Losing Venezuela: Trade Collapse and the Performance of Colombian Exporting Firms*

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Abstract

How do exporting firms navigate the collapse of a key trade partner? We study this question by examining how Colombian manufacturing firms responded to the loss of Venezuela as a destination market. The collapse began with Hugo Chávez's trade war against Colombia in 2009 and was exacerbated by Venezuela's economic decline, which caused its share of Colombian exports to plummet from 14% in 2009 to just 1% by 2018. Using transaction-level customs data linked at the firm level to the Colombian manufacturing census, we use Synthetic Difference-in-Differences and Difference-in-Difference designs to estimate medium- and long-term impacts (2009–2013 and 2014–2018). Exporting firms exposed to Venezuela experienced a sharp and persistent drop in exports, with no recovery to pre-collapse levels. While they survived the shock, they significantly reduced their scale—lowering production, input use, investment, employment, and wages. Some effects, like wage reductions, emerged only in the long term. Despite these negative effects, we find no significant impact on traditional measures total factor productivity, suggesting firms retain their technical capabilities. Exposed firms adapted by increasing exports to existing markets but failed to expand into new ones or boost domestic sales. These results are suggestive of firms' efficiency resilience but underscore the substantial difficulties in substituting a major trade partner.

JEL Codes: F13, F14, F61, O12, D22, D24.
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1 Introduction

Participation in global markets and integration into global value chains are pathways to economic development (World Bank, 2019; Goldberg and Reed, 2023b). Notably, there is now a consensus in the literature that exporting improves firm-level outcomes. Exporting enhances productivity within firms (Atkin et al., 2017; Garcia-Marin and Voigtländer, 2019), encourages improvements in product quality, and fosters the adoption of new technologies (Verhoogen, 2008; Bustos, 2011), while also reshaping organizational structures (Hansman et al., 2020). These effects are particularly pronounced for firms in developing countries trading with high-income countries (Verhoogen, 2023). Trade partners play a crucial role in this process, providing firms with the opportunities necessary for growth, innovation, and productivity improvements.

Given these positive effects, a natural but critical question arises: does halting or reducing exports reverse these gains, especially when a firm loses an important trade partner? This question has garnered increasing interest among academics and policy makers in recent years, as anti-globalization sentiments have driven policies like Brexit and the US-China trade war, and the broader trends of protectionism and fragmentation of the global economy (International Monetary Fund, 2023a). Additionally, geopolitical conflicts, such as Russia's invasion of Ukraine and recent turmoil in the Middle East, have heightened national security concerns, disrupted trade relationships, and accelerated reshoring efforts (Goldberg and Reed, 2023a). Consequently, the use of unilateral trade sanctions has surged, with the number of new trade restrictions increasing fivefold between 2017 and 2022 (International Monetary Fund, 2023b). Furthermore, studying the effects on exporting firms, particularly in developing countries, is crucial because these firms tend to generate more formal jobs and drive innovation. The collapse of a trade partner could therefore have significant economic and policy implications.

In this paper, we study the medium- and long-term performance of firms that lose access to a major trade partner. Our focus is on the collapse of Venezuelan trade and its impact on Colombian manufacturing exporters that were heavily reliant on this market. At the outset of this disruption, Venezuela's GDP per capita was nearly double that of Colombia. The trade relationship began to unravel in 2009, when Hugo Chávez initiated a trade war with Colombia, causing a sharp decline in exports to Venezuela. We provide two pieces of evidence showing that this decline in trade was specific to Venezuelan imports from Colombia. First, a synthetic control analysis based on a donor pool of 72 countries suggests that bilateral trade would not have declined after 2008 in the absence of the change in policy. Second, we use data from the Venezuelan currency board (CADIVI) to further show that Venezuelan

importing firms conducting trade with Colombia experience a disproportionate decline in access to US dollars after the trade restrictions are introduced. The decline in bilateral trade was exacerbated by the collapse of the Venezuelan economy between 2013 and 2018, which effectively erased the country as a trading partner.[1]

We study the impact of the Venezuelan trade collapse on Colombian manufacturing exporters with two data sets merged at the firm level: the Encuesta Anual Manufacturera (EAM, Anual Manufacturing Survey), a census of manufacturing plants of 10 or more workers and transaction-level customs records from the National Tax and Customs Authority (Departamento de Impuestos y Aduanas Nacionales, DIAN). The EAM provides detailed plant-level data on output, inputs, capital stock, wages, and worker skill composition, while the DIAN dataset offers transaction-level information on exports and imports, including product details and trade destinations. We construct an unbalanced panel of 2,460 firms that exported at least once during 2001–2004. Our analysis spans 2005–2018, with a pre-period (2005–2008) and a treatment period (2009–2018). We use two complementary research designs: Synthetic Difference-in-Differences (SDiD), following Arkhangelsky et al. (2021), and Difference-in-Differences (DiD). Exposed firms are defined as those exporting at least 75% of their total exports to Venezuela during 2001–2004.

The SDiD approach combines elements of DiD and Synthetic Control methods, assigning data-driven weights to control units to minimize differences in outcomes between treated and control groups during the pre-treatment period. The advantage of this design is that it lets the data identify the best control group among untreated firms and is robust to pre-testing concerns (Arkhangelsky et al., 2021; Roth, 2022). Nevertheless, it requires a balanced panel and cannot isolate long-term effects. Therefore, we complement the analysis with additional DiD exercises incorporating firm and 3-digit sector-by-year fixed effects. This method ensures transparency in defining the control group and allows for separate estimation of medium- and long-term effects. We present results from event-study specifications to support the parallel trends assumption and explore the dynamics of treatment effects. Both the SDiD and DiD yield comparable results, underscoring their robustness in capturing the consequences of Venezuela's trade collapse.

Our setting offers several advantages for studying the consequences of firms ceasing or reducing exports. First, we leverage plausibly exogenous variation in access to a key foreign market, which is uncommon in studies on exporting and firm performance. Second, while recent research has examined trade restrictions like Brexit and the US-China trade war, these events are relatively recent and occurred shortly before COVID-19, limiting the scope

[1] In 2009, 13.5% of Colombian exports were directed to Venezuela; by 2018, this share had dropped to just 1%. Between 2013 and 2018, Venezuela's GDP per capita experienced a threefold reduction.

for long-term analysis. Third, unlike most studies that focus on moderate trade shocks, such as tariff increases, our setting involves the complete collapse of a major trade partner—a rare disruption that provides a unique opportunity to identify its effects for a large number of firms. Fourth, most research focuses on the effects of firms starting to export, but the impact of ceasing to export on firm's performance may not be symmetrical. For instance, the know-how gained from entering a market might facilitate entry into others. Finally, unlike previous studies that often rely solely on customs or plant-level data, our merged dataset enables us to measure individual firms' exposure to the Venezuelan market, track their subsequent exporting behavior and adaptation measures, and examine outcomes such as sales, production, firm survival, input use, and total factor productivity.

We find that the Venezuelan trade collapse had a dramatic impact on Colombian exporters, leading to substantial and persistent declines in exports to Venezuela and overall firm-level exports. Firms exposed to Venezuela reduced their export probability by 13%, and the number of exported products by 20%, compared to pre-collapse levels. These effects persisted throughout the treatment period (2009–2018) and did not recover. We also find sharp declines in total export value and the share of exports relative to total sales, both in the medium and long term. These findings are evidence of the magnitude of the trade collapse and its lasting consequences on firms' exporting behavior.

We then turn to the effect on survival and production decisions. The collapse of trade with Venezuela had no discernible effect on firm survival or the number of plants, indicating that Colombian exporters were able to withstand the shock without exiting the market. However, firms experienced significant declines in sales (7–9%) and production value, with a production quantity index decreasing by approximately 7%. These effects were more pronounced in the long term (2014–2018), suggesting that firms gradually scaled down their operations. This reduction in scale was mirrored by firm's input decisions. Firms consumed 9% fewer material inputs, reduced their capital stock by 20%, and were 3% less likely to invest, with these impacts being most pronounced in the long term (2014–2018). Labor expenses also declined, as firms reduced their wage bills by 6%, the number of workers by 3–4%, and the average wage by 2%. These effects, especially the reductions in labor, unfolded gradually. Importantly, firms did not alter the skill composition of their workforce, suggesting that their production techniques remained largely unchanged despite the shock.

We also study the impact of the trade collapse on firm's total Factor Productivity (TFP). Specifically, we explore multiple TFP measures, including revenue-based (TFPR) and quantity-based (TFPQ) approaches, using methodologies from Levinsohn and Petrin (2003), Ackerberg et al. (2015), Gandhi et al. (2020), and the marginal costs measure of Garcia-Marin and Voigtländer (2019). The results consistently show no significant impact

of the trade collapse on firm productivity. Across all measures, the estimates are small and imprecise, implying that technical efficiency and know-how were unaffected. This resilience contrasts with literature documenting productivity gains from export entry. Our results are consistent with firms maintaining their technical efficiency despite the collapse of an important trade partner.

The collapse of Venezuela as a trade partner prompted Colombian exporters to adapt, not only through adjustments in inputs and production but also in their interactions with national and international markets. We examine adaptation behavior across various dimensions. We find that firms did not significantly increase domestic sales or expand to new international markets. Instead, they deepened relationships with their established export markets, as captured by Colombia's top 10 export destinations at baseline (2001–2004), becoming 3.4–4.1% more likely to export and increasing their export value to these countries. These changes, driven by the intensive margin, took time to materialize and were more pronounced in the long term. Firms reduced the number of exported products and did not introduce new ones, reinforcing their reliance on existing relationships rather than pursuing new opportunities. These findings underline the challenges firms face in adapting to major trade disruptions, highlighting the importance of established customer bases and market-specific knowledge.

These findings are remarkably similar for most outcomes across the SDID and DID research designs. Our results are also robust to multiple exercises, including varying the threshold for defining treated firms, excluding individual 2-digit sectors, and using alternative transformations for outcomes with zeros.

We make multiple contributions to the literature. First, recent studies on trade wars and restrictions, such as Fajgelbaum et al. (2020), document significant losses due to the US-China trade war.[2] Fernandes and Winters (2021) estimate the negative effects of Brexit on the volume and prices of exports to the UK of Portuguese firms, while Handley et al. (2024) highlight how U.S. import tariffs on China negatively impacted U.S. exporters through supply chain linkages. Jiang et al. (2023) examine the impact of US tariffs on Chinese exporters.[3] Additionally, Benguria and Saffie (2024) and Utar et al. (2023) highlight firms' adjustments to nearshoring and alternative markets during trade shocks. This research on trade wars has primarily focused on the US-China trade war that began in 2018 and Brexit, which started in 2016 and whose effects are confounded by the COVID-19 pandemic. Consequently, the

[2]Fajgelbaum and Khandelwal (2022) review the 2018–2019 US-China trade war, while Caliendo and Parro (2023) provide a broader perspective on US-China trade relations.

[3]The possibility of trade wars and the imposition of harmful tariffs can generate policy uncertainty, with negative consequences for trade and welfare (Handley and Limão, 2017; Graziano et al., 2021). See Handley and Limão (2022) for a review of this line of work.

findings from these studies are almost exclusively short-term. Moreover, firm-level data limitations have restricted a thorough investigation of changes in firm performance. Using data from 2009 to 2018, we show that losing a major trade partner has persistent negative effects on exporting, while exposed firms survive but exhibit weaker performance across multiple dimensions.

Second, we contribute to the literature on exporting and TFP. Early studies (e.g., De Loecker, 2007; Lileeva and Trefler, 2010; Park et al., 2010; Aw et al., 2011) report large productivity gains from exporting.[4] Later work addresses measurement issues, finding smaller but robust productivity effects (De Loecker, 2011; Loecker, 2013; Atkin et al., 2017; Garcia-Marin and Voigtländer, 2019).[5] [6] To our knowledge, our study is the first to estimate medium- and long-term productivity effects when firms lose access to a major trade destination. We find no significant impact on TFP, supporting the idea that technical efficiency and know-how are resilient to trade disruptions.

Third, we extend research on the broader effects of exporting. Exporting has been shown to improve product quality, wages, and workforce skill composition (Verhoogen, 2008; Bastos and Silva, 2010; Brambilla et al., 2012; Frias et al., 2012; Hallak and Sivadasan, 2013; Manova and Yu, 2017; Demir et al., 2024; Frías et al., 2024), as well as encourage firms to use higher-quality inputs and vertically integrate (Bastos et al., 2018; Hansman et al., 2020), and engage in innovation and technological upgrades (Bustos, 2011; Aghion et al., 2024; Coelli et al., 2022). We show that losing a major trade partner leads firms to reduce scale, labor expenditures, and investment, with adjustments unfolding gradually over years.

Finally, our work contributes to the literature on the determinants of the decision to export. This decision can be influenced by factors such as firm's ex-ante productivity (Melitz, 2003), uncertainty about future profits and market entry costs (Das et al., 2007), credit constraints (Minetti and Zhu, 2011), experimentation in foreign markets (Albornoz et al., 2012), selection based on quality (Crozet et al., 2012), and negative shocks in local markets (Almunia et al., 2021). The success of exporters has been shown to depend on their reputation (Macchiavello and Morjaria, 2015), knowledge of foreign markets and customers (Dickstein and Morales, 2018; Berman et al., 2019; Eaton et al., 2021; Piveteau, 2021; Domínguez et al., 2023), tariffs and exchange rates (Fitzgerald and Haller, 2018), as well as pricing

[4]Further early studies on exporting and productivity include Aw et al. (2000), López-Córdova et al. (2003), Bigsten et al. (2004), Alvarez and López (2005), Iacovone (2012), and Luong (2013).

[5]See de Roux et al. (2021) for a discussion of productivity estimation methods.

[6]Firms can benefit not only from exporting directly but also through exposure to global value chains. See, for example, Chor et al. (2021) and Alfaro-Urena et al. (2022). For work on how trade liberalization boosts local firms' productivity through pro-competitive effects, see Pavcnik (2002), Eslava et al. (2004), Topalova and Khandelwal (2011), De Loecker et al. (2016), and Fieler et al. (2018). Gelvez Alvarez (2023) studies how the trade war between Colombia and Venezuela affected Colombian firms through firm-to-firm linkages.

and advertising strategies (Fitzgerald et al., 2024). We show that exporters adapted to the collapse by deepening relationships and exporting more frequently and in greater value to countries within Colombia's top 10 export destinations where they were already exporting at baseline. Exporters did not expand to new destinations. Our finding that TFP remains unaffected suggests that the expertise gained from exporting is not entirely lost during trade shocks. However, these adaptation measures, driven by the intensive margin, highlight the challenges of establishing a customer base in new destinations and acquiring market-specific knowledge, even for experienced exporters.

2 Institutional Background

Colombia and Venezuela share a 2,219 kilometer border. Both countries are former Spanish colonies and they share strong cultural ties. Until 2009, Venezuela was Colombia's second most important trade partner after the US. In the period 2005-2008, Venezuela absorbed on average 13.5% of total yearly Colombian exports and an even larger share, 22.5%, of manufacturing exports. Colombia's main manufacturing exports to Venezuela during this period included animal products, apparel, chemicals and chemical products, leather products, textiles, and paper products.

Hugo Chávez was first elected president of Venezuela in December 1998. A former member of the armed forces, Chávez led an unsuccessful coup in 1992 and was released from prison in 1994. He had a new constitution drafted and approved through a referendum in 1999 and was re-elected as president in 2000. The early part of his term was characterized by political instability, with a failed coup attempt and a prolonged strike by employees of the national oil company (PDVSA) in 2002, as well as a failed recall referendum in 2004 (Hsieh et al., 2011). Having overcome these challenges, the *chavista* regime strengthened its control of state institutions thanks to a steady increase in the price of oil over the following years. At the same time, Venezuela developed stronger links with communist Cuba and labeled its own political ideology as 'socialism for the 21st century'. Chávez was re-elected again in 2006.

Venezuela's bilateral relation with Colombia under Chávez was largely shaped by Colombia's civil conflict (Martínez, 2017) . In particular, the links between the Venezuelan government and the Colombian left-wing insurgent groups FARC and ELN were a constant source of tension with Colombian president Alvaro Uribe, a conservative who came to power in 2002. A first major diplomatic crisis occurred in 2004, when the Colombian government captured a FARC spokesman in Caracas (BBC News, 2004). In 2007, Chávez was briefly appointed as mediator in the negotiations between the Colombian government and FARC for the release of military and political hostages held by the latter. Tensions mounted further

in 2008, when the Colombian military killed a top FARC commander inside neighboring Ecuador and seized his personal computer. Venezuela's response included the mobilization of troops to the border.

Bilateral tensions reached a breaking point in July 2009 as a result of two events. First, Colombia announced it would allow the United States to use military bases inside of the country for antinarcotic operations (BBC News, 2009a). This happened after the government of Ecuador led by Chávez's ally Rafael Correa terminated a similar agreement. Second, the Colombian government found Swedish weapons that had originally been sold to Venezuela at a FARC camp, which led to renewed accusations of Venezuelan support for the insurgents (BBC News, 2009b). Chávez suspended diplomatic relations in response, but also announced that Venezuela would start to substitute Colombian imports with purchases from other countries (La República, 2009). While he had previously threatened to use trade restrictions as retaliation for Colombia's persistent accusations, this time he followed through.

In the first half of 2009, Colombian exports to Venezuela amounted to US $2.9 billion, representing a small decrease of 4.5% relative to the previous year (in nominal terms). By the end of 2009, total yearly exports to Venezuela only reached $4.1 billion, a 34% decrease relative to 2008. Equivalently, panel (a) in Figure 1 shows that exports to Venezuela represented 10-20% of total exports almost every quarter since 2005, but fell below 5% after 2010. This pattern stands in sharp contrast to those observed for other markets. We use a synthetic control analysis to provide further evidence on the targeted nature of the decline in Venezuelan imports from Colombia. Based on a donor pool including 72 other countries, panel (b) in Figure 1 plots the time series of Venezuelan imports from Colombia and the synthetic control that best matches this time series until 2009 (Abadie, 2021). The synthetic control tracks very well the fluctuations in trade in the preceding period and suggests a sizable decline after the start of Chávez's trade war.

This decrease in imports from Colombia took place through the introduction of several non-tariff barriers (NTBs) to trade (Semana, 2009).[7] First, Venezuelan importers faced restrictions when renewing their registration and were denied import permits. For instance, the Ministry for Food no longer allowed Colombia as a source country in its online forms. Second, sanitary rules for agricultural and other food products were tightened, which the Colombian government claimed was unlawful in a complaint to the World Trade Organization (El Tiempo, 2009). Third, products imported from Colombia stopped enjoying access to a preferential exchange rate. Moreover, Venezuelan importers found themselves increasingly unable to obtain the foreign currency necessary to pay their Colombian partners. By August

[7]Venezuela announced that it would leave the CAN free trade area (which also included Colombia, Ecuador, Peru, and Bolivia) in 2006. However, the five-year withdrawal process would only be completed in 2011, so imports from Colombia were exempt from tariffs at this time.

2010, Colombian exporters were owed an estimated $1.4 billion (Cardozo, 2011).

We provide additional evidence on the targeted nature of the trade restrictions against Colombia using firm-level data from the Venezuelan currency board CADIVI. Between 2003 and 2014, CADIVI was the official government agency regulating access to foreign currency (USD) in Venezuela. We match the list of Venezuelan firms that received USD from CADIVI between 2004 and 2012 with the list of Venezuelan importers reported in our Colombian customs data from DIAN (see below for details) and classify a Venezuelan firm as an importer from Colombia if there is a match at any point between 2005 and 2008 (i.e., our pre-period). Table A1 shows results from a difference-in-difference regression that compares the change in access to currency after the trade restrictions between firms that had previously imported from Colombia and those that had not.[8] The results indicate a disproportionate decrease in access to currency in 2012 among Venezuelan firms who had previously imported from Colombia. This result is consistent with the anecdotal evidence on currency controls as one specific restriction affecting trade with Colombia, but it could also partly reflect reduced demand for USD due to the other restrictions highlighted above.

Bilateral relations only worsened over the following year. Colombian president Uribe presented evidence of FARC camps inside Venezuela at an OAS summit shortly before leaving office in August 2010. His successor, Juan Manuel Santos, set as a priority to reestablish the bilateral relation. While this effort was very successful in terms of diplomacy, Venezuela did not revert its restrictions on trade with Colombia. In June 2011, Colombia's foreign secretary acknowledged that 'the Venezuelan market had been lost', while president Santos recognized that 'trade with Venezuela would never be the same' (Cardozo, 2011; El Espectador, 2011).

Chávez played an early role as mediator in the peace process between the Colombian government and FARC that started in September 2012, but he died from cancer in early 2013. Vicepresident Nicolás Maduro was elected as his successor in a snap election a couple of months later. Maduro faced a deteriorating economy, particularly after the sharp fall in the price of oil in late 2014. A steady decrease in oil production aggravated the government's fiscal crisis, which combined with loose monetary policy led to a hyperinflation starting in 2016. Foreign sanctions further affected the economy. Amid worsening security and institutional decay, Venezuela experienced a population exodus and a massive economic contraction. GDP contracted by a factor of three between 2013 and 2019.

[8]This data is publicly available from `https://phillipadsmith.github.io/cadivi/`. The raw data includes two observations for each firm: an aggregate for the period 2004-2011 and yearly values for 2012. We convert the aggregate observation into a yearly average. This average includes five years before the trade restrictions (2004-2008) and three years afterward (2009-2011). While not exclusively pre-reform, this average contains valuable informative about access to currency before 2009. Regressions include firm fixed effects and a dummy for the year 2012.

3 Data

Our analysis relies on two main datasets to estimate the impact of the Venezuelan trade collapse on Colombian manufacturing exporters: the Encuesta Anual Manufacturera (EAM, or Annual Manufacturing Survey) and transaction-level records from Colombian customs, administered by the Colombian National Tax and Custom Authority (Dirección de Impuestos y Aduanas Nacionales, DIAN). The EAM, conducted by Colombia's national statistics agency (DANE), is a census of manufacturing plants with 10 or more employees, as well as smaller plants if their production value exceeds certain thresholds. This survey provides detailed data on plant-level output and input quantities and prices, categorized according to Central Product Classification (CPC) codes at the seven-digit level.[9] The data also provides the share of each exported product and the share of each material input that was imported. For each plant, we observe transactions involving asset purchases and sales, which allow us to construct measures of capital and investment, with a specific focus on machinery and equipment.

To estimate firm-level capital stock, we apply a perpetual inventory method to machinery and equipment, assuming an annual depreciation rate of 5%. The initial capital stock values are based on the first reported book value of these assets, deflated using Colombia's central bank gross capital formation index, and updated annually with firm-reported investments. The dataset also includes information on electricity consumption (Kw/h). Additionally, it provides data on the wage bill and the number of workers, allowing us to calculate the average wage paid by the plant. These figures are disaggregated by worker type, distinguishing between blue-collar workers (production floor workers) and white-collar workers (technicians and managers). Finally, we classify plants in the EAM into three-digit CPC sectors, based on the sector in which they produced the largest share of output during the sample period.

The DIAN customs dataset provides transaction-level details for every instance of international trade conducted by Colombian firms. It includes information on product types classified at the 10-digit Harmonized System (HS) level, transaction dates, quantities, shipment weights, and FOB monetary values. Each record also specifies the country of origin or destination. To ensure data quality, we apply several filters, excluding records with incomplete information (e.g., missing origin or destination country) or with zero or negative values. We also remove transactions involving Free Trade Zones, re-exports, and domestic transactions subject to taxes.

We collapse the manufacturing plant data to the firm level and merge it with the DIAN

[9]For outputs, the data report quantities produced and sold for each narrowly defined product, enabling the calculation of unit values for each product. For inputs, the data report quantities purchased and consumed for each narrowly defined input, allowing us to derive unit prices for material inputs.

customs data using firm-level tax IDs.[10] This merged dataset covers the period 2001–2018. We refer to the years 2001–2004 as the pre-sample period, while the years 2005–2018 correspond to the sample period used in the analysis. We use the information in the pre-sample period (2001–2004) to define our main estimation sample and measure pre-determined firm characteristics. In particular, to enhance comparability (see Melitz, 2003), we keep only firms that, according to the customs data, exported at least once during the pre-sample period, yielding a total of 2,460 firms. For these firms, we compile data from the EAM to construct an unbalanced panel covering the period from 2005 to 2018. Our analysis distinguishes between a pre-period (2005–2008) and a treatment period (2009–2018), marked by the onset of Hugo Chávez's import ban. When examining the effects, we classify medium-term effects as those occurring during the five years from 2009 to 2013 and long-term effects as those from 2014 to 2018.

Appendix Table A2 presents summary statistics for this panel. On average, firms export in 54% of the years in our sample, and in 37% of the years to Venezuela. They export 1.5 products out of an average of 4.2. Firms in our sample are large: they employ 202 workers (147 blue collar and 55 white collar) and generate 53 billion Colombian pesos in sales (2018 values), equivalent to roughly 18 million US dollars.[11] Firms in our sample account for 62% of total manufacturing sales in the EAM in 2001 and 52% in 2018. They also represent 78% of manufacturing exports in 2001 and 88% in 2018. Our sample covers all 23 CPC 2-digit manufacturing sectors. The top six sectors, which together represent 67% of manufacturing sales, are food products; chemicals and chemical products; basic metals; rubber and plastic products; non-metallic mineral products; and paper and paper products. The products exported to Venezuela by the firms in our sample are similarly diverse.[12]

4 Research Designs

To estimate the effect of Venezuela's collapse as a trade partner, we use Synthetic Difference-in-Differences (SDiD) and Difference-in-Differences (DiD) designs. This section outlines the key aspects of these approaches. Fundamentally, both designs compare firms with varying exposure to the Venezuelan market, before and after the introduction of the import ban in 2009. We begin by defining treated firms as those that, according to the DIAN customs

[10] Most firms in the EAM operate a single plant. In our final sample, there are 1.1 plants per firm on average. The merge is conducted by DANE personnel, who provide us with a de-identified dataset.

[11] All monetary values in this paper are expressed in Colombian pesos of 2018. The average exchange rate in 2018 was 2,956 pesos per US dollar.

[12] The top six 2-digit HS products represent 73% of exports to Venezuela. These are food products; chemicals and chemical products; automobiles; electrical equipment; rubber and plastic products; and wearing apparel.

data, exported at least 75% of their total exports to Venezuela during the pre-sample period (2001–2004). Appendix Figure A1 shows the distribution of export shares to Venezuela. While a substantial number of firms exported to Venezuela, many had a low export share. Of the 2,460 exporters in the sample, 971 (38%) did not export to Venezuela, whereas 108 firms (4.2%) exported exclusively to this country. The median export share to Venezuela is 0.05, and the 75th percentile is 0.41. Appendix Figure A2 presents a map of Colombia's municipalities, highlighting those with firms in our sample. The color scale represents quartiles of the fraction of treated firms in each municipality. Most firms are located in or near Colombia's major urban centers. Notably, many municipalities with a high intensity of treated firms are situated far from the Venezuelan border. This suggests a limited influence of Venezuelan migration into Colombia on our findings.

4.1 Synthetic Difference-in-Difference

Our first research design is a Synthetic Difference-in-Differences (SDiD), following Arkhangelsky et al. (2021). Columns 3 and 4 of Appendix Table A2 show that treated and control firms differ along several dimensions. Treated firms are larger, produce more, sell more, and hire more workers. They also export to a greater number of countries. Given these differences, finding the appropriate comparison group that can serve as a counterfactual for treated firms is hard. SDiD assigns convex weights to each firm in the control group to minimize the difference between the weighted average outcome of the control and treatment groups during the pre-treatment period (2005–2009 in our case). Similarly, it applies weights to time periods to balance the pre-treatment and post-treatment periods. These time weights are derived from the behavior of the control group. The SDID design resembles the traditional Difference-in-Differences approach but incorporates elements of the Synthetic Control method.[13]

Formally, and following the notation of Arkhangelsky et al. (2021), the parameters estimated in the SDiD design are obtained by solving:

$$\left(\hat{\tau}^{sdid}, \hat{\mu}, \hat{\alpha}, \hat{\beta}\right) = \arg\min_{\tau,\mu,\alpha,\beta} \left\{ \sum_{i=1}^{N} \sum_{t=1}^{T} \left(y_{it} - \mu - \alpha_i - \theta_t - W_{it}\tau\right)^2 \hat{\omega}_i^{sdid} \hat{\lambda}_t^{sdid} \right\}. \tag{1}$$

Here, y_{it} is the outcome of interest of firm i in year t, N the number of firms, α_i and θ_t correspond to firm and year fixed effects, respectively, and W_{it} is a treatment indicator equal to 1 for firms with an export share to Venezuela above the 75th percentile from 2009

[13] Arkhangelsky et al. (2021) argue that SDiD avoids pre-trends testing concerns of the Difference-in-Differences design discussed in Roth (2022).

onward, that is, $W_{it} = Exposed_i \times D[2009 \leq t]$. The weights $\hat{\omega}_i^{sdid}$ are convex weights optimally selected to ensure that the weighted average of the control units' outcomes closely approximates the treatment units' outcomes in the pre-treatment period. Similarly, $\hat{\lambda}_t^{sdid}$ are chosen to ensure that the control units' outcomes best approximate their own outcomes in the post-treatment period.[14] The parameter of interest, τ, represents the Average Treatment Effect on the Treated (ATT) of Venezuela's trade collapse on Colombian manufacturing firms.

The main advantage of SDiD relative to DiD, is that it remains agnostic about which units in the control group are most relevant for establishing the counterfactual, and relies in a data driven approach to determine them, by optimally computing their weights. In our case, the method estimates τ for the treatment period spanning 2009 (the start of Chávez's trade war) to 2018 (the end of our sample), with 2008 as the omitted period.[15] We complement this analysis with event-study plots. The SDiD has three main disadvantages. First, to implement it, we need a balanced panel. As mentioned above, our starting point is an unbalanced panel of EAM firms. Therefore, to perform the SDiD analysis, we keep only firms with information on all outcomes throughout the sample period (2005–2018). This requires dropping firms that are not observed in a given year.[16] The second disadvantage is that the weighting of firms is determined by the optimization algorithm rather than by an economic rationale, which might better justify why certain control units are more comparable to treated units. Moreover, we aim to study the medium- and long-term effects of the Venezuelan collapse on exporting firms—a task for which the SDiD method does not offer a straightforward solution. These challenges lead us to adopt an alternative research design, which we outline in the next subsection.

4.2 Difference-in-Differences

To complement the SDiD analysis and estimate separate effects for the medium and long term, we estimate the following DiD regression specification for the period 2005–2018:

$$y_{its} = \alpha_i + \gamma_{ts} + \beta Exposed_i \times D[2009 \leq t] + \varepsilon_{its}, \tag{2}$$

[14] See equations (4) and (6) in Arkhangelsky et al. (2021) for the optimization problem solved by the weights $\hat{\omega}_i^{sdid}$ and $\hat{\lambda}_t^{sdid}$, which include regularization parameters. As noted in the paper, the canonical DiD estimator corresponds to the case where $\hat{\omega}_i^{sdid}$ and $\hat{\lambda}_t^{sdid}$ are set to 0, while the Synthetic Control weights $\hat{\omega}_i^{sc}$ are used in the Synthetic Control approach instead of the term $\hat{\omega}_i^{sdid}\hat{\lambda}_t^{sdid}$.

[15] The estimates of τ, the standard errors, and the event-study plots are obtained using the Stata routine *sdid*. We don't include any time varying controls and use bootstrap with 50 repetitions for inference. For all other options, we use the command's default settings.

[16] Selection is not a concern in our case, as we will show below that the probability of observing a firm in the manufacturing data is not affected by the treatment. Nevertheless, our SDiD estimation is based on 1,390 firms instead of the 2,460 of the unbalanced panel.

where y_{its} is an outcome for firm i in year t and sector s. α_i and γ_{ts} represent firm and 3-digit sector-year fixed effects, respectively. $Exposed_i$ is a treatment indicator equal to 1 if the share of exports to Venezuela (as a percentage of the firm's total exports) in the pre-sample period (2001–2004) is above the 75th percentile, as defined earlier. $D[2009 \leq t]$ is a dummy variable equal to 1 if t is 2009 or later. ε_{its} is the error term, which is clustered at the 3-digit sector level. The key identification assumption of this research design is that, within 3-digit sectors, treated firms would follow parallel trends to those of control firms in the absence the Venezuela trade collapse.

A few points are worth noting. First, in this DiD specification, the ATT is captured by β, which is directly comparable to the parameter τ from equation (1). As we show below, we find very similar estimates of the ATT using the two methodologies. Second, given the inclusion of sector-year (3-digit) fixed effects, the estimate of β is obtained from differences in trends *within* 3-digit sectors. Compared to the SDiD design, this has the advantage of providing a transparent comparison group. Firms within the same 3-digit sector are more likely to be on parallel trajectories in the absence of treatment. Third, since the treatment date is the same for all firms, there are no concerns about negative weights due to differential treatment timing.[17] Fourth, this approach easily accommodates the estimation of medium- and long-term effects using the following regression:

$$y_{its} = \alpha_i + \gamma_{ts} + \beta_{med}\, Exposed_i \times Medium_t + \beta_{long}\, Exposed_i \times Long_t + \varepsilon_{its}, \tag{3}$$

where $Medium_t$ is a dummy equal to one if $2009 \leq t \leq 2013$, and $Long_t$ is a dummy equal to one if $2014 \leq t \leq 2018$. β_{med} captures the medium-term effect (the first five years) of a firm's exposure to the Venezuelan trade collapse, and β_{long} captures the long-term effect (the last five years). We complement this analysis with event-study specifications, where we estimate:

$$y_{its} = \alpha_i + \gamma_{ts} + \sum_{h \neq 2008} \gamma_h Exposed_i \times D_h + \varepsilon_{its}, \tag{4}$$

where D_h is a dummy equal to one for year $t = h$. This event-study specification allows us to examine the dynamics of the effects and check for pre-trends in the context of the DiD design.

[17] See, for example, Roth et al. (2023).

5 Results

5.1 The Effect of Venezuela's Trade Collapse on Exports

In this section, we study the effect of the Venezuelan trade collapse on the exporting behavior of Colombian manufacturing firms. Given that this is the most direct margin that was presumably affected by the loss of the Venezuelan market, we can think of these results as constituting a "first-stage". We find that firms exposed to Venezuela substantially decreased their exports to that country, resulting in a significant overall reduction in firm-level exports. These effects are large, sudden, and persistent, lasting throughout the treatment period, with no recovery in firms' export levels.

Figure 2 presents SDiD event study plots. Panel A shows the effect on the probability of exporting to Venezuela. The SDiD weights are successful in using firms in the control group units to replicate the behavior of the outcome in the pre-period: the point estimates are approximately zero, and the confidence intervals are narrow. Furthermore, the figure illustrates that, starting in 2010, there is a sharp decline in the probability of exporting to Venezuela, with this negative effect increasing until 2018. Panels B and C depict similar patterns for the log value of exports to Venezuela and the share of total firm exports destined to this country.[18] These effects are substantial enough to influence firms' overall exporting behavior. Specifically, Panels D, F, E, and G show that, for exposed firms after the start of the trade war in 2009, there is a sharp decline in the probability of exporting, the value of exports, and the share of exports relative to total sales.[19] Finally, the number of products exported also decreases dramatically. Importantly, Figure 2 shows that firms never recover from the Venezuelan trade collapse. Even 10 years after its onset, exports to Venezuela and overall exports remain significantly lower than in the pre-period.

Table 1 summarizes these results by presenting estimates of the coefficient of $Exposed_i \times D[2009 \leq t]$ using the SDiD (Panel A) and the DiD (Panel B) methodologies. Column 1 shows that the probability of exporting to Venezuela decreases by about 12 percentage points (pp) (or 25% relative to the sample mean in the pre-period). Similarly, large effects are observed for the value and share of exports to Venezuela (columns 2 and 3). The probability of exporting overall (column 4) decreases by 7.3 pp (or 13% relative to the sample mean). Likewise, there is a sharp decline in both the value and the share of total exports, as shown in columns 5 and 6. On average, firms in our sample exported about 1.5 products during the

[18] For export values, we assign $\log(x+1)$ for years when firms did not export to Venezuela. The results are robust to using the inverse hyperbolic sine (IHS) transformation, as shown below in the robustness section.

[19] For each 7-digit product, the manufacturing census reports the percentage of sales that were exported. We use this information to calculate the percentage of total sales corresponding to exports at the firm-year level.

pre-period. According to column 7, this number decreases to 1.2 products (a 20% decline) as a result of the Venezuelan trade collapse.

Panel B reports the effects on the same outcomes, estimated using the DiD specification in equation (2). The estimated effects are virtually identical to those obtained with the SDiD procedure. In Appendix Figure A3, we present the corresponding event studies derived from estimating equation (4). Although the confidence intervals for the point estimates in the pre-treatment period are wider than in the SDiD case, treatment and control firms are on parallel trends across outcomes. An advantage of the DiD approach is that it allows us to decompose the average treatment effect in the post-treatment period into two components, as specified in equation (3): medium-term and long-term effects, captured respectively by the coefficients of $Exposed_i \times D[2009 \leq t \leq 2013]$ and $Exposed_i \times D[2014 \leq t \leq 2018]$. Panel C of Table 2 presents the results of estimating this equation. The collapse of trade with Venezuela has significant effects on all outcomes in both the medium and long term.

What are the implications of this decline in exports for firms? We address this question in the following sections.

5.2 Survival and Production Decisions

We now investigate the effects of the collapse of trade with Venezuela on firm survival and production decisions. To measure survival, we first create a balanced panel with all the firms in our sample and define a dummy variable equal to one if the firm is observed in the manufacturing census. Additionally, we estimate the impact on the number of plants associated with each firm, as firms may close plants in response to the shock. We also estimate the effects on total sales (log), production value (log), and a production quantity index.[20] As in the previous section, we present the estimated effects using both the SDiD and DiD methodologies in the same table. Panel A of Table 2 reports the SDiD effects, while Panel B presents the DiD effects for the entire post-treatment period. Panel C shows the DiD estimates, separating medium-term (2009–2013) and long-term (2014–2018) effects. The corresponding SDiD event studies are reported in Figure 3, and the DiD event studies are presented in Appendix Figure A4.

Our first important result is that we find no effect on firm survival (column 1) or the number of plants associated with firms (column 2). Firms are not exiting the market or closing plants due to the Venezuelan trade collapse. In other words, they are able to withstand

[20]Most firms in the manufacturing census are multiproduct firms producing goods measured in units that are not directly comparable. Since we observe the total production value for narrowly defined 7-digit products and the corresponding quantities produced, we calculate prices by dividing the total production value by the quantities produced. Using this information, we construct a Sato-Vartia quantity index, following de Roux et al. (2021).

the collapse of this key trade partner. This holds true in both the medium and long term. However, firms sell and produce less. According to column 3, sales decline by between 7% (DiD) and 9% (SDiD), with similar effects reported for the value of production in column 4. The quantity index decreases by approximately 7% in both designs, though this effect is less precise and only significant at the 10% level. Interestingly, as shown in the event studies and Panel C of Table A4, the effects on sales and production appear to be more pronounced in the long term (2014–2018). This result suggests that firms reduce their scale in response to the shock, but this adjustment takes time to fully materialize.

The reduction in production suggests changes in firms' input usage. We turn to the study of input effects in the next section.

5.3 Input Decisions

To explore the effects on input choices, we focus on the value of material inputs consumed, the log value of machinery and equipment capital stock, a dummy variable equal to one if the firm made positive investments, the log of energy consumption (Kw/h), the wage bill (total amount paid in wages by the firm), the number of workers (in logs), and the log of the mean wage.[21] As in the previous two sections, we present the SDiD effects in Panel A of Table 3, and the DiD effects in Panel B. Panel C reports the estimated effects for the medium term (2009–2013) and long term (2014–2018). We also complement these results with SDiD event study plots (Figure 4) and DiD event study plots (Appendix Figure A5).

Consistent with the decline in production, we find that firms exposed to the Venezuela's trade collapse consume fewer material inputs and reduce their capital stock and investment. The size of these effects is economically meaningful. Results in column 1 of Table 3 show that material input consumption declines by 9%, while column 2 indicates that the capital stock decreases by approximately 20%. The probability that a firm invests decreases by around 3%. This result is reminiscent of Garcia-Marin and Voigtländer (2019), who find that in the initial years following export entry, plant-level investment in machinery increases substantially. Although our results show the opposite effect, in our case, the impacts on the capital stock are primarily long-term effects, as evidenced in column 2 of Panel C and the event studies (Panels B of Figure 3 and of Appendix Figure A5). A plausible explanation is that firms scale down by reducing their capital, but this adjustment takes time, as capital is harder to adjust than other inputs, such as material inputs. Although the point estimates for energy consumption are negative, we find no statistically significant effects, except for the long-term effects reported in Panel C, column 4.

[21] We calculate the mean wage paid by the firm by dividing the wage bill by the number of workers.

Columns 5 to 7 of Table 3 report the effects on the log wage bill, the log number of workers, and the log average wage, respectively. According to both the SDiD methodology (Panel A) and the DiD methodology (Panel B), there is a negative effect of the collapse of trade with Venezuela on these three outcomes, although the effect on the number of workers is imprecisely estimated by the SDiD design. The effects are economically meaningful: compared to the change of firms in the control group, the wage bill of treated firms fell by 6%, the number of workers by 3–4%, and the average wage by 2%. Most of the lost jobs were formal, which is concerning in a country where the formality rate is only around 54% (Camacho et al., 2014). As shown in Panel C of Table 3 and the event studies in Panels E, F, and G of Figure 4 and Appendix Figure A5, these effects primarily manifest in the long term (2015–2018). Furthermore, the event studies indicate that labor reductions take longer to materialize than wage decreases. This is consistent with the notion that firing workers is more difficult than lowering wages in labor markets with frictions, such as Colombia's. Appendix Table A4 presents the results disaggregated by low-skill workers (blue-collar) and high-skill workers (white-collar). The point estimates show similar negative effects for both groups, although the effects on white-collar workers are imprecisely measured. This suggests that firms are not altering the skill composition of their workforce in response to the shocks.

Results thus far show that firms more exposed to the Venezuelan trade collapse export less but survive in both the medium and long terms. However, this survival is not without consequences: these firms sell less, produce less, use fewer material inputs, reduce their capital stock, and spend less on labor—both by hiring fewer workers and paying lower wages. The fact that the skill composition of the workforce does not change suggests that the production techniques used by these firms may not be changing substantially. We further investigate this question in the next section, where we estimate the effects on productivity.

5.4 Effects on Productivity

To explain how we construct our total factor productivity (TFP) measure and to fix ideas, consider the following Cobb-Douglas gross output production function:

$$Y_{it} = e^{\omega_{it}+\varepsilon_{it}} M_{it}^{\beta_m} L_{it}^{\beta_l} K_{it}^{\beta_k}, \tag{5}$$

where Y_{it} is the value of (real) revenues for firm i in year t, M_{it} is material inputs consumed, L_{it} is the number of workers, K_{it} is the capital stock, ω_{it} is a productivity shock observed by firms when making their flexible input choices, and ε_{it} is a productivity shock unobserved by

the firm before making its input decisions. Written in logs, the production function becomes:

$$y_{it} = \beta_m m_{it} + \beta_l l_{it} + \beta_k k_{it} + \omega_{it} + \varepsilon_{it}. \tag{6}$$

Suppose that we were able to obtain consistent estimates of the production function revenue elasticities, β_m, β_l, and β_k. In that case, the estimated residual would serve as a proxy for revenue productivity. Following the literature, we refer to this productivity measure as TFPR. Note that, since Y_{it} represents firm revenues, which are influenced by prices and the demand faced by firms, differences in prices across firms would appear in the residual and be accounted for as TFP. In other words, the resulting TFPR measure reflects the firm's ability to generate revenues, which could increase, for example, if the firm has some degree of output market power. Also, obtaining consistent estimates of β_m, β_l, and β_k is challenging due to the presence of ω_{it}. For instance, more productive firms may choose to use more material inputs than less productive ones. This bias, known as *transmission bias*, is the focus of a large body of literature on productivity estimation. Various methods have been proposed to address this issue, starting with Olley and Pakes (1996), which introduced methodologies that proxy or control non-parametrically for ω_{it}. We estimate TFPR using several methodologies, including those proposed by Ackerberg et al. (2015) and Levinsohn and Petrin (2003), which we refer to as ACF and LP, respectively.[22] Additionally, we implement the method of Gandhi et al. (2020), which is based on firms' first-order conditions.

Thus far, we have focused on TFPR, which measures a firm's ability to generate revenues. As noted by Garcia-Marin and Voigtländer (2019), among others, this measure does not necessarily reflect technical efficiency. Using data from Chile, these authors argue that the failure of earlier studies to find a positive relationship between within-firm changes in TFPR and entry into export markets arises from a measurement issue. They show that when firms enter new markets, efficiency improves, as evidenced by a reduction in marginal costs. Simultaneously, firms lower their prices to establish a customer base in foreign markets. These two effects offset each other so that TFPR remains unchanged. For Colombian data, implementing the approach of Garcia-Marin and Voigtländer (2019) for our full sample of exporting firms is not feasible because it requires product-level input cost shares, which are available in the Chilean data but not in our case. Instead, we apply their methodology to single-product firms.[23]

[22]The ACF methodology, unless one assumes that materials are Leontief, only applies to value-added production functions. Such a production function is similar to (5), but the left-hand side uses value added, $Y_{it} - M_{it}$, and M_{it} does not appear on the right-hand side of the equation. For our TFPR estimates using the ACF method, we estimate a value-added production function and obtain the corresponding residual.

[23]This follows Garcia-Marin and Voigtländer (2019), who show robustness results using data from Colombia and Mexico but limit their analysis to single-product firms for the reasons noted.

Another alternative to measure firm efficiency is to consider total factor productivity measures based on quantities (TFPQ). DANE reports detailed information on physical quantities for both outputs and inputs at the 7-digit product code level. DANE pays close attention to units of measurement, as this product-level information is used to construct producer price indexes. We calculate product prices by dividing the total value of a product by its corresponding quantity. Similarly, we divide the value of each material input consumed by the quantity consumed to obtain input prices. Using this information, we construct Sato-Vartia quantity indexes for production and material inputs, following the procedures described in de Roux et al. (2021). The Sato-Vartia production quantity index measures the quantities produced and is therefore free of the concerns related to demand and prices mentioned above. We compute TFPQ measures by replacing y_{it} with the Sato-Vartia production quantity index and m_{it} with the Sato-Vartia input quantity index in equation (6), and applying the LP procedure.[24] Given that each of these TFP measures has advantages and disadvantages, we will present results using multiple measures to provide a fuller picture.

The effects of the Venezuela trade collapse on these measures of TFP are hard to predict. On the one hand, if TFP is a measure of capabilities or technical efficiency—reflecting the know-how of the firm in converting inputs into outputs—one would expect it to remain unchanged following the collapse of a trade partner. On the other hand, if part of what TFP captures includes the firm's ability to appeal to customers in a specific destination and its knowledge of that market (Eaton et al., 2021; Fitzgerald et al., 2024), then TFP would be expected to decline. Similarly, if TFP—and TFPR in particular—captures the firm's capacity to generate revenues, partly due to its market position, it would also be expected to decrease.

Table 4 reports the effects of the Venezuelan trade collapse on Colombian exporters, and present the corresponding event study plots in Figure 5 (SDID) and Appendix Figure A8 (DiD). Column 1 shows the effect on output per worker. We find a negative effect in the SDiD case (Panel A), which can be explained by production decreasing faster than the number of workers.[25] However, this result is not robust to using the DiD design. Column 2 reports the results where TFP is the residual from estimating equation (6) by OLS, which does not correct for transmission bias. Columns 3, 4, and 5 present TFPR estimates obtained using the ACF, LP, and GNR methods, respectively. Column 6 shows the effects on TFPQ, calculated using the Sato-Vartia indexes for outputs and material inputs and the LP methodology to estimate the production function, and finally, column 7 reports the results using the Garcia-Marin and

[24] One limitation of this measure of firm technical efficiency is that it may include quality and variety biases, as discussed in de Roux et al. (2021).

[25] As described in the previous sections, there is an immediate reduction in production, but the decrease in the number of workers takes longer to materialize.

Voigtländer (2019) measure of marginal cost (which is inversely related to productivity).

The main takeaway from Table 4 is that, although the coefficients for the effects of the trade collapse are negative, they tend to be small and imprecise across estimation methods and measures of TFP. In other words, there is no clear effect of the collapse of trade with Venezuela on manufacturing firms' productivity. In fact, for the marginal cost measure, the point estimate is negative, suggesting, if anything, an increase in productivity. This lack of effect persists throughout the post-treatment period, as shown in Panel C of the table and the event studies. These results contrast sharply with recent findings in the literature that exporting leads firms to increase technical efficiency (see, e.g., Atkin et al., 2017; Garcia-Marin and Voigtländer, 2019). A shock in the opposite direction does not appear to have an analogous effect on productivity, neither in the medium- or long-term. This holds true even when using measures of TFP that address the limitations of TFPR as indicators of technical efficiency, such as TFPQ or the marginal cost measure. This result is consistent with the idea that traditional TFP measures capture technical efficiency or know-how, which should not necessarily decline with the collapse of a trade partner. Alternatively, these results suggest that technical efficiency may play a more critical role in determining TFP than other factors, such as knowledge of foreign markets.

5.5 Adaptation

In the previous sections, we examined how firms respond to shocks through their input decisions. However, shocks can also alter how firms adjust their operations in domestic and foreign markets. The literature has shown, for instance, that firms facing domestic economic downturns may pivot to foreign markets to mitigate the impact of the shock (Almunia et al., 2021), or adjust their short-term exporting behavior in response to events such as Brexit or the U.S.-China trade war (see, e.g., Fernandes and Winters, 2021; Jiang et al., 2023; Benguria and Saffie, 2024). Our data allows us to examine these adaptive responses not only in the medium term but also in the long term, and for a shock of far greater magnitude than those studied in prior research. This is not merely a case of additional tariffs—it involves the complete collapse of a trade partner over a much longer period than previously analyzed.

We investigate firms' adaptation by focusing on the following outcomes. First, domestic sales, as firms may turn to the local market to weather the collapse of a trade partner. Second, the number of markets (excluding Venezuela) to which firms export, as affected firms may seek other international markets for their sales. Relatedly, we examine the probability that a firm exports to one of the top 10 trade partners of Colombia at baseline (excluding Venezuela

and focusing on the pre-sample period, 2001-2004) and the value sold to those destinations.[26] Next, we analyze the probability of exporting and the value exported to destinations (among the top 10) where the firm was not exporting at baseline. Finally, we study whether the firm changes the number of products produced or introduces new products, potentially to appeal to new customers in new destinations. We report the results in Table 5 and the corresponding event studies in Figure 6 (SDID) and Appendix Figure A9 (DiD).

Column 1 of Table 5 shows, somewhat surprisingly, that firms do not increase their domestic sales. We find no effects on sales in Colombia under either methodology, even in the long term. This could be because firms produce goods that are specific to the Venezuelan market or because they have other, more effective ways to cope with the loss of a trading partner. In column 2, we report the effect on the number of markets (excluding Venezuela) to which firms export. Again, we find no effects on this outcome, suggesting that firms are not exporting to more markets than before. Columns 3 and 4 present the effects on the probability of exporting to, and the log value of exports to, countries in the top 10 export destinations. Exposed firms are significantly more likely to export to countries in the top 10. The probability of exporting increases by 4.1 pp (according to the SDiD) and by 3.7 pp (according to the DiD). This increase is accompanied by an increase in the total value exported, as shown in column 4. Panel C indicates that both effects are larger in the long term (2014–2018) than in the short term (2009–2013), suggesting that this adaptation strategy takes several years to materialize.

The finding that firms export more frequently and in greater value to countries in the top 10 could be driven by two potential channels: (i) firms exposed to the trade collapse exporting more to destinations where they were already exporting at baseline, or (ii) firms expanding into new markets after the collapse of trade with Venezuela, i.e., markets to which they did not export in 2001–2004. We distinguish between these alternatives by estimating the effects on the probability of exporting and the value exported to countries in the top 10, but only to those to which the firm was not exporting before the start of the sample period. These results are reported in columns 5 and 6. We find no effect on either of these outcomes. Taken together, the results from columns 3 to 6 indicate that exposed firms increase both the probability of exporting and the value exported to countries in the top 10 destinations compared to firms in the control group. However, this effect is driven entirely by the intensive margin. Firms export more, but only to countries to which they were already exporting at baseline; they do not expand into new markets within the top 10 destinations after Venezuela's trade collapse. This result implies that even for exporting firms under pressure—firms with

[26]Ranked by importance, Colombia's 10 main trade partners during the pre-sample period (2001–2004), excluding Venezuela, are the United States, Ecuador, Peru, Mexico, Panama, Costa Rica, the Dominican Republic, Guatemala, and Honduras.

exporting knowledge—it is difficult to enter new markets. This finding is consistent with the literature emphasizing the importance of customer bases and knowledge of destination markets in determining the success of exporting firms (see, e.g., Eaton et al., 2021; Fitzgerald et al., 2024). It appears to be easier for these firms to double down on efforts in markets where they already have a foothold than to establish themselves in new ones.

Finally, we explore whether firms adapt their product mix to appeal to different destinations. As discussed in Section 5.1, treated firms reduce the number of exported products. However, it could also be the case that, to appeal to customers in destinations other than Venezuela, they create new products. Column 7 shows that, according to the SDiD design, exposed firms produced fewer products after the collapse of their trade partner.[27] Similarly, column 8 shows that firms are not more likely to include a new product in their product mix. These two results reinforce the idea that firms are not entering new markets but are instead trying to adapt to the shock by strengthening their relationships with existing trade partners. Again, this aligns with the notion that selling to a new destination is significantly harder than increasing efforts in already established destinations with which firms have an existing relationship.

5.6 Robustness

We explore the robustness of our results across multiple dimensions. First, the choice of the 75th percentile for the share of exports to Venezuela as the threshold for defining treated firms is arbitrary. Appendix Figures A10 and A11 illustrate how the treatment effect varies when we change the percentile threshold for treated firms to percentiles in the range (50, 55, ..., 95). Each panel in these figures corresponds to a different outcome and reports the estimated treatment effect using the SDiD research design, along with its 95% confidence interval. The results are robust to the choice of percentile. Interestingly, for some outcomes, the (absolute) size of the effect increases monotonically as the percentile increases.

Appendix Figures A12 and A13 show that our results are not driven by any particular 2-digit sector. Each panel in these figures shows the estimated effect of the trade partner collapse when excluding, one by one, each 2-digit sector from our SDiD estimation. The y-axis reports the point estimate and the corresponding 95% confidence interval obtained from a sample that excludes the sector listed on the y-axis. For a selection of the outcomes from our main analysis, these figures show that the results remain practically unchanged when excluding any single sector. Finally, Appendix Table A5 shows that our results are robust to using the inverse hyperbolic sine (IHS) transformation instead of the $\log(\text{value}+1)$

[27] The estimated effect is negative but imprecise in the DiD case, reported in Panel B.

transformation for outcomes where the latter was applied, such as the total value exported to Venezuela or the total value exported. These outcomes can take a value of zero for some firms in certain years.

6 Conclusion

This paper examines the medium- and long-term impacts of the collapse of Venezuela as a trade partner on Colombian manufacturing exporters. We exploit the abrupt trade disruption initiated by Hugo Chávez's policies in 2009 and Venezuela's subsequent economic collapse. Using rich data from the Colombian manufacturing census and customs records merged at the firm level, we apply Synthetic Difference-in-Differences (SDiD) and Difference-in-Differences (DiD) research designs to study the firm-level responses across various dimensions. Our findings reveal substantial declines in export activity for firms heavily reliant on Venezuela, with reductions in the probability and value of exports, as well as the number of exported products. These effects persisted over a decade, highlighting the enduring challenges posed by the loss of a major trade partner. Despite these disruptions, firms do not exit the market, though they reduce their sales and production.

The collapse of trade with Venezuela led to significant adjustments in input and labor decisions. Firms reduced their consumption of material inputs, scaled back capital investment, and lowered labor costs by cutting wages and workforce size. However, these adjustments unfolded gradually, particularly for labor. Interestingly, we find no evidence of significant declines in total factor productivity (TFP), suggesting that technical efficiency and firm know-how were largely preserved. In terms of adaptation, firms did not expand into new markets or introduce new products; instead, they reinforced trade relationships with pre-existing export destinations. This response underscores the difficulties of market diversification in the face of major trade disruptions.

Our findings underscore the need for policymakers to mitigate the risks associated with over-reliance on a single trade partner. Trade diversification strategies, such as fostering new export relationships and reducing barriers to entry in international markets, could help firms build resilience against future shocks. Programs that provide financial assistance or technical support to firms seeking to enter new markets may also facilitate adaptation. Moreover, the lack of significant TFP losses highlights the potential benefits of leveraging existing firm capabilities. Policies aimed at strengthening firms' access to global value chains and encouraging innovation could capitalize on the technical efficiency preserved even after the trade collapse. Additionally, labor market reforms that balance flexibility with worker protections could enable more timely adjustments, helping firms respond more effectively to

trade shocks. By addressing these aspects, policymakers can better equip firms to navigate the challenges of a rapidly changing and uncertain global trade environment.

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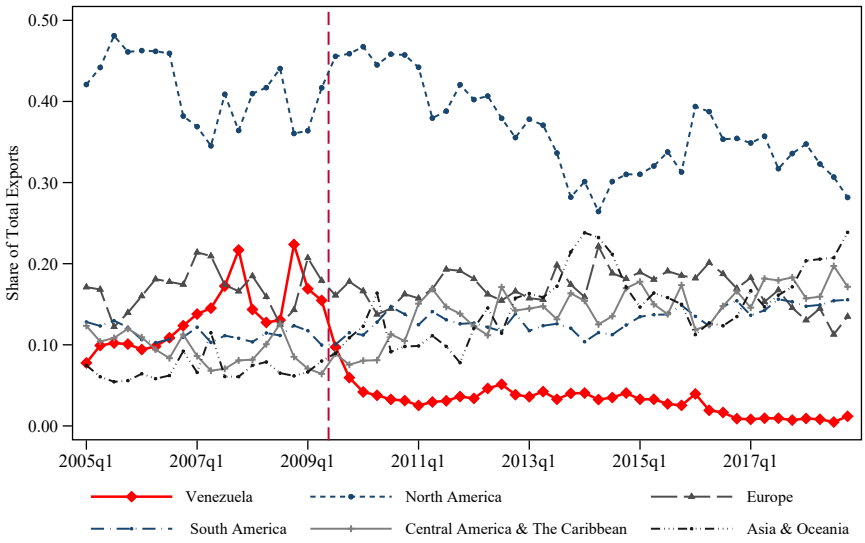
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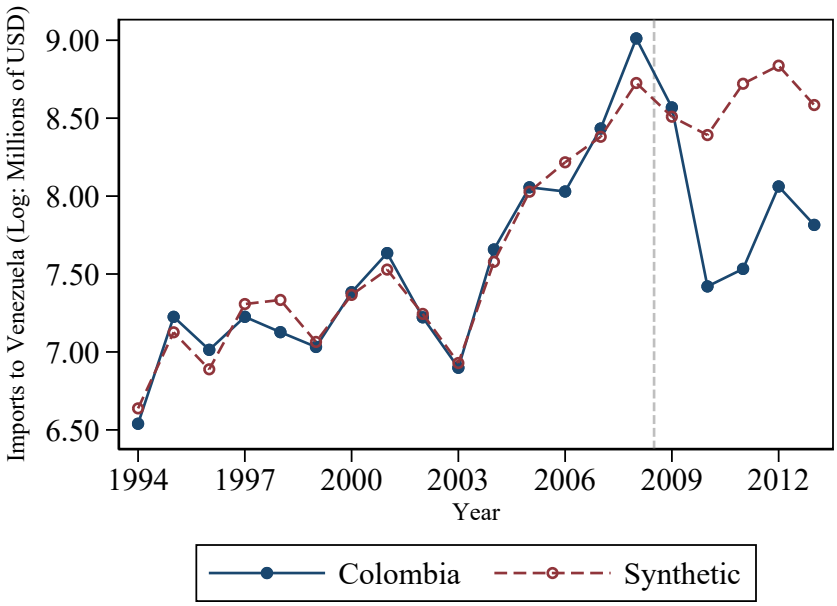
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Figure 1: The Venezuelan Trade Collapse: Time Series and Synthetic Control Evidence



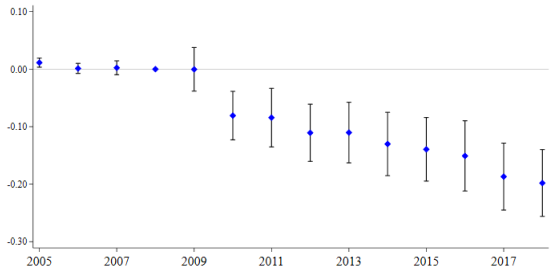
(a) Colombian Exports: Share by Destination



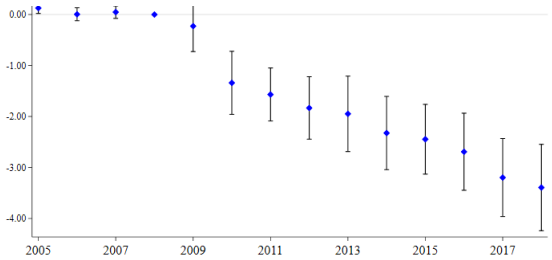
(b) Venezuelan Imports from Colombia: Synthetic control

Notes: Panel (a) shows the share of Colombian exports for different destinations at the quarterly level, based on the customs data from DIAN. Panel (b) shows the time series of log Venezuelan imports from Colombia at the yearly level, based on data from UN-COMTRADE. This panel also shows estimates from the synthetic control designed to best replicate the time series until 2009. The latter is based on a donor pool of 72 countries.

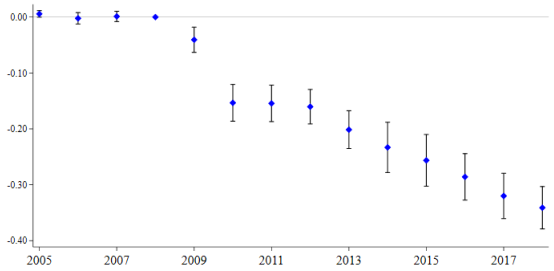
Figure 2: Exporting Behavior, SDiD, Event Studies



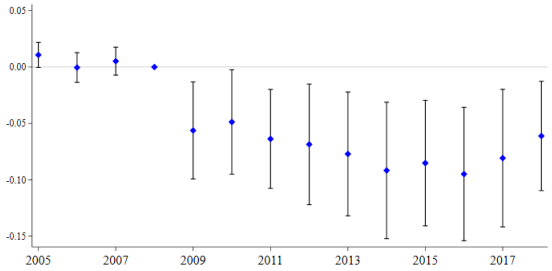
(a) Exports to Venezuela, Probability



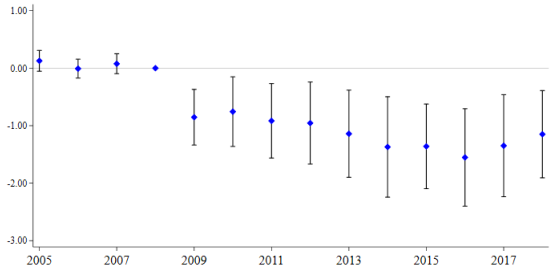
(b) Exports to Venezuela, Value



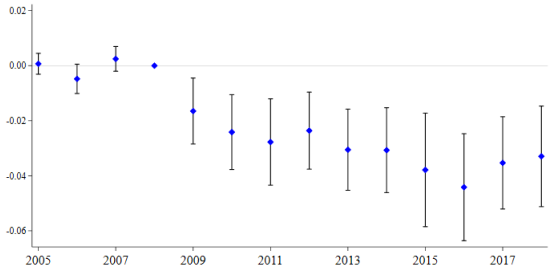
(c) Exports to Venezuela, Share



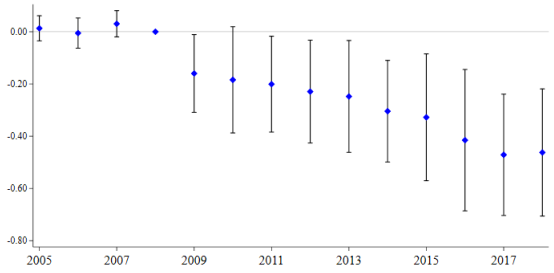
(d) Exports, Probability



(e) Exports, Value



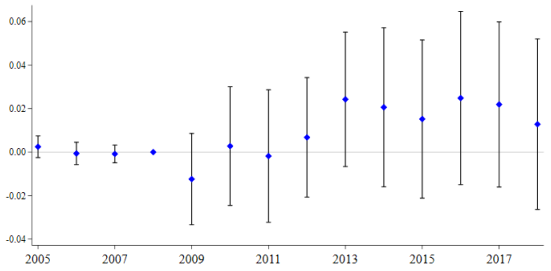
(f) Exports, Share



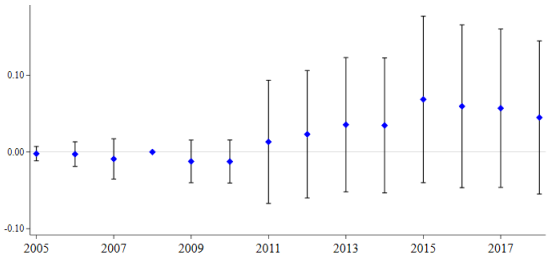
(g) Exported Products

Notes: Each panel shows an event study plot of the effect of the Venezuela trade collapse, using the Synthetic Difference-in-Differences design (equation 1 in the text) for the outcome described in the caption. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004 and observed every year in 2005-2018. Each panel shows the estimated coefficient and 95% confidence intervals of $Exposed_i \times D[\text{year} = x]$, where $Exposed_i$ is a dummy equal to 1 for firms exposed to the collapse, and x is the year indicated on the x-axis. Exposed firms are those with a share of exports to Venezuela (out of total exports) during 2001–2004 above the 75th percentile across firms. The outcomes are: (a) a dummy equal to one if the firm exported to Venezuela, (b) the log(value+1) of total exports to Venezuela, (c) the export share to Venezuela, (d) a dummy equal to one if the firm exported to any country, (e) the log(value+1) of total exports, (f) the export share out of total sales, and (g) the number of exported products. Standard errors are obtained using a bootstrap procedure with 50 repetitions.

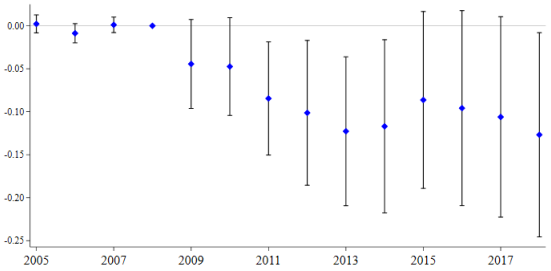
Figure 3: Survival and Production Decisions, SDiD, Event Studies



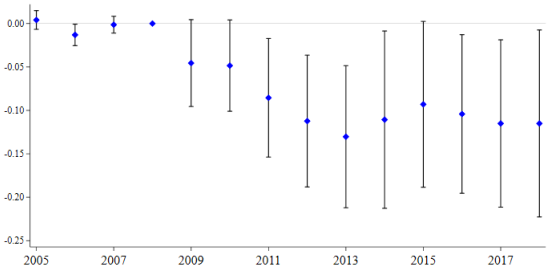
(a) Survival, Probability



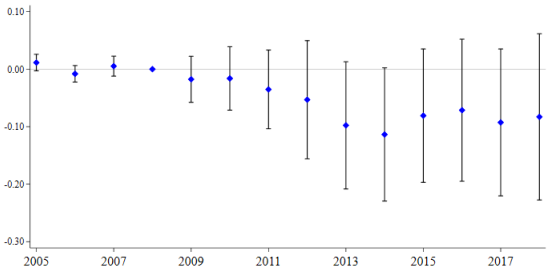
(b) Number of Plants



(c) Total Sales



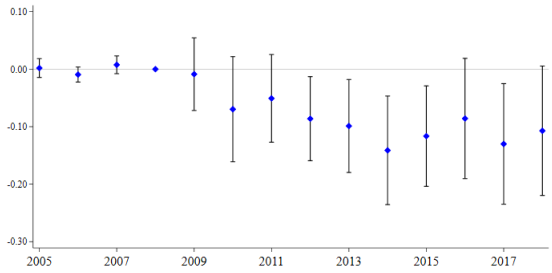
(d) Production Values



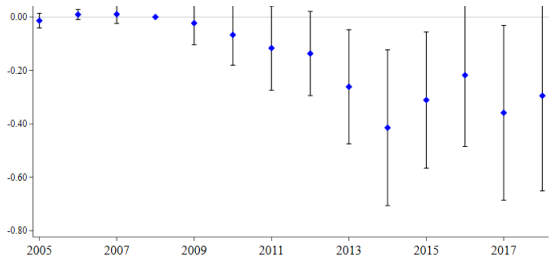
(e) Production Quantities, Satio-Vartia Index

Notes: Each panel shows an event study plot of the effect of the Venezuela trade collapse, using the Synthetic Difference-in-Differences design (equation 1 in the text) for the outcome described in the caption. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004 and observed every year in 2005-2018. Each panel shows the estimated coefficient and 95% confidence intervals of $Exposed_i \times D[\text{year} = x]$, where $Exposed_i$ is a dummy equal to 1 for firms exposed to the collapse, and x is the year indicated on the x-axis. Exposed firms are those with a share of exports to Venezuela (out of total exports) during 2001–2004 above the 75th percentile across firms. The outcomes are: (a) a dummy variable equal to one if the firm appears in the manufacturing census, (b) the firm's number of plants, (c) the log(value) of the firm's total sales, (d) the log(value) of the firm's production, and (e) the log(value) of the Sato-Vartia Index of production quantities.

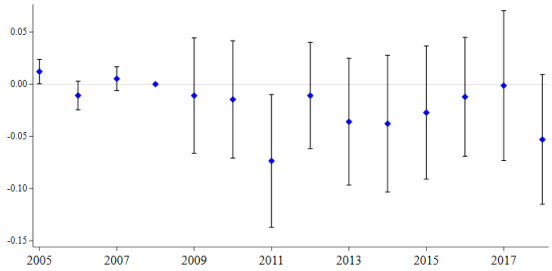
Figure 4: Input Decisions, SDiD, Event Studies



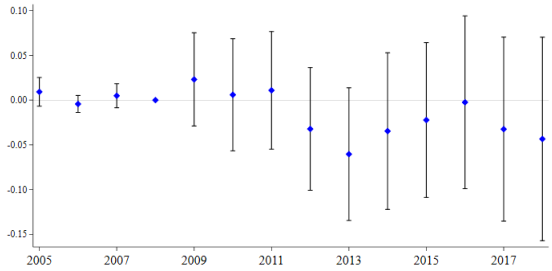
(a) Material Inputs



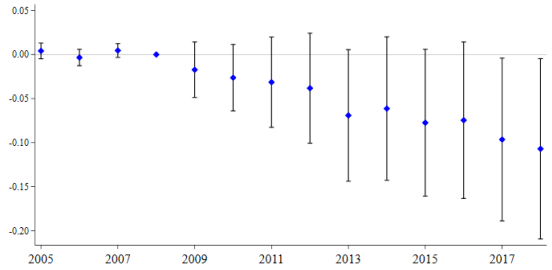
(b) Capital Stock



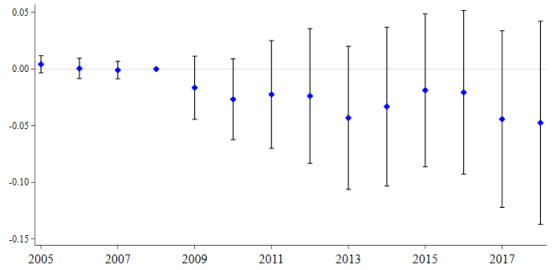
(c) Investment



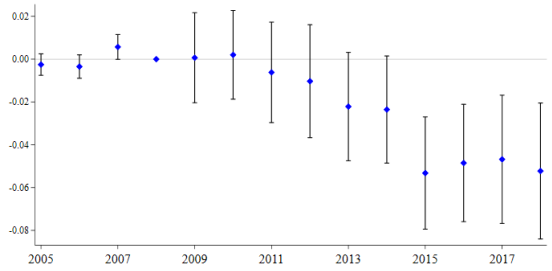
(d) Energy



(e) Wage Bill



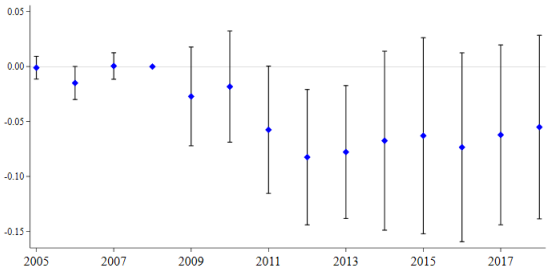
(f) Number of Workers



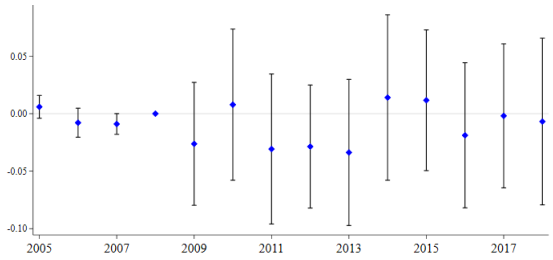
(g) Average Wage

Notes: Each panel shows an event study plot of the effect of the Venezuela trade collapse, using the Synthetic Difference-in-Differences design (equation 1 in the text) for the outcome described in the caption. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004 and observed every year in 2005-2018. Each panel shows the estimated coefficient and 95% confidence intervals of $Exposed_i \times D[\text{year} = x]$, where $Exposed_i$ is a dummy equal to 1 for firms exposed to the collapse, and x is the year indicated on the x-axis. Exposed firms are those with a share of exports to Venezuela (out of total exports) during 2001–2004 above the 75th percentile across firms. The outcomes are: (a) the log(value) of material inputs consumed, (b) the log(value+1) of machinery and equipment capital stock, (c) a dummy equal to one if the firm made a positive investment in capital and equipment, (d) the log(value) of energy consumption, (e) the log(value) of the wage bill, (f) the log(value) of the number of workers, and (g) the log(value) of the average wage, obtained by dividing the wage bill by the number of workers.

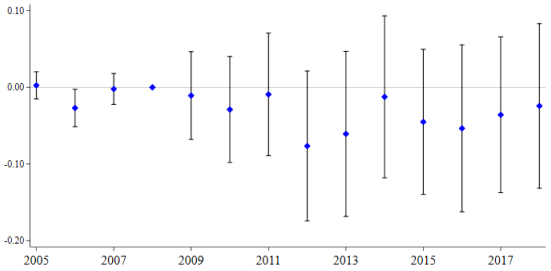
Figure 5: Total Factor Productivity, SDiD, Event Studies



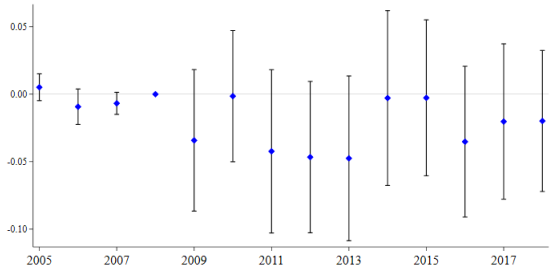
(a) Output per Worker



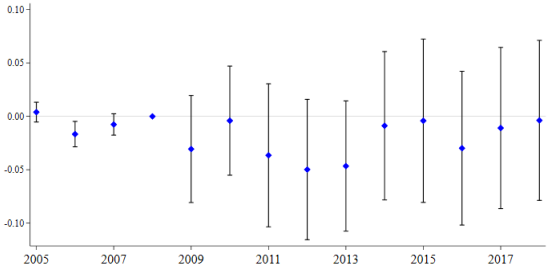
(b) TFPR, OLS



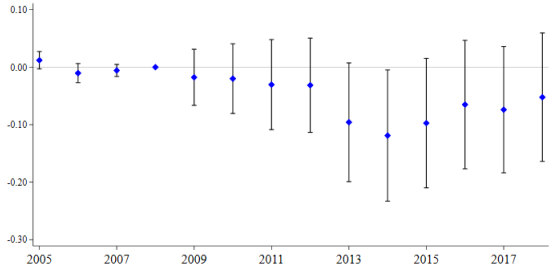
(c) TFPR, LP



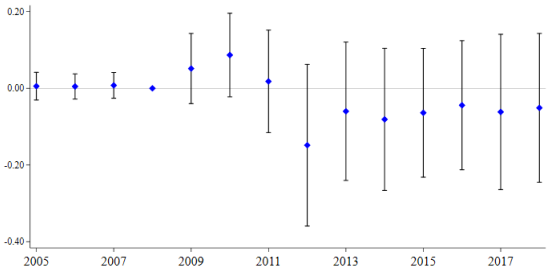
(d) TFPR, ACF



(e) TFPQ, GNR



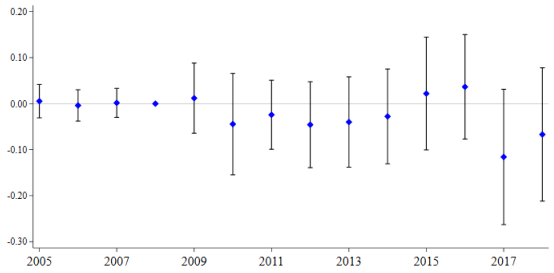
(f) TFPQ, LP



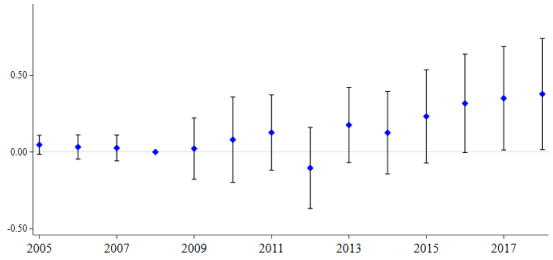
(g) Marginal Cost

Notes: Each panel shows an event study plot of the effect of the Venezuela trade collapse, using the Synthetic Difference-in-Differences design (equation 1 in the text) for the outcome described in the caption. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004 and observed every year in 2005-2018. Each panel shows the estimated coefficient and 95% confidence intervals of $Exposed_i \times D[\text{year} = x]$, where $Exposed_i$ is a dummy equal to 1 for firms exposed to the collapse, and x is the year indicated on the x-axis. Exposed firms are those with a share of exports to Venezuela (out of total exports) during 2001–2004 above the 75th percentile across firms. The outcomes are: (a) output per worker, TFPR based on a Cobb-Douglass production function estimated using OLS (b), LP (c), ACF (d), and GNR (f), TFPQ based on a Cobb-Douglass production function estimated using LP (g), and (d) marginal costs derived from single-product firms following Garcia-Marin and Voigtländer (2019).

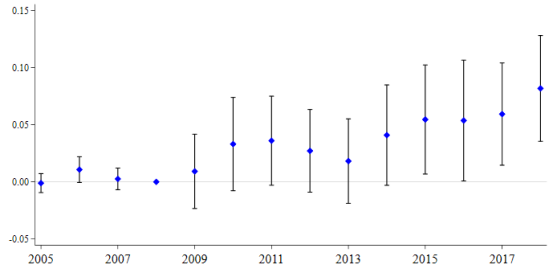
Figure 6: Adaptation, SDiD, Event Studies



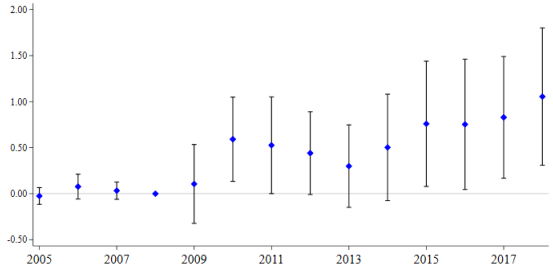
(a) Domestic Sales



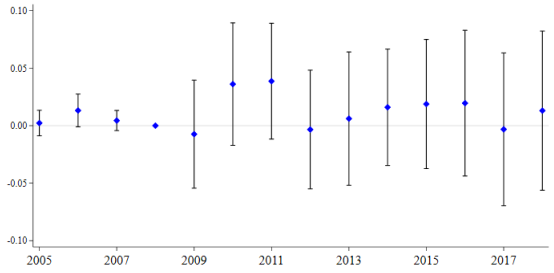
(b) Number of Markets



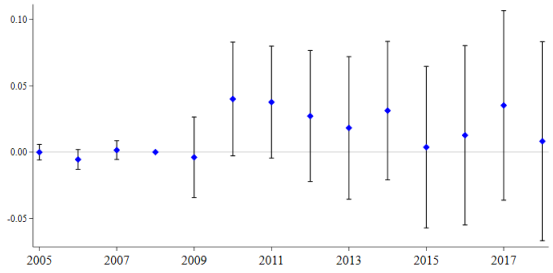
(c) Exports to Top 10, Probability



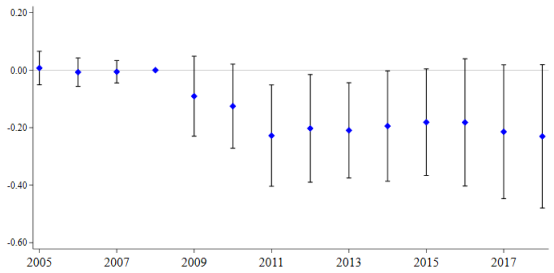
(d) Exports to Top 10, Value



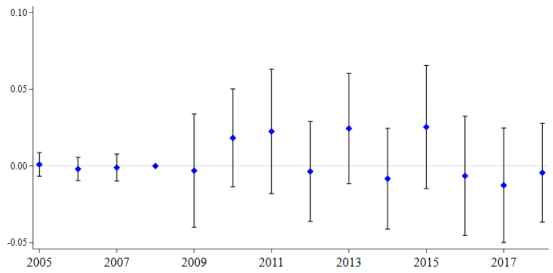
(e) New Destination in Top 10, Prob.



(f) New Destination in Top 10, Value



(g) Number of Products



(h) Number of New Products

Notes: Each panel shows an event study plot of the effect of the Venezuela trade collapse, using the Synthetic Difference-in-Differences design (equation 1 in the text) for the outcome described in the caption. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004 and observed every year in 2005-2018. Each panel shows the estimated coefficient and 95% confidence intervals of $Exposed_i \times D[\text{year} = x]$, where $Exposed_i$ is a dummy equal to 1 for firms exposed to the collapse, and x is the year indicated on the x-axis. Exposed firms are those with a share of exports to Venezuela (out of total exports) during 2001–2004 above the 75th percentile across firms. The outcomes are: (a) the log(value) of domestic sales, (b) the number of markets to which the firm exports, (c) the probability of exporting to the top 10 destination countries (excluding Venezuela), (d) the log(value+1) of exports the top 10, (e) the probability of exporting to the top 10 excluding destinations to which the firm did not export in 2001-2004, (f) the log(value+1) of exports to the top 10 excluding destinations to which the firm did not export in 2001-2004, (g) the number of products, and (h) the number of new products introduced by the firm.

Table 1: Exporting Behavior

	Exports to Venezuela			Total Exports			
	= 1	Log Value	Share	= 1	Log Value	Share	Products
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A: SDiD						
Exposed_i	-0.119***	-2.096***	-0.215***	-0.073***	-1.140***	-0.030***	-0.300***
$\times \mathbb{1}[2009 \leq t]$	(0.020)	(0.274)	(0.018)	(0.016)	(0.224)	(0.007)	(0.079)
Observations	19,460	19,460	13,790	19,460	19,460	19,460	19,460
Firms	1,390	1,390	985	1,390	1,390	1,390	1,390
Treated	345	345	240	345	345	345	345
Mean	0.483	3.670	0.236	0.548	10.213	0.130	1.560
	Panel B: DiD						
Exposed_i	-0.128***	-2.055***	-0.201***	-0.073***	-1.116***	-0.025***	-0.282***
$\times \mathbb{1}[2009 \leq t]$	(0.019)	(0.253)	(0.015)	(0.017)	(0.224)	(0.005)	(0.066)
	Panel C: DiD - Medium and Long Term						
Exposed_i	-0.090***	-1.452***	-0.134***	-0.063***	-0.922***	-0.019***	-0.207***
$\times \mathbb{1}[2009 \leq t \leq 2013]$	(0.019)	(0.246)	(0.015)	(0.018)	(0.230)	(0.005)	(0.060)
Exposed_i	-0.177***	-2.833***	-0.294***	-0.087***	-1.367***	-0.032***	-0.378***
$\times \mathbb{1}[2014 \leq t \leq 2018]$	(0.024)	(0.320)	(0.018)	(0.022)	(0.299)	(0.007)	(0.097)
p-val: med.=long	0.000	0.000	0.000	0.240	0.113	0.053	0.044
Obs.	26,581	26,581	19,343	26,581	26,581	26,581	26,581
Firms	2,351	2,351	2,030	2,351	2,351	2,351	2,351
Treated	577	577	507	577	577	577	577
Mean	0.443	2.861	0.251	0.498	7.693	0.127	1.342

Notes: This table reports estimates of the effect of the trade collapse of Venezuela on exporting outcomes. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004, according to the customs data. Panel A shows Synthetic Differences-in-Differences (SDiD) estimates (see equation (1) in the text) of the effect of the trade collapse. We report the estimated coefficient of $Exposed_i \times D[2009 \leq t]$, which is a dummy equal to 1 for firms exposed to the collapse and years 2009 and onward. Exposed firms are those whose share of exports to Venezuela (out of total exports) during 2001–2004 is above the 75th percentile across firms. Panel B shows Difference-in-Difference estimates of the same treatment effect (see equation 2). Panel C shows Difference-in-Difference estimates of the effect of the trade collapse in the medium term (2009-2003) and the long-term (2014-2018), captured by the coefficients of $Exposed_i \times D[2009 \leq t \leq 2013]$ (a dummy equal to 1 for exposed firms in years 2009 to 2013), and $Exposed_i \times D[2014 \leq t \leq 2018]$ (a dummy equal to 1 for exposed firms in years 2009 to 2018), following equation (3). Each column corresponds to a different outcome. The outcomes are: (1) a dummy equal to one if the firm exported to Venezuela, (2) the log(value+1) of total exports to Venezuela, (3) the export share to Venezuela, (4) a dummy equal to one if the firm exported to any country, (5) the log(value+1) of total exports, (6) the export share out of total sales, and (7) the number of exported products. The sample of Panel A includes only firms observed in the EAM in all the years in 2005-2018. Line "Mean" reports the outcome mean in 2005-2009 and line "panel p-val: med = long" reports the p-value of a test where the null hypothesis is that the coefficients of $Exposed_i \times D[2009 \leq t \leq 2013]$ and $Exposed_i \times D[2014 \leq t \leq 2018]$ are equal. Regressions in Panels B and C include year × 3-digit sector fixed effects. In parenthesis, Panel A reports bootstrapped standard errors (with 50 repetitions) while Panel B and C report standard errors clustered at the 3-digit sector level. *p<0.1, **p<0.05, ***p<0.01.

Table 2: Survival and Production Decisions

	Survival = 1	Plants	Total Sales Log Value	Production	
				Log Value	Index
	(1)	(2)	(3)	(4)	(5)
	Panel A: SDiD				
Exposed_i	0.011	0.031	-0.093***	-0.096***	-0.066*
$\times \mathbb{1}[2009 \leq t]$	(0.012)	(0.031)	(0.034)	(0.034)	(0.037)
Observations	34,440	19,460	19,460	19,460	19,124
Firms	2,460	1,390	1,390	1,390	1,366
Treated	615	345	345	345	340
Mean	0.919	1.181	57.366	59.564	16.241
	Panel B: DiD				
Exposed_i	-0.001	0.022	-0.069**	-0.070**	-0.067*
$\times \mathbb{1}[2009 \leq t]$	(0.019)	(0.026)	(0.034)	(0.034)	(0.037)
	Panel C: DiD - Medium and long term				
Exposed_i	-0.004	0.010	-0.042	-0.046	-0.048
$\times \mathbb{1}[2009 \leq t \leq 2013]$	(0.019)	(0.022)	(0.029)	(0.028)	(0.031)
Exposed_i	0.003	0.037	-0.103**	-0.101**	-0.094*
$\times \mathbb{1}[2014 \leq t \leq 2018]$	(0.021)	(0.035)	(0.048)	(0.048)	(0.052)
p-val: med =long	0.605	0.198	0.083	0.102	0.219
Observations.	34,300	26,581	26,581	26,581	24,352
Firms	2,450	2,351	2,351	2,351	2,202
Treated	614	577	577	577	522
Mean	0.919	1.128	42.028	43.636	15.792

Notes: This table reports estimates of the effect of the trade collapse of Venezuela on exporting outcomes. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004, according to the customs data. Panel A shows Synthetic Differences-in-Differences (SDiD) estimates (see equation (1) in the text) of the effect of the trade collapse. We report the estimated coefficient of $Exposed_i \times D[2009 \leq t]$, which is a dummy equal to 1 for firms exposed to the collapse and years 2009 and onward. Exposed firms are those whose share of exports to Venezuela (out of total exports) during 2001–2004 is above the 75th percentile across firms. Panel B shows Difference-in-Difference estimates of the same treatment effect (see equation 2). Panel C shows Difference-in-Difference estimates of the effect of the trade collapse in the medium term (2009-2003) and the long-term (2014-2018), captured by the coefficients of $Exposed_i \times D[2009 \leq t \leq 2013]$ (a dummy equal to 1 for exposed firms in years 2009 to 2013), and $Exposed_i \times D[2014 \leq t \leq 2018]$ (a dummy equal to 1 for exposed firms in years 2009 to 2018), following equation (3). Each column corresponds to a different outcome. The outcomes are: (1) a dummy variable equal to one if the firm appears in the manufacturing census in the corresponding year, (2) the firm's number of plants, (3) the log(value) of the firm's total sales, (4) the log(value) of the firm's production, and (5) the log(value) of the Sato-Vartia Index of production quantities. The sample of Panel A includes only firms observed in the EAM in all the years in 2005-2018. Line "Mean" reports the outcome mean in 2005-2009 and line "panel p-val: med = long" reports the p-value of a test where the null hypothesis is that the coefficients of $Exposed_i \times D[2009 \leq t \leq 2013]$ and $Exposed_i \times D[2014 \leq t \leq 2018]$ are equal. Regressions in Panels B and C include year × 3-digit sector fixed effects. In parenthesis, Panel A reports bootstrapped standard errors (with 50 repetitions) while Panel B and C report standard errors clustered at the 3-digit sector level. *p<0.1, **p<0.05, ***p<0.01.

Table 3: Input Decisions

	Materials Consumed Log Value	Capital Stock Log Value	Positive Investment = 1	Energy Consump. Log Value	Wage Bill Log Value	Labor Log Value	Mean Wage Log Value
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A: SDiD						
Exposed_i	-0.089**	-0.220**	-0.028**	-0.019	-0.060**	-0.030	-0.026***
$\times \mathbb{1}[2009 \leq t]$	(0.035)	(0.096)	(0.014)	(0.032)	(0.027)	(0.028)	(0.008)
Observations.	19,460	19,460	19,460	19,460	19,460	19,460	19,460
Firms	1,390	1,390	1,390	1,390	1,390	1,390	1,390
Treated	345	345	345	345	345	345	345
Mean	29.537	16.589	0.753	4.145	7.408	228.796	0.027
	Panel B: DiD						
Exposed_i	-0.092***	-0.205**	-0.027*	-0.051	-0.067**	-0.044*	-0.023**
$\times \mathbb{1}[2009 \leq t]$	(0.031)	(0.090)	(0.015)	(0.035)	(0.027)	(0.024)	(0.009)
	Panel C: DiD - Medium and long term						
Exposed_i	-0.055**	-0.099*	-0.018	-0.030	-0.045*	-0.035*	-0.010
$\times \mathbb{1}[2009 \leq t \leq 2013]$	(0.025)	(0.059)	(0.015)	(0.031)	(0.024)	(0.021)	(0.008)
Exposed_i	-0.141***	-0.341**	-0.039**	-0.079*	-0.096**	-0.057*	-0.039***
$\times \mathbb{1}[2014 \leq t \leq 2018]$	(0.046)	(0.148)	(0.019)	(0.044)	(0.037)	(0.033)	(0.013)
p-val: med=long	0.012	0.041	0.204	0.054	0.062	0.382	0.007
Observations	26,581	26,581	26,581	26,581	26,581	26,581	26,581
Firms	2,351	2,351	2,351	2,351	2,351	2,351	2,351
Treated	577	577	577	577	577	577	577
Mean	22.026	12.480	0.701	3.029	5.750	182.047	0.026

Notes: This table reports estimates of the effect of the trade collapse of Venezuela on exporting outcomes. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004, according to the customs data. Panel A shows Synthetic Differences-in-Differences (SDiD) estimates (see equation (1) in the text) of the effect of the trade collapse. We report the estimated coefficient of $Exposed_i \times D[2009 \leq t]$, which is a dummy equal to 1 for firms exposed to the collapse and years 2009 and onward. Exposed firms are those whose share of exports to Venezuela (out of total exports) during 2001–2004 is above the 75th percentile across firms. Panel B shows Difference-in-Difference estimates of the same treatment effect (see equation 2). Panel C shows Difference-in-Difference estimates of the effect of the trade collapse in the medium term (2009-2003) and the long-term (2014-2018), captured by the coefficients of $Exposed_i \times D[2009 \leq t \leq 2013]$ (a dummy equal to 1 for exposed firms in years 2009 to 2013), and $Exposed_i \times D[2014 \leq t \leq 2018]$ (a dummy equal to 1 for exposed firms in years 2009 to 2013), following equation (3). Each column corresponds to a different outcome. The outcomes are: (1) the log(value) of material inputs consumed, (2) the log(value+1) of machinery and equipment capital stock, (3) a dummy equal to one if the firm made a positive investment in capital and equipment, (4) the log(value) of energy consumption (Kw/h), (5) the log(value) of the wage bill, (6) the log(value) of the number of workers, and (7) the log(value) of the average wage, obtained by dividing the wage bill by the number of workers. The sample of Panel A includes only firms observed in the EAM in all the years in 2005-2018. Line "Mean" reports the outcome mean in 2005-2009 and line "panel p-val: med = long" reports the p-value of a test where the null hypothesis is that the coefficients of $Exposed_i \times D[2009 \leq t \leq 2013]$ and $Exposed_i \times D[2014 \leq t \leq 2018]$ are equal. Regressions in Panels B and C include year × 3-digit sector fixed effects. In parenthesis, Panel A reports bootstrapped standard errors (with 50 repetitions) while Panel B and C report standard errors clustered at the 3-digit sector level. *p<0.1, **p<0.05, ***p<0.01.

Table 4: Total Factor Productivity

		TFPR				TFPQ	Marginal Cost
	Y/L	OLS	ACF	LP	GNR	LP	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel A: SDiD						
Exposed_i	-0.058**	-0.011	-0.036	-0.025	-0.022	-0.060*	-0.035
$\times \mathbb{1}[2009 \leq t]$	(0.026)	(0.020)	(0.028)	(0.020)	(0.023)	(0.037)	(0.067)
Observations	19,460	18,088	17,612	18,256	18,088	17,920	4,116
Firms	1,390	1,292	1,258	1,304	1,292	1,280	294
Treated	345	318	312	321	318	316	69
Mean	251.858	3.359	6.908	5.044	6.187	5.199	0.0068
	Panel B: DiD						
Exposed_i	-0.026	0.003	-0.007	-0.031	-0.004	-0.048	-0.128*
$\times \mathbb{1}[2009 \leq t]$	(0.029)	(0.020)	(0.021)	(0.035)	(0.024)	(0.039)	(0.069)
	Panel C: DiD - Medium and long term						
Exposed_i	-0.011	-0.001	-0.009	-0.031	-0.006	-0.030	-0.144**
$\times \mathbb{1}[2009 \leq t \leq 2013]$	(0.025)	(0.017)	(0.018)	(0.032)	(0.020)	(0.030)	(0.068)
Exposed_i	-0.045	0.009	-0.006	-0.031	-0.000	-0.073	-0.099
$\times \mathbb{1}[2014 \leq t \leq 2018]$	(0.038)	(0.028)	(0.029)	(0.044)	(0.033)	(0.056)	(0.099)
p-val: me.=long	0.139	0.632	0.906	0.996	0.818	0.256	0.602
Observations	26,581	23,660	23,660	22,614	23,660	22,768	5,215
Firm	2,351	2,122	2,122	2,063	2,122	2,034	644
Treatment Firms	577	528	528	511	528	512	130
Mean	253.246	3.358	5.042	6.961	6.186	5.202	0.0068

Notes: This table reports estimates of the effect of the trade collapse of Venezuela on exporting outcomes. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004, according to the customs data. Panel A shows Synthetic Differences-in-Differences (SDiD) estimates (see equation (1) in the text) of the effect of the trade collapse. We report the estimated coefficient of $Exposed_i \times D[2009 \leq t]$, which is a dummy equal to 1 for firms exposed to the collapse and years 2009 and onward. Exposed firms are those whose share of exports to Venezuela (out of total exports) during 2001–2004 is above the 75th percentile across firms. Panel B shows Difference-in-Difference estimates of the same treatment effect (see equation 2). Panel C shows Difference-in-Difference estimates of the effect of the trade collapse in the medium term (2009-2003) and the long-term (2014-2018), captured by the coefficients of $Exposed_i \times D[2009 \leq t \leq 2013]$ (a dummy equal to 1 for exposed firms in years 2009 to 2013), and $Exposed_i \times D[2014 \leq t \leq 2018]$ (a dummy equal to 1 for exposed firms in years 2009 to 2013), following equation (3). Each column corresponds to a different outcome. The outcomes are: (a) output per worker, TFPR based on a Cobb-Douglass production function estimated using OLS (b), LP (c), ACF (d), and GNR (f), TFPQ based on a Cobb-Douglass production function estimated using LP (g), and (d) marginal costs derived from single-product firms following Garcia-Marin and Voigtländer (2019). The sample of Panel A includes only firms observed in the EAM in all the years in 2005-2018. Line "Mean" reports the outcome mean in 2005-2009 and line "panel p-val: med = long" reports the p-value of a test where the null hypothesis is that the coefficients of $Exposed_i \times D[2009 \leq t \leq 2013]$ and $Exposed_i \times D[2014 \leq t \leq 2018]$ are equal. Regressions in Panels B and C include year × 3-digit sector fixed effects. In parenthesis, Panel A reports bootstrapped standard errors (with 50 repetitions) while Panel B and C report standard errors clustered at the 3-digit sector level. *p<0.1, **p<0.05, ***p<0.01.

Table 5: Adaptation

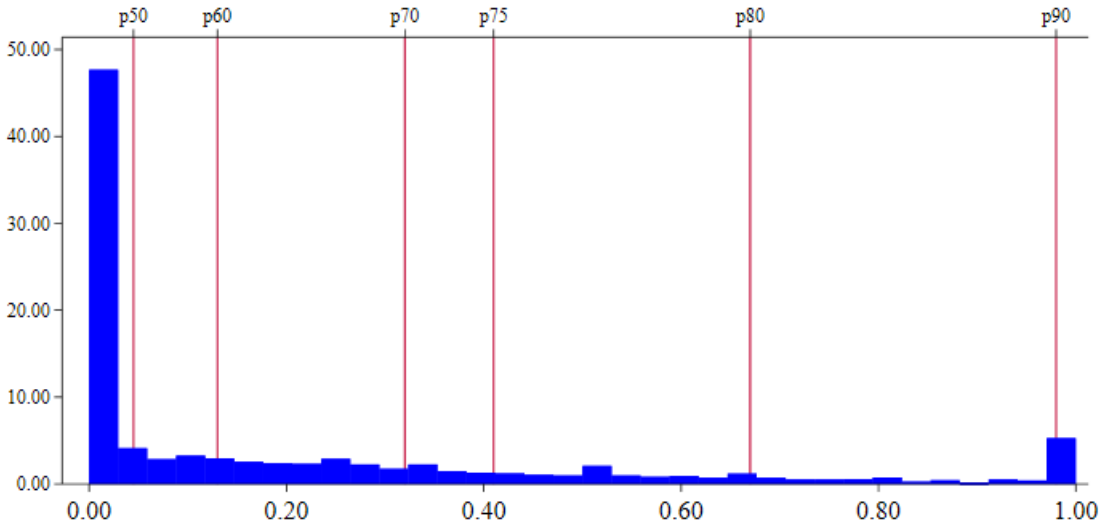
	Domestic Sales Log Val.	Number of Destin.	Exports Top 10 = 1	Exports Top 10 Log Val.	Exports New Des.=1	Exports New Des. Log Val.	Number of Products	New Product =1
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Panel A: SDiD							
Exposed_i	-0.029	0.170	0.041***	0.586***	0.013	0.021	0.186***	0.005
$\times \mathbb{1}[2009 \leq t]$	(0.046)	(0.137)	(0.014)	(0.181)	(0.018)	(0.018)	(0.091)	(0.011)
Observations	19,460	19,460	19,460	19,460	19,460	19,460	19,460	19,460
Firms	1,390	1,390	1,390	1,390	1,390	1,390	1,390	1,390
Treated	345	345	345	345	345	345	345	345
Mean	47.153	4.807	0.758	1.336	0.273	0.143	4.508	0.111
	Panel B: DiD							
Exposed_i	-0.006	0.032	0.037**	0.563***	-0.001	-0.017	-0.095	0.011
$\times \mathbb{1}[2009 \leq t]$	(0.042)	(0.107)	(0.014)	(0.183)	(0.021)	(0.017)	(0.089)	(0.009)
	Panel C: DiD - Medium and long term							
Exposed_i	0.008	0.089	0.026*	0.432**	0.005	0.017	-0.068	-0.016
$\times \mathbb{1}[2014 \leq t \leq 2018]$	(0.039)	(0.098)	(0.015)	(0.189)	(0.022)	(0.014)	(0.082)	(0.012)
Exposed_i	-0.024	0.188	0.051***	0.732***	0.004	0.016	-0.130	0.005
$\times \mathbb{1}[2014 \leq t \leq 2018]$	(0.060)	(0.146)	(0.017)	(0.215)	(0.023)	(0.024)	(0.109)	(0.009)
p-val: med.=long	0.546	0.014	0.058	0.065	0.542	0.987	0.347	0.324
Observations	26,581	26,581	26,581	26,581	26,581	26,581	26,581	26,581
Firms	2,351	2,351	2,351	2,351	2,351	2,351	2,351	2,351
Treated	577	577	577	577	577	577	577	577
Mean	34.335	4.103	0.712	0.913	0.250	0.106	4.703	0.101

Notes: This table reports estimates of the effect of the trade collapse of Venezuela on exporting outcomes. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004, according to the customs data. Panel A shows Synthetic Differences-in-Differences (SDiD) estimates (see equation (1) in the text) of the effect of the trade collapse. We report the estimated coefficient of $Exposed_i \times D[2009 \leq t]$, which is a dummy equal to 1 for firms exposed to the collapse and years 2009 and onward. Exposed firms are those whose share of exports to Venezuela (out of total exports) during 2001–2004 is above the 75th percentile across firms. Panel B shows Difference-in-Difference estimates of the same treatment effect (see equation 2). Panel C shows Difference-in-Difference estimates of the effect of the trade collapse in the medium term (2009-2003) and the long-term (2014-2018), captured by the coefficients of $Exposed_i \times D[2009 \leq t \leq 2013]$ (a dummy equal to 1 for exposed firms in years 2009 to 2013), and $Exposed_i \times D[2014 \leq t \leq 2018]$ (a dummy equal to 1 for exposed firms in years 2009 to 2013), following equation (3). Each column corresponds to a different outcome. The outcomes are: (a) the log(value) of domestic sales, (b) the number of markets to which the firm exports, (c) the probability of exporting to the top 10 destination countries (excluding Venezuela), (d) the log(value+1) of exports the top 10, (e) the probability of exporting to the top 10 excluding destinations to which the firm did not export in 2001-2004, (f) the log(value+1) of exports to the top 10 excluding destinations to which the firm did not export in 2001-2004, (g) the number of products, and (h) a dummy equal to one if the firm produced a new product. The sample of Panel A includes only firms observed in the EAM in all the years in 2005-2018. Line "Mean" reports the outcome mean in 2005-2009 and line "panel p-val: med = long" reports the p-value of a test where the null hypothesis is that the coefficients of $Exposed_i \times D[2009 \leq t \leq 2013]$ and $Exposed_i \times D[2014 \leq t \leq 2018]$ are equal. Regressions in Panels B and C include year × 3-digit sector fixed effects. In parenthesis, Panel A reports bootstrapped standard errors (with 50 repetitions) while Panel B and C report standard errors clustered at the 3-digit sector level. *p<0.1, **p<0.05, ***p<0.01.

APPENDIX
(for online publication)

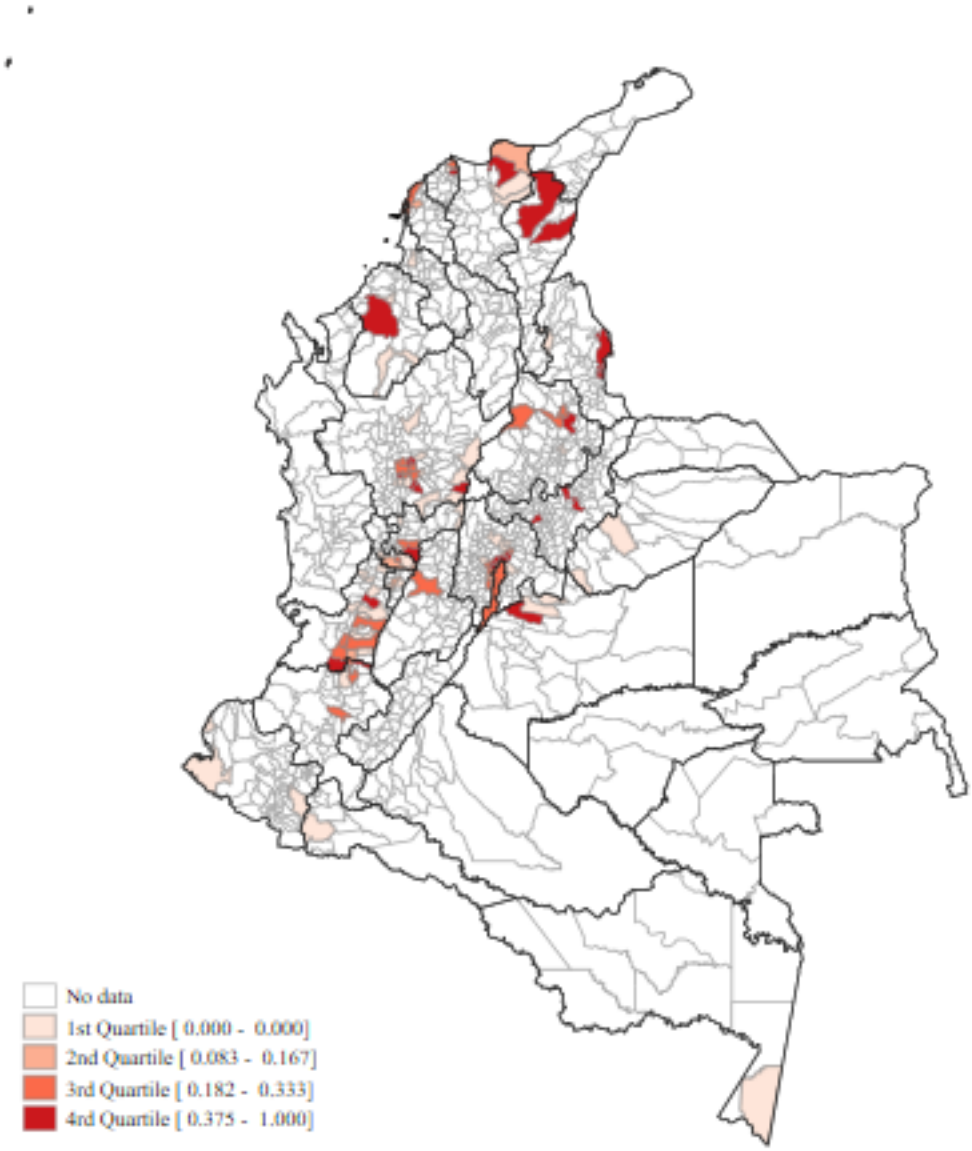
Appendix A Additional Figures and Tables

Figure A1: Share of Exports to Venezuela



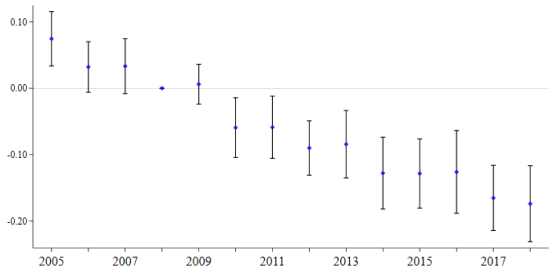
Notes: This figure shows the distribution of firms' export share to Venezuela for the years 2001–2004 in the sample.

Figure A2: Share of Exports to Venezuela

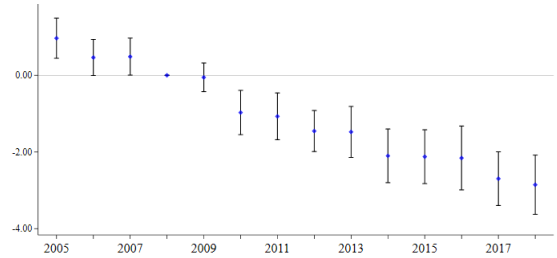


Notes: The figure is a map of Colombia. Bold dark lines indicate departmental boundaries, and gray lines represent municipal boundaries. Colored municipalities are those with at least one firm in the sample. The color scale reflects quartiles of the fraction of firms in each municipality exposed to Venezuela.

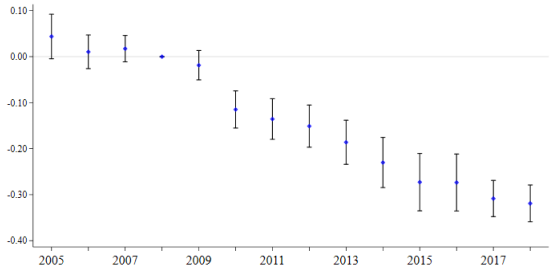
Figure A3: Exporting Behavior, DiD, Event Studies



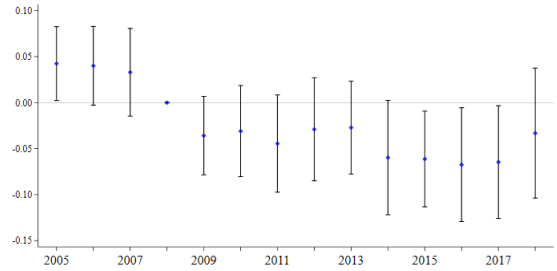
(a) Exports to Venezuela, Probability



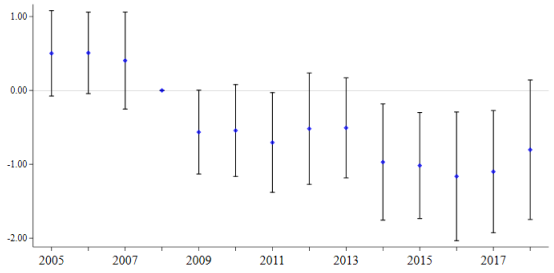
(b) Exports to Venezuela, Value



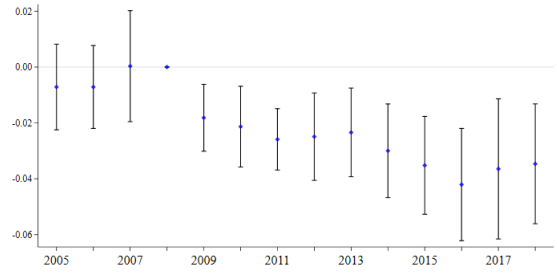
(c) Exports to Venezuela, Share



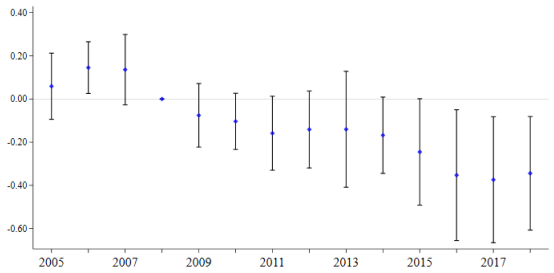
(d) Exports, Probability



(e) Exports, Value



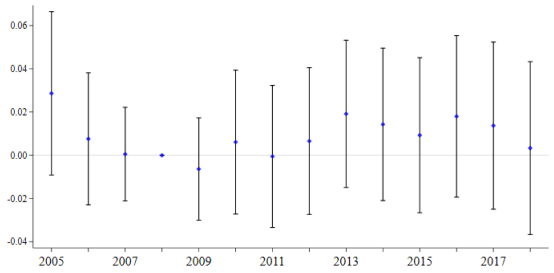
(f) Exports, Share



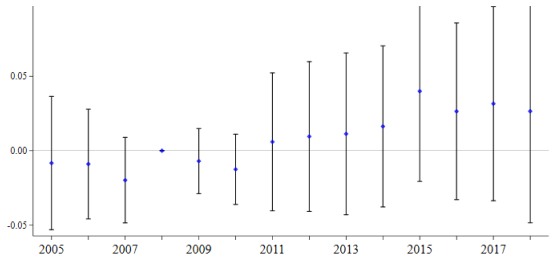
(g) Exported Products

Notes: Each panel shows an event study plot of the effect of the Venezuela trade collapse, using the Difference-in-Differences design (equation 2 in the text) for the outcome described in the caption. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004. Each panel shows the estimated coefficient and 95% confidence intervals of $Exposed_i \times D[\text{year} = x]$, where $Exposed_i$ is a dummy equal to 1 for firms exposed to the collapse, and x is the year indicated on the x-axis. Exposed firms are those with a share of exports to Venezuela (out of total exports) during 2001–2004 above the 75th percentile across firms. The outcomes are: (a) a dummy equal to one if the firm exported to Venezuela, (b) the log(value+1) of total exports to Venezuela, (c) the export share to Venezuela, (d) a dummy equal to one if the firm exported to any country, (e) the log(value+1) of total exports, (f) the export share out of total sales, and (g) the number of exported products. The regressions include year × 3-digit sector fixed effects. Standard errors are clustered at the 3-digit sector level.

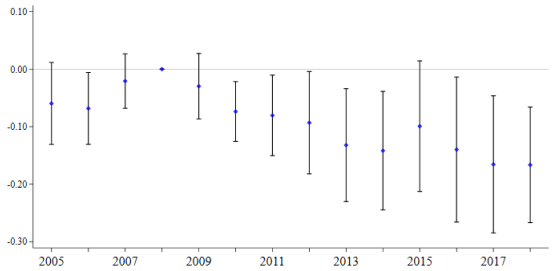
Figure A4: Survival and Production Decisions, DiD, Event Studies



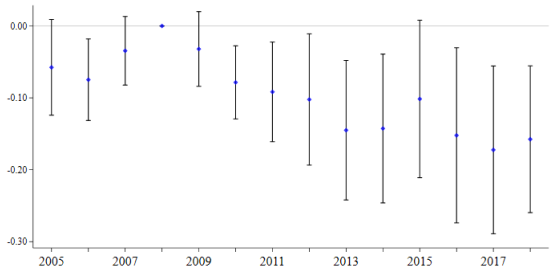
(a) Survival, Probability



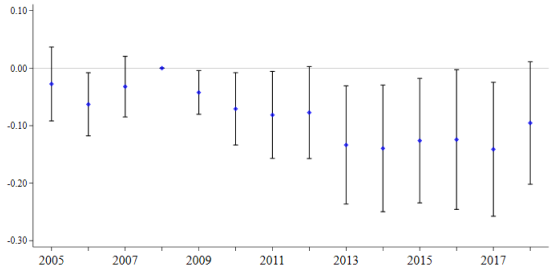
(b) Number of Plants



(c) Total Sales



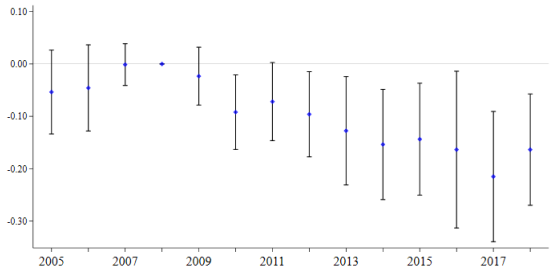
(d) Production Value



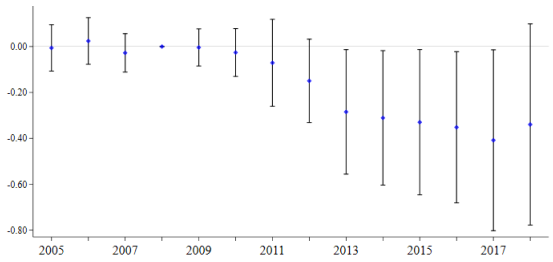
(e) Production Quantities, Satio-Vartia Index

Notes: Each panel shows an event study plot of the effect of the Venezuela trade collapse, using the Difference-in-Differences design (equation 2 in the text) for the outcome described in the caption. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004. Each panel shows the estimated coefficient and 95% confidence intervals of $Exposed_i \times D[\text{year} = x]$, where $Exposed_i$ is a dummy equal to 1 for firms exposed to the collapse, and x is the year indicated on the x-axis. Exposed firms are those with a share of exports to Venezuela (out of total exports) during 2001–2004 above the 75th percentile across firms. The outcomes are: (a) a dummy variable equal to one if the firm appears in the manufacturing census, (b) the firm's number of plants, (c) the log(value) of the firm's total sales, (d) the log(value) of the firm's production, and (e) the log(value) of the Sato-Vartia Index of production quantities. The regressions include year × 3-digit sector fixed effects. Standard errors are clustered at the 3-digit sector level.

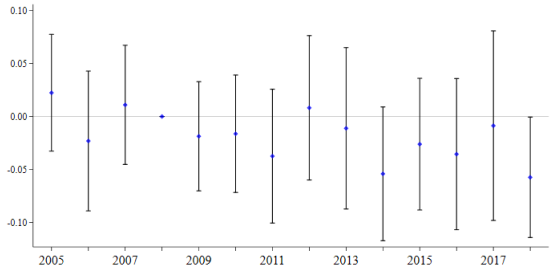
Figure A5: Input Decisions, DiD, Event Studies



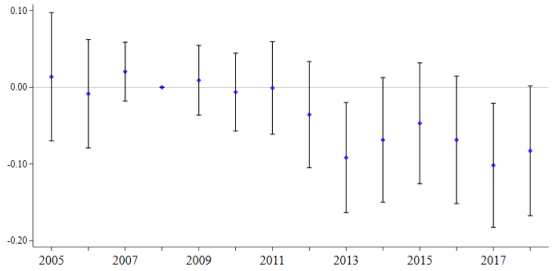
(a) Material Inputs



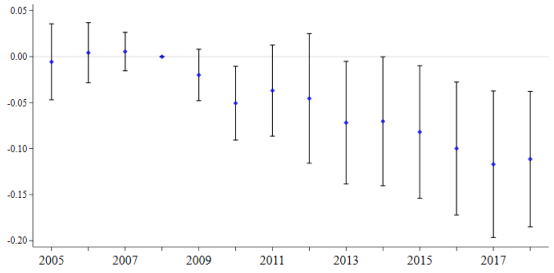
(b) Capital Stock



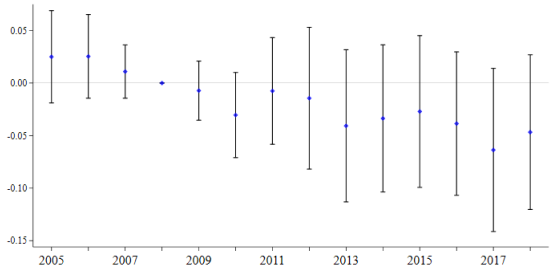
(c) Investment



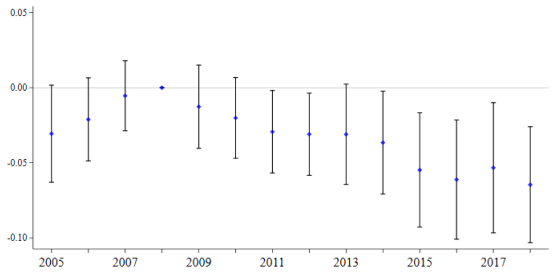
(d) Energy



(e) Wage Bill



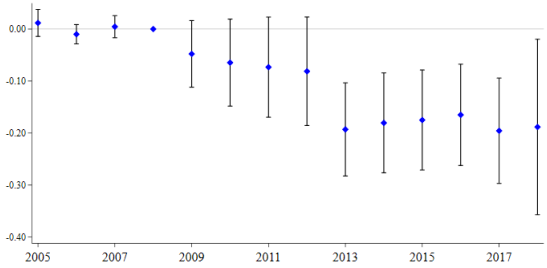
(f) Number of Workers



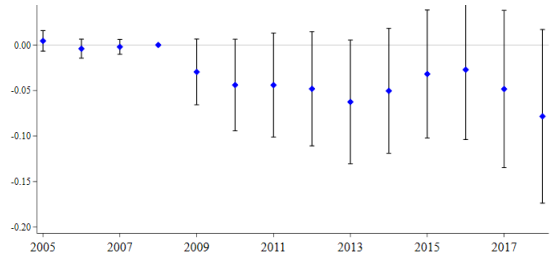
(g) Average Wage

Notes: Each panel shows an event study plot of the effect of the Venezuela trade collapse, using the Difference-in-Differences design (equation 2 in the text) for the outcome described in the caption. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004. Each panel shows the estimated coefficient and 95% confidence intervals of $Exposed_i \times D[\text{year} = x]$, where $Exposed_i$ is a dummy equal to 1 for firms exposed to the collapse, and x is the year indicated on the x-axis. Exposed firms are those with a share of exports to Venezuela (out of total exports) during 2001–2004 above the 75th percentile across firms. The outcomes are: (a) the log(value) of material inputs consumed, (b) the log(value+1) of machinery and equipment capital stock, (c) a dummy equal to one if the firm made a positive investment in capital and equipment, (d) the log(value) of energy consumption, (e) the log(value) of the wage bill, (f) the log(value) of the number of workers, and (g) the log(value) of the average wage, obtained by dividing the wage bill by the number of workers. The regressions include year × 3-digit sector fixed effects. Standard errors are clustered at the 3-digit sector level.

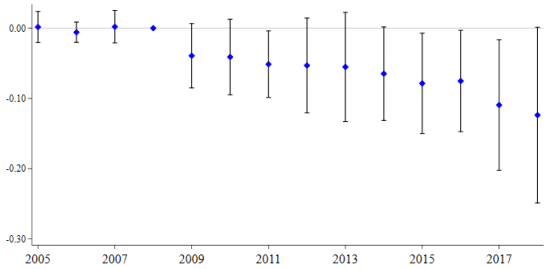
Figure A6: Wages and Labor by Skill Type, SDiD, Event Studies



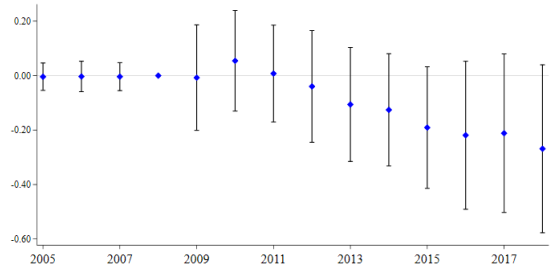
(a) Wage Bill, Blue Collar



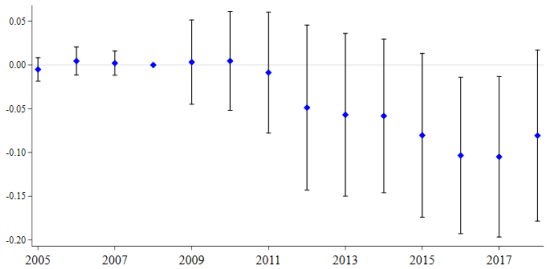
(b) Number of Workers, Blue Collar



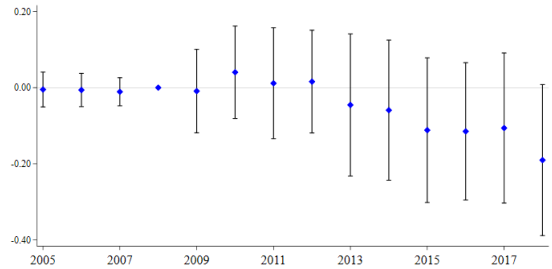
(c) Average Wage, Blue Collar



(d) Wage Bill, White Collar



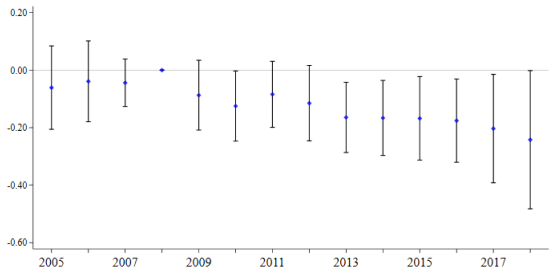
(e) Number of Workers, White Collar



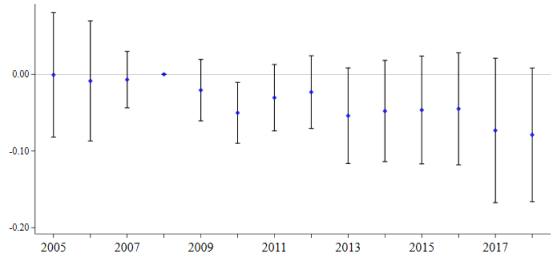
(f) Average Wage, White Collar

Notes: Each panel shows an event study plot of the effect of the Venezuela trade collapse, using the Synthetic Difference-in-Differences design (equation 1 in the text) for the outcome described in the caption. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004 and observed every year in 2005-2018. Each panel shows the estimated coefficient and 95% confidence intervals of $Exposed_i \times D[\text{year} = x]$, where $Exposed_i$ is a dummy equal to 1 for firms exposed to the collapse, and x is the year indicated on the x-axis. Exposed firms are those with a share of exports to Venezuela (out of total exports) during 2001–2004 above the 75th percentile across firms. The outcomes are: (a) the log(value) of the wage bill of blue collar workers, (b) the log(value) of the number of blue collar workers, and (c) the log(value) of the average wage of blue collar workers, obtained by dividing the wage bill of blue collar workers by their number, (d) the log(value) of the wage bill of white collar workers, (e) the log(value) of the number of white collar workers, and (f) the log(value) of the average wage of white collar workers, obtained by dividing the wage bill of white collar workers by their number. Standard errors are obtained using a bootstrap procedure with 50 repetitions.

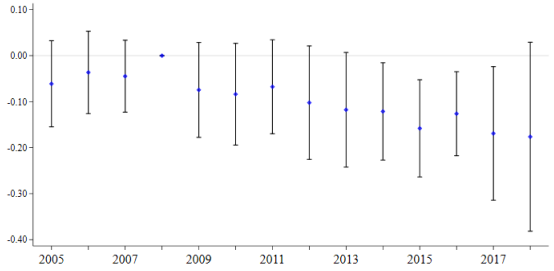
Figure A7: Wages and Labor by Skill Type, DiD, Event Studies



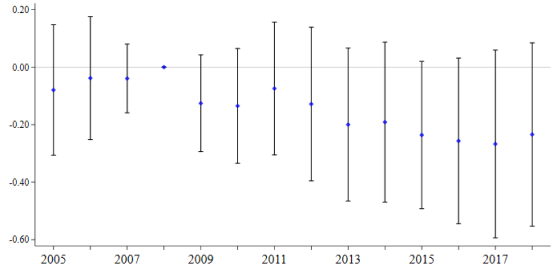
(a) Wage Bill, Blue Collar



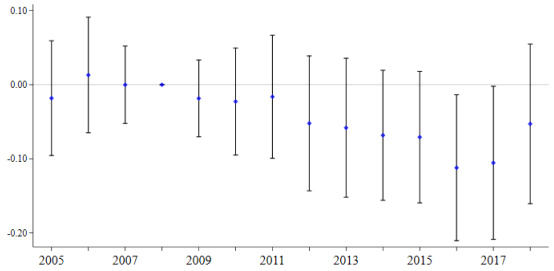
(b) Number of Workers, Blue Collar



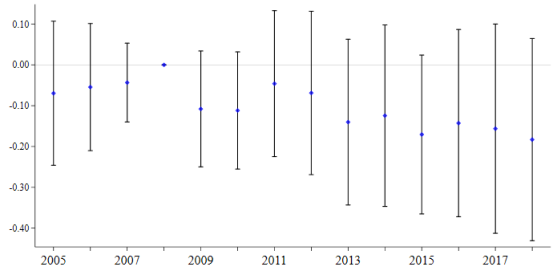
(c) Average Wage, Blue Collar



(d) Wage Bill, White Collar



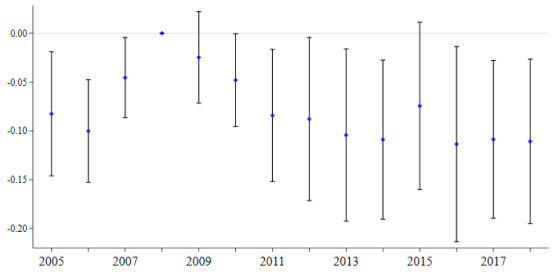
(e) Number of Workers, White Collar



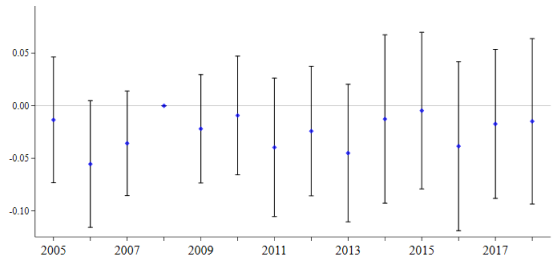
(f) Average Wage, White Collar

Notes: Each panel shows an event study plot of the effect of the Venezuela trade collapse, using the Difference-in-Differences design (equation 2 in the text) for the outcome described in the caption. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004. Each panel shows the estimated coefficient and 95% confidence intervals of $Exposed_i \times D[\text{year} = x]$, where $Exposed_i$ is a dummy equal to 1 for firms exposed to the collapse, and x is the year indicated on the x-axis. Exposed firms are those with a share of exports to Venezuela (out of total exports) during 2001–2004 above the 75th percentile across firms. The outcomes are: (a) the log(value) of the wage bill of blue collar workers, (b) the log(value) of the number of blue collar workers, and (c) the log(value) of the average wage of blue collar workers, obtained by dividing the wage bill of blue collar workers by their number, (d) the log(value) of the wage bill of white collar workers, (e) the log(value) of the number of white collar workers, and (f) the log(value) of the average wage of white collar workers, obtained by dividing the wage bill of white collar workers by their number. The regressions include year $\times$ 3-digit sector fixed effects. Standard errors are clustered at the 3-digit sector level.

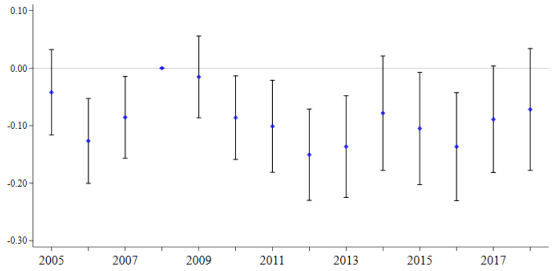
Figure A8: Total Factor Productivity, DiD, Event Studies



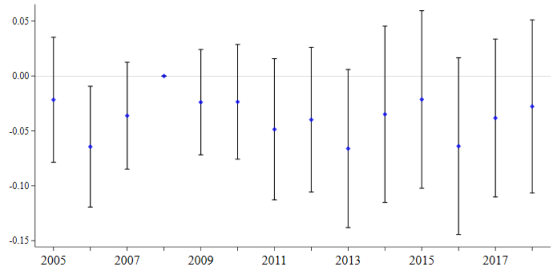
(a) Output per Worker



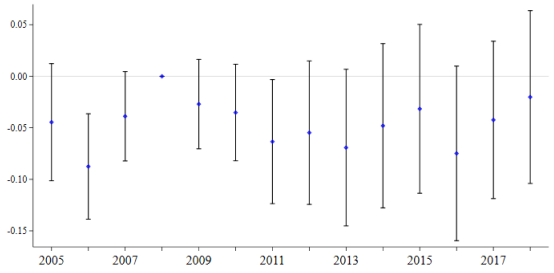
(b) TFPR, OLS



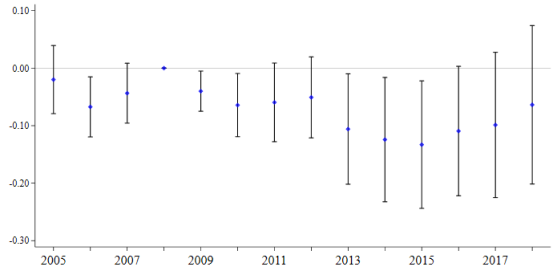
(c) TFPR, LP



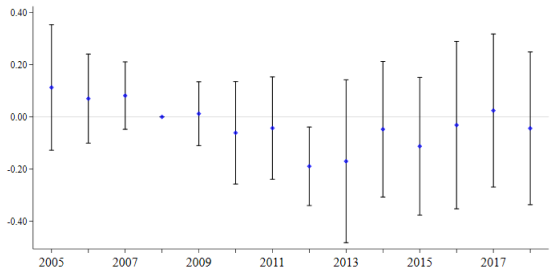
(d) TFPR, ACF



(e) TFPQ, GNR



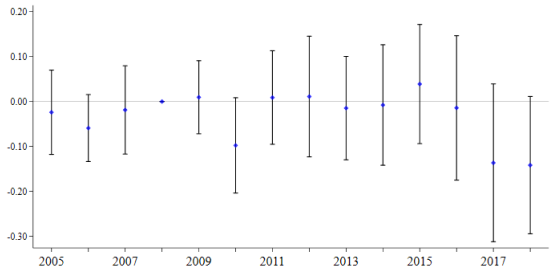
(f) TFPQ, LP



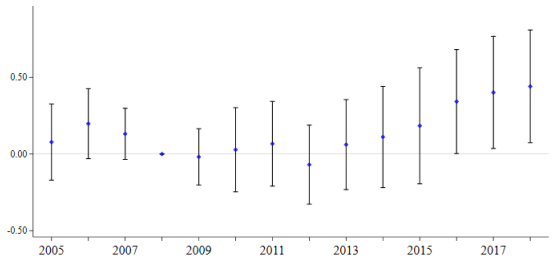
(g) Marginal Cost

Notes: Each panel shows an event study plot of the effect of the Venezuela trade collapse, using the Difference-in-Differences design (equation 2 in the text) for the outcome described in the caption. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004. Each panel shows the estimated coefficient and 95% confidence intervals of $Exposed_i \times D[\text{year} = x]$, where $Exposed_i$ is a dummy equal to 1 for firms exposed to the collapse, and x is the year indicated on the x-axis. Exposed firms are those with a share of exports to Venezuela (out of total exports) during 2001–2004 above the 75th percentile across firms. The outcomes are: (a) output per worker, TFPR based on a Cobb-Douglass production function estimated using OLS (b), LP (c), ACF (d), and GNR (f), TFPQ based on production function estimated using LP (g), and (d) marginal costs derived from single-product firms following Garcia-Marin and Voigtländer (2019). The regressions include year × 3-digit sector fixed effects. Standard errors are clustered at the 3-digit sector level.

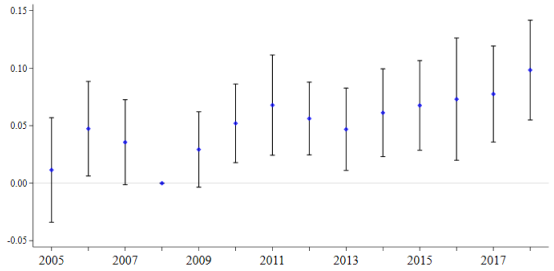
Figure A9: Adaptation, DiD, Event Studies



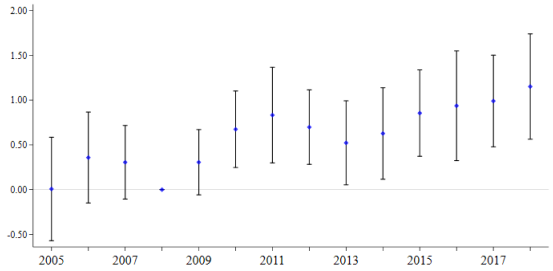
(a) Domestic Sales



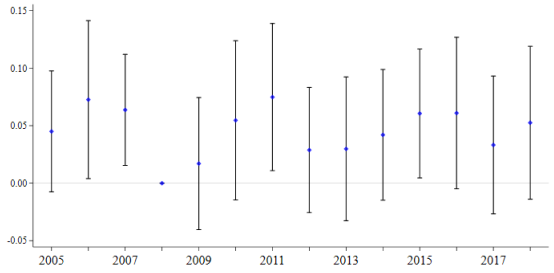
(b) Number of Markets



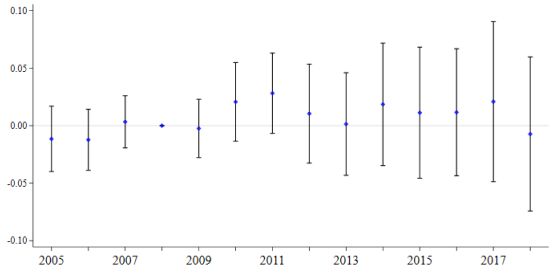
(c) Exports to Top 10, Probability



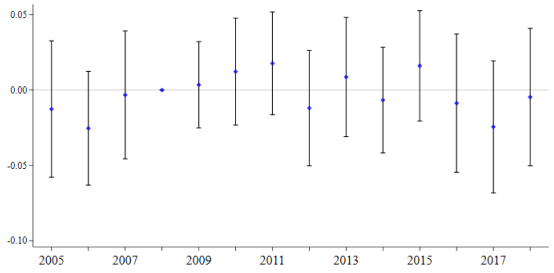
(d) Exports to Top 10, Value



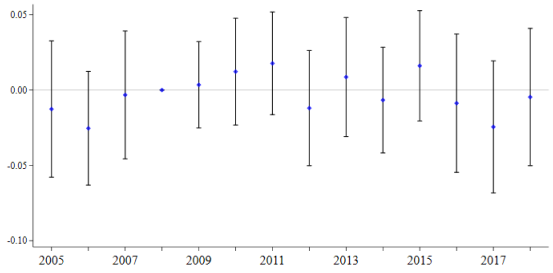
(e) New Destination in Top 10, Prob.



(f) New Destination in Top 10, Value



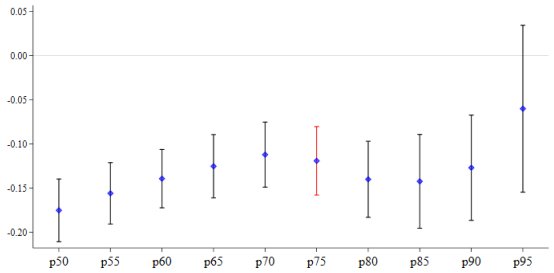
(g) Number of Products



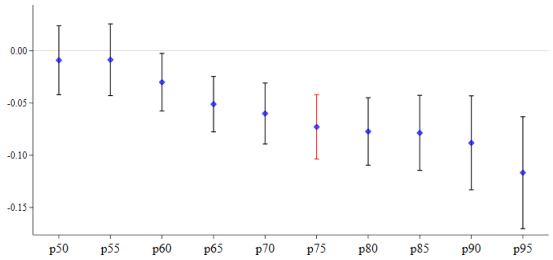
(h) Number of New Products

Notes: Each panel shows an event study plot of the effect of the Venezuela trade collapse, using the Difference-in-Differences design (equation 2 in the text) for the outcome described in the caption. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004. Each panel shows the estimated coefficient and 95% confidence intervals of $Exposed_i \times D[\text{year} = x]$, where $Exposed_i$ is a dummy equal to 1 for firms exposed to the collapse, and x is the year indicated on the x-axis. Exposed firms are those with a share of exports to Venezuela (out of total exports) during 2001–2004 above the 75th percentile across firms. The outcomes are: (a) the log(value) of domestic sales, (b) the number of markets to which the firm exports, (c) the probability of exporting to the top 10 destination countries (excluding Venezuela), (d) the log(value+1) of exports the top 10, (e) the probability of exporting to the top 10 excluding destinations to which the firm did not export in 2001-2004, (f) the log(value+1) of exports to the top 10 excluding destinations to which the firm did not export in 2001-2004, (g) the number of products, and (h) the number of new products introduced by the firm. The regressions include year × 3-digit sector fixed effects. Standard errors are clustered at the 3-digit sector level.

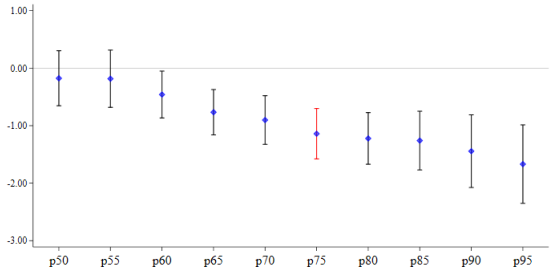
Figure A10: Robustness, Effects for different Percentiles of treatment definition, Part A



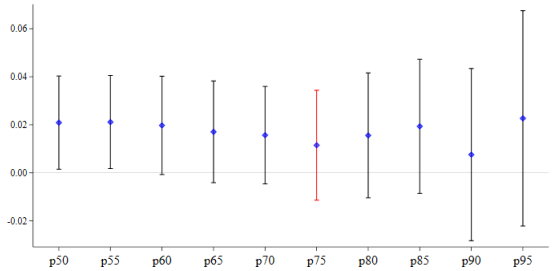
(a) Exports to Venezuela, Probability



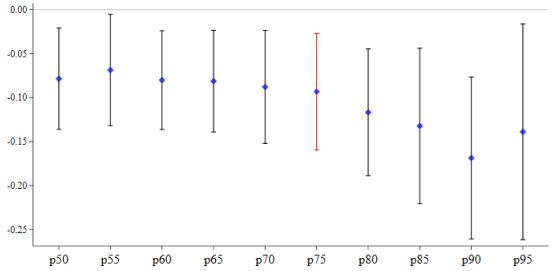
(b) Exports, Probability



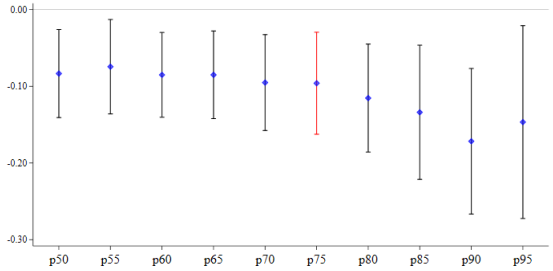
(c) Exports, Value



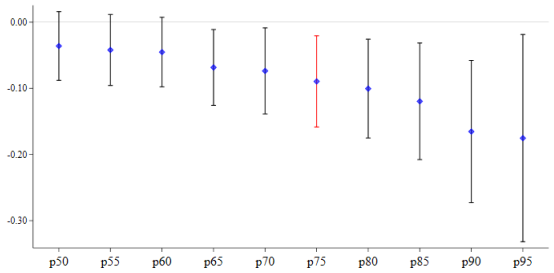
(d) Survival, Probability



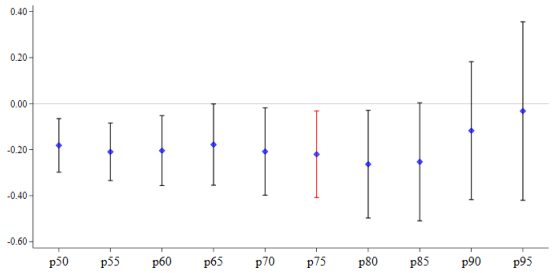
(e) Total Sales



(f) Production



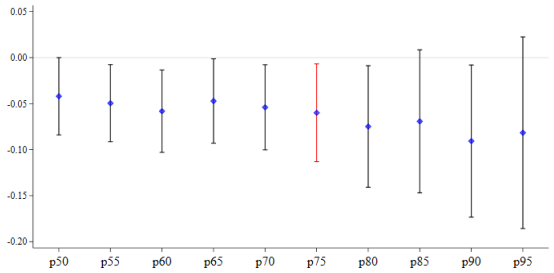
(g) Material Inputs



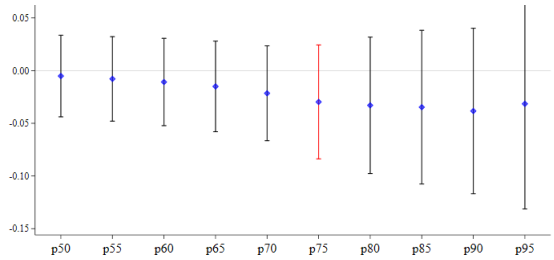
(h) Capital Stock

Each panel shows Synthetic Differences-in-Differences (SDiD) estimates (see equation (1) in the text) of the effect of the trade collapse on the outcome indicated by the caption. The figure in each panel reports the point estimate and 95% confidence interval of the coefficient of $Exposed_i \times D[2009 \leq t]$, which is a dummy equal to 1 for firms exposed the collapse and years 2009 and onward. Exposed firms are those whose share of exports to Venezuela (out of total exports) during 2001–2004 is above the percentile X across firms, where X corresponds to the value indicated in the x-axis. The outcomes are: (a) a dummy equal to one if the firm exported to Venezuela, (b) a dummy equal to one if the firm exported to any country, (c) the log(value+1) of total exports, (d) a dummy variable equal to one if the firm appears in the manufacturing census, (e) the log(value) of the firm's total sales, (f) the log(value) of the firm's production, (g) the log(value) of material inputs consumed, and (h) the log(value+1) of machinery and equipment capital stock. The estimate with the red confidence interval corresponds to the baseline estimate.

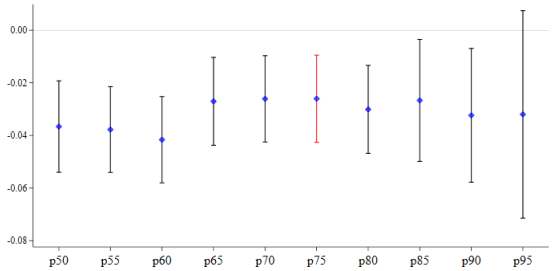
Figure A11: Robustness, Effects for different Percentiles of treatment definition, Part B



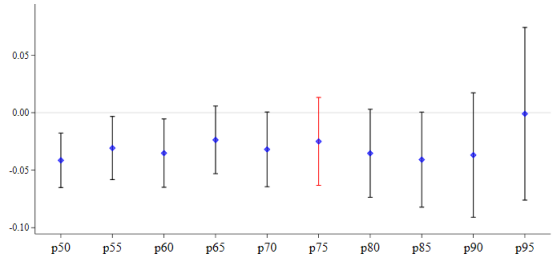
(a) Wage Bill



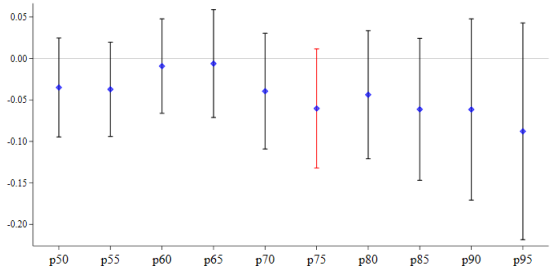
(b) Number of Workers



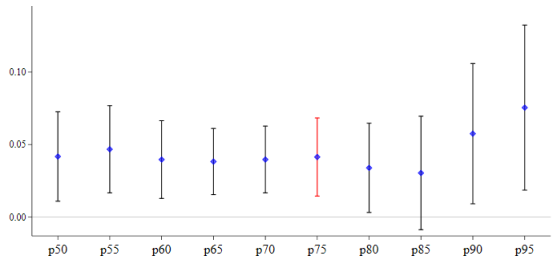
(c) Average Wage



(d) TFPR, LP



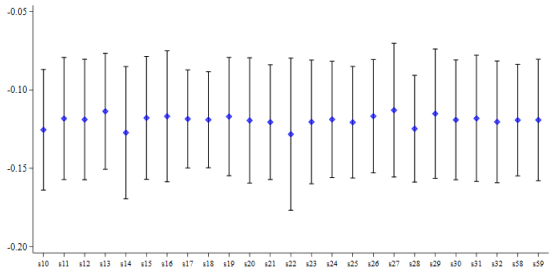
(e) TFPQ, LP



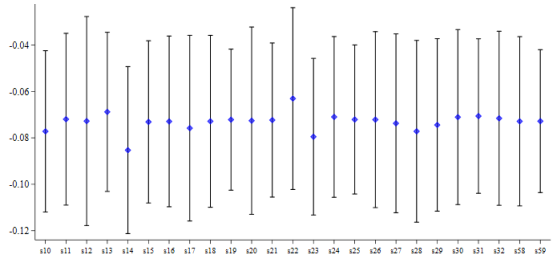
(f) Exports to Top 10, Probability

Each panel shows Synthetic Differences-in-Differences (SDiD) estimates (see equation (1) in the text) of the effect of the trade collapse on the outcome indicated by the caption. The figure in each panel reports the point estimate and 95% confidence interval of the coefficient of $Exposed_i \times D[2009 \leq t]$, which is a dummy equal to 1 for firms exposed the collapse and years 2009 and onward. Exposed firms are those whose share of exports to Venezuela (out of total exports) during 2001–2004 is above the percentile X across firms, where X corresponds to the value indicated in the x-axis. The outcomes are: (a) the log(value) of the wage bill, (b) the log(value) of the number of workers, (c) the log(value) of the average wage, (d) TFPR based on a Cobb-Douglass production function estimated using, (f) TFPQ based on a Cobb-Douglass production function estimated using LP, and (g) the probability of exporting to the top 10 destination countries (excluding Venezuela).

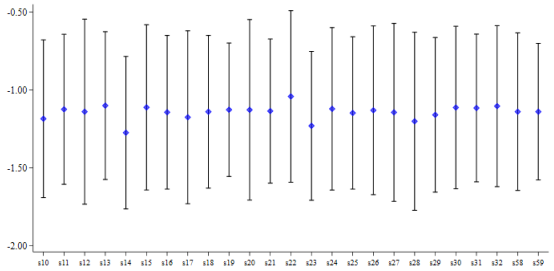
Figure A12: Robustness, Effects Removing Individual Sectors, Part A



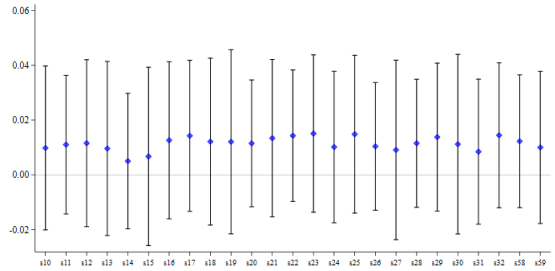
(a) Exports to Venezuela, Probability



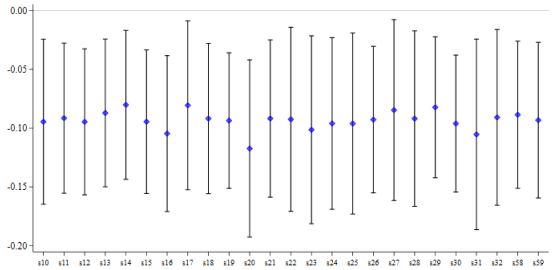
(b) Exports, Probability



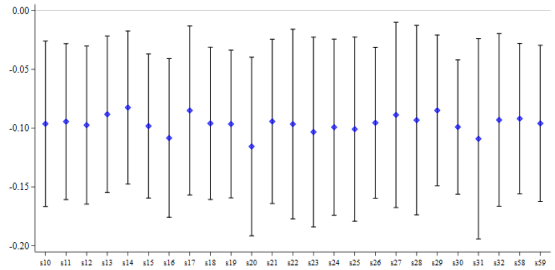
(c) Exports, Value



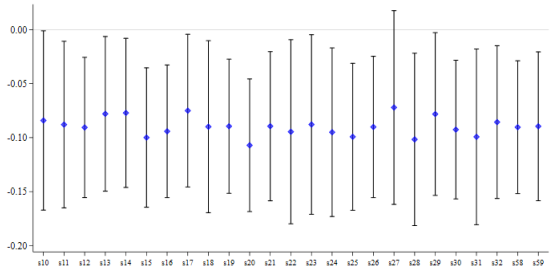
(d) Survival, Probability



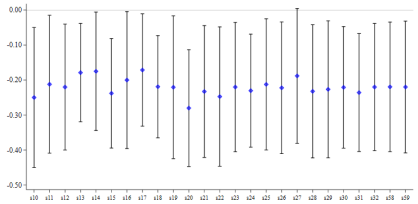
(e) Total Sales



(f) Production



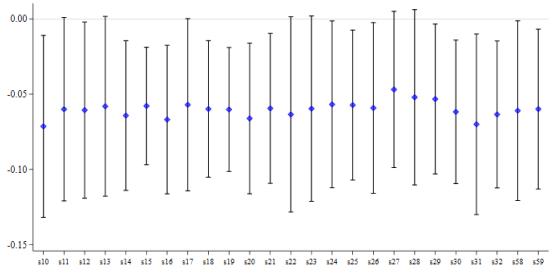
(g) Material Inputs



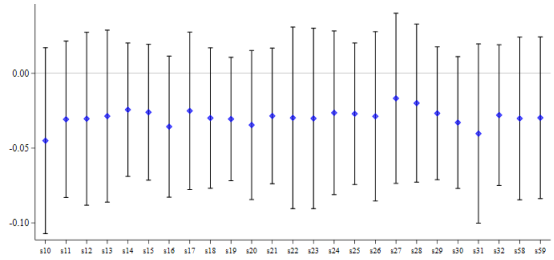
(h) Capital Stock

Each panel shows Synthetic Differences-in-Differences (SDiD) estimates (see equation (1) in the text) of the effect of the trade collapse on the outcome indicated by the caption. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004, observed every year in 2005-2018, and removing firms in the 2-digit sector indicated in the x-axis. The figure in each panel reports the point estimate and 95% confidence interval of the coefficient of $Exposed_i \times D[2009 \leq t]$, which is a dummy equal to 1 for firms exposed the collapse and years 2009 and onward. Exposed firms are those whose share of exports to Venezuela (out of total exports) during 2001–2004 is above the 75th percentile across firms. The outcomes are: (a) a dummy equal to one if the firm exported to Venezuela, (b) a dummy equal to one if the firm exported to any country, (c) the log(value+1) of total exports, (d) a dummy variable equal to one if the firm appears in the manufacturing census, (e) the log(value) of the firm's total sales, (f) the log(value) of the firm's production, (g) the log(value) of material inputs consumed, and (h) the log(value+1) of machinery and equipment capital stock. The estimate with the red confidence interval corresponds to the baseline estimate.

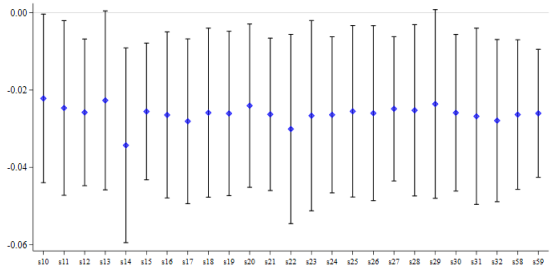
Figure A13: Robustness, Effects Removing Individual Sectors, Part B



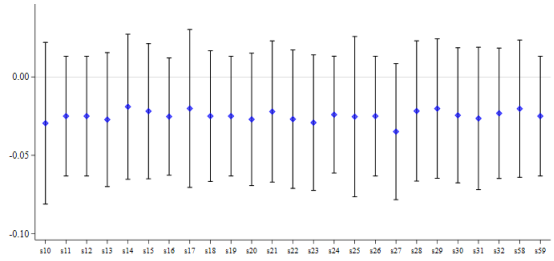
(a) Wage Bill



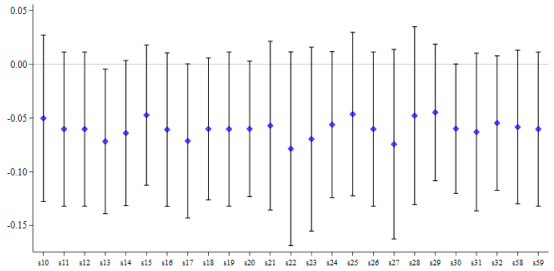
(b) Number of Workers



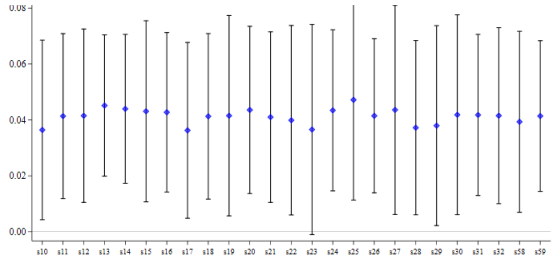
(c) Average Wage



(d) TFPR, LP



(e) TFPQ, LP



(f) Exports to Top 10, Probability

Each panel shows Synthetic Differences-in-Differences (SDiD) estimates (see equation (1) in the text) of the effect of the trade collapse on the outcome indicated by the caption. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004, observed every year in 2005-2018, and removing firms in the 2-digit sector indicated in the x-axis. The figure in each panel reports the point estimate and 95% confidence interval of the coefficient of $Exposed_i \times D[2009 \leq t]$, which is a dummy equal to 1 for firms exposed the collapse and years 2009 and onward. Exposed firms are those whose share of exports to Venezuela (out of total exports) during 2001–2004 is above the 75th percentile across firms. The outcomes are: (a) the log(value) of the wage bill, (b) the log(value) of the number of workers, (c) the log(value) of the average wage, (d) TFPR based on a Cobb-Douglass production function estimated using, (f) TFPQ based on a Cobb-Douglass production function estimated using LP, and (g) the probability of exporting to the top 10 destination countries (excluding Venezuela).

Table A1: Venezuelan importers: Access to US dollars

	USD			Log USD			IHS USD		
	Total	Ordinary	Other	Total	Ordinary	Other	Total	Ordinary	Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Importer from Colombia$_i$	-0.406***	-0.213*	-0.087***	-0.094***	-0.084***	-0.039***	-0.124***	-0.112***	-0.081***
$\times \mathbb{1}[t = 2012]$	(0.150)	(0.128)	(0.022)	(0.023)	(0.022)	(0.009)	(0.030)	(0.029)	(0.017)
Observations	20,696	20,696	20,696	20,696	20,696	20,696	20,696	20,696	20,696
Firms	10,349	10,349	10,349	10,349	10,349	10,349	10,349	10,349	10,349
Treated	975	975	975	975	975	975	975	975	975

Notes: This table reports estimates of the change in access to foreign currency (USD) for Venezuelan firms importing goods from Colombia. The sample is a panel of Venezuelan firms that requested USD from the Venezuelan currency board (CADIVI) between 2004 and 2012. The raw data includes two observations for each firm: an aggregate for the period 2004-2011 and yearly values for 2012. We winsorize the raw values and convert the aggregate observation into a yearly average. For each period, the raw data includes the total amount of USD provided by CADIVI to each firm and disaggregate values for *ordinary* requests and *other*. The raw data is publicly available at `https://phillipadsmith.github.io/cadivi/`. We match the list of firms in the CADIVI file with the list of Venezuelan importers reported in our customs data and classify a Venezuelan importer as *importer from Colombia* if there is a match at any point between 2005 and 2008 (i.e., our pre-period). We report the estimated coefficient of Importer from Colombia$_i \times D[t = 2012]$, which is a dummy equal to 1 for firms that imported from Colombia in the pre-period and the year 2012. All regressions include firm fixed effects and a dummy for the year 2012. In parenthesis, we report standard errors clustered by firm. *p<0.1, **p<0.05, ***p<0.01.

Table A2: Descriptives, Sample of Exporters

	Mean All Firms	Standard Deviation	Mean Exposed$_i$ = 0	Mean Exposed$_i$ = 1	p-value
Exports to Venezuela (=1)	0.337	0.473	0.327	0.383	0.000***
Exports to Venezuela (log value)	1.918	17.439	1.981	1.601	0.184
Exports to Venezuela (share)	0.165	0.288	0.153	0.230	0.000***
Exports (=1)	0.541	0.498	0.543	0.533	0.230
Exported Sales (share)	0.124	0.213	0.130	0.095	0.000***
Number of products (Export)	1.484	2.612	1.465	1.578	0.008***
Survival (=1)	0.780	0.414	0.791	0.726	0.000***
Plants	1.167	0.877	1.146	1.276	0.000***
Total Sales (log value)	53.402	142.254	49.880	71.056	0.000***
Production (log value)	55.751	150.887	51.877	75.168	0.000***
Production (Sato-Vartia index)	15.926	2.100	15.888	16.123	0.000***
Materials consumed (log value)	26.807	73.320	24.715	37.291	0.000***
Capital Stock (log value)	15.194	48.652	14.810	17.116	0.004***
Positive investment (= 1)	0.673	0.469	0.678	0.650	0.000***
Energy consumption (log value)	3.412	10.382	3.310	3.923	0.000***
Wage Bill (log value)	7.130	15.069	6.759	8.988	0.000***
Labor (log value)	201.865	383.032	193.092	245.893	0.000***
Mean Wage (log value)	0.029	0.020	0.029	0.032	0.000***
Y/L	0.295	2.485	0.280	0.369	0.028**
TFPR OLS	3.440	0.988	3.424	3.523	0.000***
TFPR ACF	6.970	2.458	6.933	7.158	0.000***
TFPR LP	5.111	1.505	5.106	5.137	0.249
GNR	6.216	1.471	6.202	6.294	0.000***
TFPQ LP	5.179	1.798	5.184	5.153	0.334
Marginal Cost	0.009	0.093	0.010	0.008	0.641
Domestic sales (log value)	44.861	125.703	41.088	63.772	0.000***
Number of Destinations	4.311	6.476	4.482	3.453	0.000***
Exports top 10 (=1)	0.681	0.466	0.691	0.630	0.000***
Export top 10 (log value)	13.677	344.889	15.276	5.664	0.089*
Exports New Destination (=1)	0.304	0.460	0.297	0.341	0.000***
Exports New Destination (log value)	0.289	2.340	0.245	0.509	0.000***
Number of products	4.156	4.290	4.051	4.682	0.000***
New product (=1)	0.078	0.269	0.079	0.072	0.118
Wage Bill - White Collar (log value)	2.853	6.305	2.724	3.501	0.000***
Labor - White Collar (log value)	54.746	127.053	51.755	69.737	0.000***
Mean Wage - White Collar (log value)	0.045	0.042	0.044	0.047	0.000***
Wage Bill - Blue Collar (log value)	4.082	8.666	3.884	5.077	0.000***
Labor - Blue Collar (log value)	147.118	293.616	141.336	176.095	0.000***
Mean Wage - Blue Collar (log value)	0.023	0.014	0.022	0.025	0.000***

Notes: This table reports summary statistics of the main variables used in the analysis. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004. This sample corresponds to the one used in the DiD exercises. Exposed firms are those whose share of exports to Venezuela (out of total exports) during 2001–2004 is above the 75th percentile across firms. Column "p-value" reports the p-value of a test where the null hypothesis is that the population mean of the variable listed in the first column is equal for exposed and non-exposed firms. *p<0.1, **p<0.05, ***p<0.01.

Table A3: Descriptives, SDiD Sample

	Mean All Firms	Standard Deviation	Mean Exposed$_i$ = 0	Mean Exposed$_i$ = 1	p-value
Exports to Venezuela (=1)	0.354	0.478	0.343	0.402	0.000***
Exports to Venezuela (log value)	2.303	18.847	2.393	1.883	0.149
Exports to Venezuela (share)	0.155	0.276	0.142	0.221	0.000***
Exports (=1)	0.586	0.493	0.591	0.562	0.002***
Exported Sales (share)	0.126	0.207	0.134	0.092	0.346
Number of products (Export)	1.701	2.763	1.693	1.742	0.000***
Survival (=1)	0.780	0.414	0.791	0.726	0.000***
Plants	1.212	1002	1.185	1.337	0.000***
Total Sales (log value)	67.908	161.947	63.890	86.551	0.000***
Production (log value)	70.974	171.828	66.488	91.791	0.000***
Production (Sato-Vartia index)	16.236	2.044	16.214	16.338	0.001***
Materials consumed (log value)	33.835	83.070	31.365	45.301	0.000***
Capital Stock (log value)	18.867	55.092	18.507	20.537	0.050***
Positive investment (= 1)	0.718	0.450	0.725	0.689	0.000***
Energy consumption (log value)	4.302	11.822	4.226	4.653	0.054*
Wage Bill (log value)	8.702	16.834	8.274	10.690	0.000***
Labor (log value)	242.323	429.147	231.679	291.718	0.000***
Mean Wage (log value)	0.031	0.020	0.030	0.032	0.000***
Y/L	0.296	1.689	0.305	0.255	0.119
TFPR OLS	3.456	0.945	3.437	3.545	0.000***
TFPR ACF	7.022	2.404	6.964	7.291	0.000***
TFPR LP	5.139	1.540	5.133	5.168	0.253
GNR	6.232	1526	6.218	6.295	0.010***
TFPQ LP	5.232	1.755	5.235	5.218	0.629
Marginal Cost	0.010	0.108	0.011	0.004	0.173
Domestic sales (log value)	57.241	143.648	52.801	77.843	0.000***
Number of Destinations	4.910	7.020	5.135	3.866	0.000***
Exports top 10 (=1)	0.719	0.450	0.732	0.655	0.000***
Export top 10 (log value)	18.199	405.147	20.597	7.074	0.075*
Exports New Destination (=1)	0.334	0.471	0.328	0.359	0.001***
Exports New Destination (log value)	0.375	2.738	0.328	0.624	0.000***
Number of products	4.554	4.468	4.444	5.063	0.000***
New product (=1)	0.082	0.274	0.083	0.075	0.102
Wage Bill - White Collar (log value)	3.474	6.994	3.330	4.138	0.000***
Labor - White Collar (log value)	66.091	143.325	62.453	82.973	0.000***
Mean Wage - White Collar (log value)	0.047	0.043	0.047	0.109	0.000***
Wage Bill - Blue Collar (log value)	4.975	9.692	4.799	6.024	0.000***
Labor - Blue Collar (log value)	176.231	328.278	169.225	208.744	0.000***
Mean Wage - Blue Collar (log value)	0.024	0.014	0.024	0.025	0.000***

Notes: This table reports summary statistics of the main variables used in the analysis. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004 and observed in the EAM in all the years in 2005-2018. This sample corresponds to the one used in the SDiD exercises. Exposed firms are those whose share of exports to Venezuela (out of total exports) during 2001–2004 is above the 75th percentile across firms. Column "p-value" reports the p-value of a test where the null hypothesis is that the population mean of the variable listed in the first column is equal for exposed and non-exposed firms. *p<0.1, **p<0.05, ***p<0.01.

Table A4: Effects on Labor and Wages, by Skill Type

	Blue Collar Workers			White Collar Workers		
	Wage Bill (Log)	Labor (Log)	Mean Wage (Log)	Wage Bill (Log)	Labor (Log)	Mean Wage (Log)
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: SDID					
Exposed_i	-0.136***	-0.046	-0.069**	-0.111	-0.053*	-0.057
$\times \mathbb{1}[2009 \leq t]$	(0.046)	(0.032)	(0.032)	(0.085)	(0.032)	(0.065)
Observations	19,460	19,460	19,460	19,460	19,460	19,460
Firm	1,390	1,390	1,390	1,390	1,390	1,390
Treated	345	345	345	345	345	345
Mean	4.350	170.660	0.022	2.908	58.136	0.044
	Panel B: DiD					
Exposed_i	-0.111***	-0.041*	-0.079**	-0.138	-0.053	-0.079
$\times \mathbb{1}[2009 \leq t]$	(0.038)	(0.023)	(0.037)	(0.104)	(0.032)	(0.081)
	Panel C: DiD - Medium and long term					
Exposed_i	-0.078**	-0.031	-0.053	-0.092	-0.031	-0.053
$\times \mathbb{1}[2009 \leq t \leq 2013]$	(0.033)	(0.022)	(0.034)	(0.091)	(0.030)	(0.069)
Exposed_i	-0.153***	-0.053*	-0.113**	-0.196	-0.080*	-0.113
$\times \mathbb{1}[2014 \leq t \leq 2018]$	(0.055)	(0.032)	(0.044)	(0.133)	(0.043)	(0.104)
p-val: a=b	0.111	0.388	0.008	0.189	0.150	0.331
Observations	26,581	26,581	26,581	26,581	26,581	26,581
Firm	2,351	2,351	2,351	2,351	2,351	2,351
Treated	577	577	577	577	577	577
Mean	3.372	135.768	0.021	2.263	46.279	0.041

Notes: This table reports estimates of the effect of the trade collapse of Venezuela on wages and labor outcomes, by skill type. The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004, according to the customs data. Panel A shows Synthetic Differences-in-Differences (SDiD) estimates (see equation (1) in the text) of the effect of the trade collapse. We report the estimated coefficient of $Exposed_i \times D[2009 \leq t]$, which is a dummy equal to 1 for firms exposed to the collapse and years 2009 and onward. Exposed firms are those whose share of exports to Venezuela (out of total exports) during 2001–2004 is above the 75th percentile across firms. Panel B shows Difference-in-Difference estimates of the same treatment effect (see equation 2). Panel C shows Difference-in-Difference estimates of the effect of the trade collapse in the medium term (2009-2003) and the long-term (2014-2018), captured by the coefficients of $Exposed_i \times D[2009 \leq t \leq 2013]$ (a dummy equal to 1 for exposed firms in years 2009 to 2013), and $Exposed_i \times D[2014 \leq t \leq 2018]$ (a dummy equal to 1 for exposed firms in years 2009 to 2018), following equation (3). Each column corresponds to a different outcome. The outcomes are: (1) the log(value) of the wage bill of blue collar workers, (2) the log(value) of the number of blue collar workers, and (3) the log(value) of the average wage of blue collar workers, obtained by dividing the wage bill of blue collar workers by their number, (4) the log(value) of the wage bill of white collar workers, (5) the log(value) of the number of white collar workers, and (6) the log(value) of the average wage of white collar workers, obtained by dividing the wage bill of white collar workers by their number. The sample of Panel A includes only firms observed in the EAM in all the years in 2005-2018. Line "Mean" reports the outcome mean in 2005-2009 and line "panel p-val: med = long" reports the p-value of a test where the null hypothesis is that the coefficients of $Exposed_i \times D[2009 \leq t \leq 2013]$ and $Exposed_i \times D[2014 \leq t \leq 2018]$ are equal. Regressions in Panels B and C include year × 3-digit sector fixed effects. In parenthesis, Panel A reports bootstrapped standard errors (with 50 repetitions) while Panel B and C report standard errors clustered at the 3-digit sector level. *p<0.1, **p<0.05, ***p<0.01.

Table A5: Robustness, IHS, selected outcomes

	Exports Value		Total Sales	Production Value	Materials Consumed	Capital Stock
	Venezuela = 1	Total				
	(1)	(2)	(3)	(4)	(5)	(6)
Exposed$_i$	-2.179***	-1.190***	-0.093***	-0.120***	-0.089**	-0.226**
$\times \mathbb{1}[2009 \leq t]$	(0.287)	(0.234)	(0.034)	(0.028)	(0.035)	(0.100)
Observations	19,460	19,460	19,460	19,460	19,460	19,460
Firms	1,390	1,390	1,390	1,390	1,390	1,390
Treated	345	345	345	374	345	345
Mean	3.670	10.213	57.366	59.564	29.537	16.589

	Energy Consump.	Wage Bill	Labor	Mean Wage	Domestic Sales
Exposed$_i$	-0.019	-0.060**	-0.030	-0.026***	-0.028
$\times \mathbb{1}[2009 \leq t]$	(0.032)	(0.027)	(0.028)	(0.008)	(0.047)
Observations	19,460	19,460	19,460	19,460	19,460
Firms	1,390	1,390	1,390	1,390	1,390
Treated	345	345	345	345	345
Mean	4.145	7.408	228.796	0.027	47.153

Notes: This table reports estimates of the effect of the trade collapse of Venezuela on a selection of outcomes transformed with the Inverse Hyperbolic Sine (IHS). The sample is a panel of firms from the manufacturing census (EAM) at the year level. It includes only firms that exported at least once between 2001 and 2004, according to the customs data. Panel A shows Synthetic Differences-in-Differences (SDiD) estimates (see equation (1) in the text) of the effect of the trade collapse. We report the estimated coefficient of $Exposed_i \times D[2009 \leq t]$, which is a dummy equal to 1 for firms exposed to the collapse and years 2009 and onward. Exposed firms are those whose share of exports to Venezuela (out of total exports) during 2001–2004 is above the 75th percentile across firms. Panel B shows Difference-in-Difference estimates of the same treatment effect (see equation 2). Panel C shows Difference-in-Difference estimates of the effect of the trade collapse in the medium term (2009-2003) and the long-term (2014-2018), captured by the coefficients of $Exposed_i \times D[2009 \leq t \leq 2013]$ (a dummy equal to 1 for exposed firms in years 2009 to 2013), and $Exposed_i \times D[2014 \leq t \leq 2018]$ (a dummy equal to 1 for exposed firms in years 2009 to 2018), following equation (3). Each column corresponds to a different outcome. The outcomes of the first row are: (1) the IHS of total exports value to Venezuela, (2) the IHS of total exports value, (3) the IHS of total sales, (3) the IHS of the firm's production value, (4) the IHS of material inputs consumed, (5) the IHS of machinery and equipment capital stock. The outcomes of the second row are: (1) the IHS of the value of energy consumption, (2) the IHS of the wage bill, (3) the IHS of the number of workers, (4) the IHS of the mean wage, (5) the IHS of domestic sales. The sample of Panel A includes only firms observed in the EAM in all the years in 2005-2018. Line "Mean" reports the outcome mean in 2005-2009 and line "panel p-val: med = long" reports the p-value of a test where the null hypothesis is that the coefficients of $Exposed_i \times D[2009 \leq t \leq 2013]$ and $Exposed_i \times D[2014 \leq t \leq 2018]$ are equal. Regressions in Panels B and C include year × 3-digit sector fixed effects. In parenthesis, Panel A reports bootstrapped standard errors (with 50 repetitions) while Panel B and C report standard errors clustered at the 3-digit sector level. *p<0.1, **p<0.05, ***p<0.01.

Appendix B Data Appendix

This appendix provides detailed descriptions of the main variables used in the analysis. The variables are listed in the order in which they appear in the paper (see Tables 3 to 5).

- **Exports to Venezuela (=1)**: Dummy that equals one if, in the DIAN customs data, the firm is observed exporting to Venezuela in the corresponding year.
- **Exports to Venezuela (log value)**: FOB value of exports to Venezuela, measured in billions of 2018 COP per firm-year. To construct this variable, export values in USD were converted to COP using the exchange rate (TRM) of the corresponding month. These values were then adjusted for inflation using the Producer Price Index (PPI) based on the year 2018, with both the TRM and PPI sourced from the Central Bank of Colombia. The values were then winsorized annually at the 1st and 99th percentiles. This means that values above the 99th percentile are capped at the 99th percentile, and values below the 1st percentile are capped at the 1st percentile.
- **Exports to Venezuela (share)**: Share of FOB value of exports to Venezuela in the total FOB value export per firm-year. Source: DIAN customs data.
- **Exports (=1)**: Dummy that equals one if the firm reports export sales in the Annual Manufacturing Survey (EAM) for the respective year.
- **Exported Sales (log value)**: Exported sales (at factory sales price, excluding indirect taxes), measured in billions of 2018 COP per firm-year. This variable is created by multiplying the percentage of exported sales by the total sales for each product (CPC 7-digit code), and plant. To obtain a firm-level measure, the values are aggregated across all product-plants within each firm. These values were adjusted for inflation using the Producer Price Index (PPI) based on the year 2018 and winsorized annually at the 1st and 99th percentiles.
- **Exported Sales (share)**: Share of export sales over total sales value (at factory sales price, excluding indirect taxes) reported in the Annual Manufacturing Survey (EAM) by firm-year.
- **Number of products (Export)**: Number of products exported per firm-year, with each products defined at the 7-digit CPC level.
- **Survival(=1)**: Dummy equal to one if the firm appears in Annual Manufacturing Survey (EAM).

- **Plants**: Firm's number of plants per firm-year. Plants are economic units with facilities that are permanently located in a specific location, where factors and inputs are combined for production.

- **Total Sales (log value)**: Total sales (at factory sales price, excluding indirect taxes), measured in billions of 2018 COP per firm-year. These values were adjusted for inflation using the Producer Price Index (PPI) based on the year 2018 and winsorized annually at the 1st and 99th percentiles.

- **Production values (log value)**: Production value (at factory sales price, excluding indirect taxes), measured in billions of 2018 COP per firm-year. These values were adjusted for inflation using the Producer Price Index (PPI) based on the year 2018 and winsorized annually at the 1st and 99th percentiles.

- **Production quantities (index)**: Sato-Vartia quantity indexes of production values per firm-year, following the procedure de Roux et al. (2021).

- **Materials consumend (log value)**: Value of the factory cost (excluding indirect taxes) of all the elements physically incorporated into the products produced by the firm, measured in billions of 2018 COP. These values were adjusted for inflation using the Producer Price Index (PPI) based on the year 2018 and winsorized annually at the 1st and 99th percentiles.

- **Capital Stock (log value)**: Capital stock (machinery and equipment) measured in billions of 2018 COP per firm-year. The capital series is generated on an inter-annual basis for each plant, using the perpetual inventory method. For the first year that the firm appears, the capital stock corresponds to the opening balance reported in the EAM. For the following years, the capital stock is calculated using the capital of the previous period (adjusted by a depreciation rate of 5%) plus the investment for this period. To obtain a firm-level measure, the capital stock values are aggregated across all plants within each firm.

- **Positive Investment (=1)**: Dummy equal to one if the firm made a positive investment in capital and equipment per firm-year.

- **Energy Consumption**: Quantity of energy purchased in kWh (kilowatt-hours) per firm-year.

- **Labor**: Total number of workers per firm-year.

- **Wage Bill (log value)**: Costs and expenses associated with total persons employed, measured in billions of 2018 COP per firm-year. These values were then adjusted for inflation using the Producer Price Index (PPI) based on the year 2018 and winsorized annually at the 1st and 99th percentiles. These costs include salaries and social benefits for the year.

- **Mean Wage (log value)**: Average wage for workers, calculated as the ratio of the wage bill to labor per firm-year.

- **Y/L**: Production values for workers, calculated as the ratio of the production values to labor per firm-year.

- **TFPR OLS**: Total factor productivity is calculated using a Cobb-Douglas production function, estimated based on equation (6) of the main text. In this function, y_{it} represents production (log value), m_{it} represents materials consumed (log value), k_{it} represents capital stock (log value), and l_{it} represents labor (log value). The estimation uses OLS, is done separately for each 2-digit sector, and includes year fixed effects. The estimated residual is the measure of productivity.

- **TFPR ACF**: Total factor productivity based on a Cobb-Douglass production function similar to ecuation (6) in the main text, but with value added on the left-hand side ($Y_{it} - M_{it}$) and without M_{it} on the right-hand side of the equation.

- **TFPR LP**: Total factor productivity is calculated using a Cobb-Douglas production function, estimated based on (6) of the main text. In this function, y_{it} represents production (log value), m_{it} represents materials consumed (log value), k_{it} represents capital stock (log value), and l_{it} represents labor (log value). The estimation uses Levinson and Petrin procedure separately for each 2-digit sector. We use Stata command *prodest* with option method(lp), state(k), proxy(m), free(l) and reps(50).

- **GNR**: Total factor productivity based on a Cobb-Douglass production function estimated implement the method of Gandhi et al. (2020), which is based on firms' first-order conditions. We coded this routine ourselves, following de Roux et al. (2021).

- **TFPQ LP**: Total factor productivity is calculated using a Cobb-Douglas production function, estimated based on (6) of the main text. In this function, y_{it} represents the Sato-Vartia production quantity index, m_{it} represents the Sato-Vartia materials quantity index (calculated similarly to the Sato-Vartia production quantity index), k_{it} represents capital stock (log value), and l_{it} represents labor (log value). The estimation uses Levinson and Petrin procedure separately for each 2-digit sector. We

use Stata command *prodest* with option method(lp), state(k), proxy(mtildesv), free(l) and reps(50), where mtildesv is the name in the data set of the input quantities Sato-Vartia index.

- **Marginal cost LP**: Marginal costs are derived from single-product firms following the methodology of Garcia-Marin and Voigtländer (2019). First, the production function at the firm level is estimated as described in TFPR LP, and the material elasticity (β_m) is recovered. Next, the approach of De Loecker and Warzynski (2012) is applied to calculate markups, defined as the ratio of material elasticity (β_m) to the share of materials in production (materials consumed/production values). Finally, marginal costs are obtained by dividing prices by the calculated markups.

- **Domestic Sales(log value)**: Difference between the total sales value and the value of export sales (at factory sales price, excluding indirect taxes), measured in billions of 2018 COP per firm-year. These values were adjusted for inflation using the Producer Price Index (PPI) based on the year 2018 and winsorized annually at the 1st and 99th percentiles.

- **Number of Destinations**: Number of countries to which the firm exports annually, excluding Venezuela, as reported in the DIAN customs data.

- **Exports top 10 (=1)**: Dummy equal to one the firm is observed in the DIAN panel exporting to any of Colombia's top 10 export destinations during 2001–2004, excluding Venezuela. These top 10 markets are established by aggregating the total export value of Colombia during this time frame using DIAN data, ranking the countries by export value, and selecting the top 10 destinations, with excluding Venezuela.

- **Export top 10 (log value)**: FOB value of exports, measured in billions of 2018 COP, to the top 10 export destinations of Colombia during the period 2001-2004 (excluding Venezuela). The top 10 destinations were identified by aggregating Colombia's total export values during this period using DIAN data, ranking countries by export value, and selecting the top 10 (excluding Venezuela). These USD values were converted to COP using the exchange rate (TRM) applicable for each month. These values were inflation-adjusted with the Producer Price Index (PPI) based on the year 2018 and subjected to annual winsorization at the 1st and 99th percentiles.

- **Exports New Destination (=1)**: Dummy equals one if the firm exports to any of Colombia's top 10 export destinations (excluding Venezuela) that it did not export to during the 2001–2004 period. The top 10 markets list is defined by aggregating

Colombia's total export value during this period using DIAN data, ranking countries by export value, and selecting the top 10 destinations, with Venezuela excluded.

- **Exports New Destination (log value)**: FOB value of exports, measured in billions of 2018 COP, to new markets within Colombia's top 10 export destinations (excluding Venezuela) where the firm did not export during the period 2001-2004. The top 10 destinations were identified by aggregating Colombia's total export values during this period using DIAN data, ranking countries by export value, and selecting the top 10 (excluding Venezuela). These USD values were converted to COP using the exchange rate (TRM) applicable for each month. These values were inflation-adjusted with the Producer Price Index (PPI) based on the year 2018 and subjected to annual winsorization at the 1st and 99th percentiles.

- **Number of products**: Number of products and by-products manufactured by the firm, classified at the product level using the 7-digit CPC code.

- **New product (=1)**: Dummy equal to one if a firm is observed producing a product at the 7-digit CPC level that it did not manufacture in previous years.

- **Wage Bill Blue collar (log value)**: Costs and expenses associated with workers and operators directly involved in production, measured in billions of 2018 COP per firm-year. These values were then adjusted for inflation using the Producer Price Index (PPI) based on the year 2018 and winsorized annually at the 1st and 99th percentiles. These costs include salaries and social benefits for the year.

- **Labor Blue Collar**: Total number of workers and operators whose activity is directly related to production per firm-year.

- **Mean Wage Blue collar (log value)**: Average wage for blue-collar workers, calculated as the ratio of the wage bill blue collar to the total number of blue-collar workers per firm-year.

- **Wage Bill white collar (log value)**: Costs and expenses associated with executives, administrative, and sales workers, measured in billions of 2018 COP per firm-year. These values were then adjusted for inflation using the Producer Price Index (PPI) based on the year 2018 and winsorized annually at the 1st and 99th percentiles. These costs include salaries and social benefits for the year.

- **Labor White Collar**: Total number of executives, administrative, and sales workers per firm-year.

- **Mean Wage White Collar (log value)**: Average wage for white-collar workers, calculated as the ratio of the wage bill white collar to the total number of white-collar workers per firm-year.