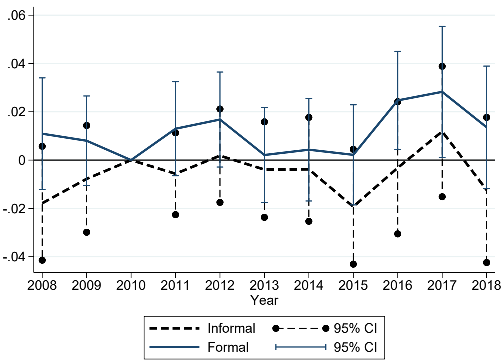
(b) *Competition Shock on HH-Survey*



(c) *Input Shock on Social Security Data*



(d) *Input Shock on HH-Survey*

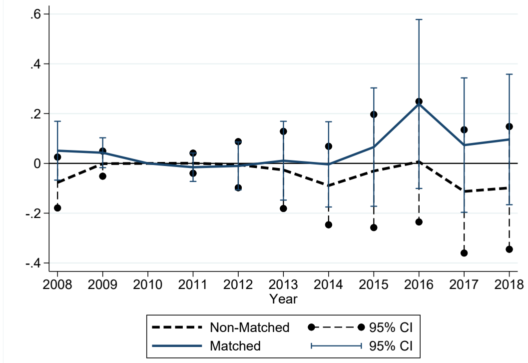


Notes: These graphs plot the point estimates and the 95 percent confidence interval of the estimation in Equation (7) using employment in the social security data in Panels B.3a and B.3c, and household survey data in Panels B.3b and B.3d. N = 4,576 in Panels B.3a and B.3c, and N = 4,222 in Panels B.3b and B.3d. Panels B.3a and B.3b present the coefficients attached to the competition shock T_j^c, and Panels B.3c and B.3d the coefficients attached to the input shock T_j^i. The estimation includes industry and year fixed effects, and the standard errors are clustered at the industry level.

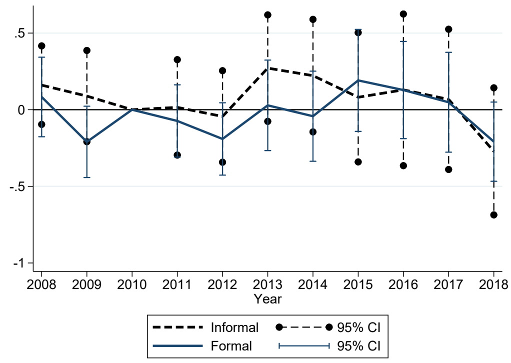
FIGURE B.4

Event Study Estimates of the Competition and Input Shocks on Earnings

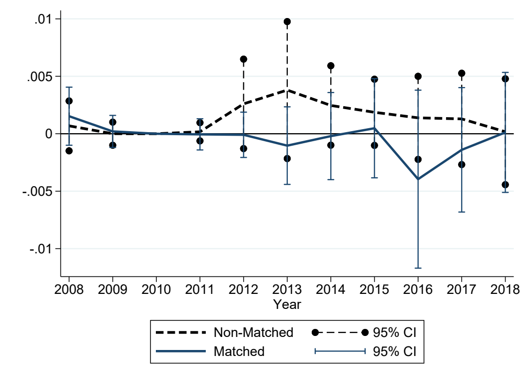
(a) *Competition Shock on Social Security Data*



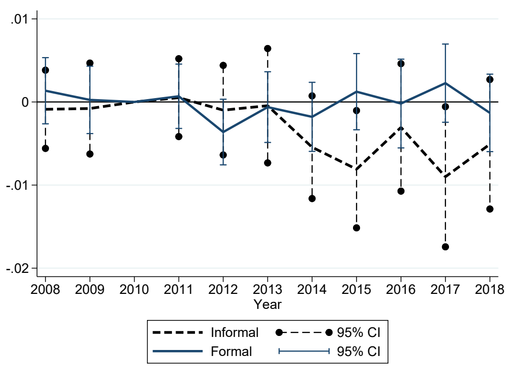
(b) *Competition Shock on HH-Survey*



(c) *Input Shock on Social Security Data*



(d) *Input Shock on HH-Survey*



Notes: These graphs plot the point estimates and the 95 percent confidence interval of the estimation in Equation (7) using earnings wage premia in the social security data in Panels B.4a and B.4c, and household survey data in Panels B.4b and B.4d. Industry wage premia computed controlling by age, age-squared, gender, and region and month indicators. Estimations are efficiency weighted by the inverse of the standard error of the estimated industry wage premia. Panels B.4a and B.4b present the coefficients attached to the competition shock T_j^c, and Panels B.4c and B.3d the coefficients attached to the input shock T_j^i. The estimation includes industry and year fixed effects, and the standard errors are clustered at the industry level.

C. Description of the Matching Procedure

In this appendix we describe the matching algorithm. The goal of this procedure is to reduce the differences in levels between industries used as treated and industries used as controls. To implement this approach, we begin by collapsing the data at the industry level, and keeping information for 2008 and 2009, which correspond to the years before the first tariff reduction.

Then we estimate two linear regressions. First, we use a dummy variable that equals to one if the given industry reduced tariffs and zero otherwise. We regress this binary outcome on the log of employment, the wage premia, the log of the average size of firms, the share of women, and the share of workers under 30 for every industry. All of these outcomes are measured in 2008 and 2009, so we include a total of 10 covariates. The results of this estimation is presented column (1) of Table C.1. We observe some imbalances in log Employment and the share of workers under 30. Second, we estimate a regression using as outcome a dummy variable that equals to one if the industry reduces prices of foreign inputs and zero otherwise, and regress it on the same group of covariates. We present these results in column (3) of Table C.1, and we do not observe any imbalance.

TABLE C.1
Covariate Balance in Matched Sample

	Import Competition		Foreign Inputs	
	Raw Sample (1)	Matched Sample (2)	Raw Sample (3)	Matched Sample (4)
log(Employment) in 2008	0.582***	0.296	0.126	-0.009
	(0.184)	(0.261)	(0.125)	(0.118)
log(Employment) in 2009	-0.692***	-0.404	-0.099	0.047
	(0.184)	(0.260)	(0.124)	(0.118)
Wage premia in 2008	-0.455	-0.141	-0.035	-0.253
	(0.326)	(0.468)	(0.221)	(0.213)
Wage premia in 2009	0.285	0.031	-0.029	0.238
	(0.324)	(0.465)	(0.220)	(0.211)
log(Av. Firm Size) in 2008	0.004	-0.011	-0.137	-0.044
	(0.124)	(0.160)	(0.084)	(0.073)
log(Av. Firm Size) in 2009	0.157	0.191	0.103	0.003
	(0.121)	(0.158)	(0.082)	(0.072)
Share of Women in 2008	-0.483	0.887	0.054	0.078
	(0.693)	(0.999)	(0.470)	(0.453)
Share of Women in 2009	0.145	-0.846	-0.414	-0.268
	(0.683)	(0.977)	(0.463)	(0.444)
Share of Under 30 in 2008	1.620**	1.542	0.873	0.381
	(0.807)	(1.182)	(0.547)	(0.536)
Share of Under 30 in 2009	-1.731**	-1.299	-0.816	-0.794
	(0.795)	(1.119)	(0.539)	(0.508)
Observations	416	316	416	316

Note: The dependent variable in columns (1) and (2) corresponds to a dummy variable that takes the value of one if the industry reduced tariffs and zero if not. The dependent variable in columns (3) and (4) corresponds to a dummy variable that takes the value of one if the prices of the inputs of that industry decreased and zero otherwise. The estimations are done at the four-digit industry level. The covariates correspond to the values in 2008 and 2009, which constitute the pre-treatment period. The matched sample is computed by implementing a Mahalanobis distance matching using as covariates those displayed in the table. *** p<0.01, ** p<0.05, * p<0.1

Using these results, we employ a mahalanobis matching method to match every treated unit to a control. We use as treatment indicator the dummy that takes the value of one if the industry reduced tariffs (i.e. the one used as outcome in column (1)), since is around this variable where we observe the imbalances. This procedure selects N treated units and find N controls that, on average, decrease observable differences between units. We allow for replacing, so it is possible that multiple treated units have the same control. Following King and Nielsen (2019), we employ a mahalanobis method because of its statistical properties. We then run a the same regressions on the matched sample and present the results on columns (2) and (4). In this new sample we do not observe any differences between treated and control units.