October 31, 2026

Professor Jeffrey Frankel and Professor Hélène Rey
Co-Chairs, NBER International Seminar on Macroeconomics

Dear Professors Frankel and Rey,

We are pleased to submit our paper, "Supplier Dependence and Market Power in International Trade," for consideration at the 50th International Seminar on Macroeconomics.

Governments and central banks increasingly use product-level concentration indices to assess dependence on foreign suppliers. Our paper asks what these indices tell us about the dependence of individual buyers. Using Colombian customs records for 2001–2025, we find that aggregate imports have become more diversified while buyers' sourcing has become more concentrated. The difference is striking for country exposure. In 2019, purchases of products that buyers sourced entirely from China accounted for 8.9 percent of import value; using pooled shares would put that figure at just 0.1 percent. Buyers whose suppliers exit buy persistently less than other buyers of the same product, and their additional purchases from exporters already in the market are small, even where many such exporters are present. Together, these findings show that a low product-level HHI alone is insufficient to assess buyers' dependence on foreign suppliers, and they support measuring dependence within buyers' own supplier bases. Our bargaining model shows that the distinction also matters for prices, changing both the level and the trend of implied margins.

We are also extending the analysis to the United States using firm-to-firm customs data under an approved Federal Statistical Research Data Center project. We have built the US sample, computed the concentration measures, and submitted the results for Census disclosure review. The extension will test whether diversification in a much larger import market gives individual buyers more supplier options. US research on supplier relationships and switching costs (Kamal and Monarch, 2018; Monarch, 2022) motivates the dependence question, while evidence of substantial importer bargaining power (Alviarez et al., 2025) makes the pricing implications especially relevant. We plan to incorporate the US results into the conference version, subject to disclosure approval.

Thank you for considering our submission. We would be delighted to present the paper at the conference.

Sincerely,

Vanessa Alviarez, Michele Fioretti,
Ken Kikkawa, and Monica Morlacco

Supplier Dependence and Market Power in International Trade*

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October 31, 2026

Abstract

Imports can become more diversified in the aggregate while individual buyers' sourcing becomes more concentrated. We document this divergence in Colombian customs records for 2001–2025, comparing the HHI of each product's pooled imports with *sourcing concentration*, the average HHI of buyers' own purchases. Pooling also hides country exposure. In 2019, purchases of products that buyers sourced entirely from China accounted for 8.9 percent of imports, compared with just 0.1 percent using pooled shares. After a supplier exits, more exposed buyers purchase persistently less relative to less exposed buyers, with little reallocation to existing exporters even where many are present. To assess what the two concentration measures imply for prices, we derive an equilibrium expression linking aggregate price–cost margins to supplier concentration, customer concentration and bargaining power under negotiated pricing. Using buyer-specific rather than pooled supplier shares raises implied margins, while buyer bargaining lowers them. Different market definitions and bargaining assumptions can even imply opposite margin trends for the same transactions.

Keywords: supplier dependence; buyer-supplier networks; sourcing concentration; market definition; bargaining.

JEL codes: F12, F14, L11, L14, D43.

*We thank Laura Castillo-Martinez, Sebastian Heise, and Yannis Papadakis for insightful discussions. We are also grateful to Rodrigo Adao, Ariel Burstein, Thomas Chaney, Jan De Loecker, Esteban Rossi-Hansberg, and many seminar and conference participants for helpful feedback. Andrew Sharng and Nicolas Wesseler provided excellent research assistance. We gratefully acknowledge financial support from the University of Southern California for data acquisition. The customs records are obtained from publicly available Colombian government sources. The authors declare that they have no relevant or material financial interests that relate to the research described in this paper. All errors are our own.

1 Introduction

Dependence on foreign suppliers has become a central concern in discussions of supply-chain resilience. A lack of alternative suppliers leaves buyers vulnerable to supply disruptions and may give incumbent suppliers market power. Governments now screen imports for products sourced from a small number of suppliers (European Commission, 2021; The White House, 2021), and central banks study whether supplier dependence raises import prices (Balteanu et al., 2025). These assessments pool each product's imports across buyers and compute concentration measures such as the Herfindahl–Hirschman index (HHI) across supplying countries or firms. These measures describe how a country's imports of a product are distributed across sources. What they imply about an individual buyer's dependence, however, turns on whether all the exporters serving that market are viable alternatives for that buyer.

Whether that is so is an open question in intermediate input markets. Inputs are often adapted to a buyer's technology (Antràs and Chor, 2022), replacing a supplier is costly, and trading relationships last for years (Monarch, 2022; Martin et al., 2026). Suppliers can reinforce this lock-in by making their products harder to replace (Casal, 2025). Consistent with these frictions, firms trade with few partners (e.g., Bernard et al., 2018), even when many exporters serve the same product market. A large pool of exporters thus need not give individual buyers many alternatives when a supplier raises prices or stops delivering. What, then, does concentration in a product's pooled imports tell us about buyers' dependence on foreign suppliers and the prices they pay?

We answer this question in three steps. First, using Colombian customs data for 2001–2025, we document declining product-market concentration alongside rising *sourcing concentration*, the average HHI of buyers' purchases of a given product, and derive an exact decomposition linking the two. Second, we follow buyers whose suppliers exit and find persistent declines in their purchases relative to other buyers, even in diversified product markets. Third, we derive an aggregate margin formula from a bilateral bargaining model and use it to compare market definitions and allocations of bargaining power. We show that these choices substantially change both the level and the evolution of implied margins.

The average HS10 product imported by Colombia has 72 foreign exporters, but the average importer buys from just 1.4 of them. Buyers also rely on different suppliers, so pooling their purchases creates diversification that individual buyers do not share. We show that sourcing concentration equals the product-market HHI plus *sourcing segmentation*, which measures this diversification created by pooling. The decomposition holds in levels and in changes, explaining how aggregate imports can become more diversified while buyers' sourcing becomes more concentrated. In the Colombian data, segmentation accounts for 70 percent of sourcing concentration and has increased over time.

The distribution of imports across firms matters for exposure to supplier shocks (Di Giovanni et al., 2014). Shocks that partly offset in aggregate import prices can still generate large price changes for

individual buyers. Country exposure makes the distinction particularly clear. In 2019, purchases of products that individual buyers sourced entirely from China accounted for 8.9 percent of Colombian import value. Assigning every buyer its product's overall Chinese share would identify just 0.1 percent of import value as entirely sourced from China. Pooling thus conceals buyers' complete reliance on one country within an apparently diversified import base.

Whether concentrated sourcing reflects dependence depends on the buyer's relevant market, defined by the suppliers it can turn to. The two concentration measures correspond to polar views of that market. If all exporters of the product to Colombia are viable alternatives for every buyer, the product-market HHI is the relevant measure. If switching costs restrict buyers to their incumbent suppliers, sourcing concentration is relevant. We examine whether buyers turn to other exporters already serving the Colombian market when an incumbent supplier leaves. We compare buyers that obtained at least half their purchases of a product from exiting suppliers with other buyers of the same product in the same year. Relative to comparison buyers, their purchases fall by 33 percent of pre-exit purchases in the exit year and by 30 percent three years later. Purchases from exporters already supplying other Colombian buyers rise relative to comparison buyers by only 5 percent of pre-exit purchases.

We define an exit as an exporter stopping all sales to Colombia for at least two years after serving at least two Colombian buyers. This distinguishes a supplier's departure from the market from the end of a single buyer–supplier relationship. Comparing buyers of the same product in the same year accounts for common demand shocks and market-wide changes in supply, including those caused by the exit. If other exporters are viable alternatives, buyers should find it easier to replace lost purchases where more exporters are present. Yet purchases fall about as much in products with hundreds of exporters as in products with a few dozen. A caveat is that some of the relative decline precedes supplier exit, and suppliers may leave for reasons that also reduce their buyers' purchases, so we interpret these comparisons as descriptive evidence. Persistently lower purchases even in products with many exporters show that the product-market HHI alone is insufficient to assess buyers' dependence on their incumbent suppliers.

Moving from dependence to pricing power requires a pricing rule. When prices are negotiated, the buyer's importance to its supplier matters alongside its outside options. A buyer that relies on one supplier may account for a large share of that supplier's sales and use this position to bargain for a lower price. We summarize suppliers' reliance on their buyers through *customer concentration*, the sales-weighted average of the HHI of each supplier's sales across buyers. Unlike the pooled importer HHI, this measure retains differences in suppliers' customer bases. In the Colombian data, customer concentration is high and stable, while the pooled importer HHI is much lower and declining.

Using the bargaining model of Alviarez et al. (2025), we derive an equilibrium expression linking the aggregate price–cost margin to supplier concentration, customer concentration and bargaining power. To first order, the margin equals a baseline constant plus a term proportional to supplier

concentration minus a term proportional to customer concentration. Bargaining power determines the relative weight on the two terms. This extends the classic Cournot link between aggregate margins and supplier concentration to negotiated prices and market boundaries shaped by switching costs. The first-order expression also makes the margin difference between the two market definitions proportional to sourcing segmentation.

For the quantitative exercises, we evaluate the nonlinear pricing rule and aggregate margins exactly. This requires only a few calibrated pricing parameters; the remaining inputs are the buyer and supplier shares observed in the data. In the 2019 benchmark, using buyer-specific rather than pooled supplier shares raises the implied aggregate margin from 17 to 30 percent when suppliers set prices. Allowing buyer bargaining lowers it to 4 percent, more than offsetting that increase. These calculations use buyers' shares of their suppliers' Colombian sales, which can overstate their importance to suppliers that also sell elsewhere. We therefore examine sensitivity to broader definitions of suppliers' markets. Market definition also matters for trends. At fixed pricing parameters, buyer-specific shares imply rising margins while pooled shares can imply declining margins.

The gap between sourcing concentration and the product-market HHI remains large and continues to widen under alternative product definitions and when the sample is restricted to intermediate goods. Segmentation is greatest for differentiated products, consistent with input specificity and switching costs limiting buyers' alternatives. Assessments of foreign dependence therefore need to distinguish the diversification of national imports from the alternatives available to individual buyers. Drawing pricing implications requires, in addition, information about suppliers' reliance on their customers and assumptions about bargaining power.

Related literature. The paper relates to three literatures. The first concerns the measurement and consequences of concentration within industries or product markets. Much of the debate on rising concentration and markups has turned on market definition (Syverson, 2019; Berry et al., 2019): measured concentration depends on whether the market is national or local (Rossi-Hansberg et al., 2021), on how products are grouped (Benkard et al., 2021; Pellegrino, 2025), and on whether foreign competitors are counted (Amiti and Heise, 2025). These studies draw market boundaries by geography or product. We consider boundaries shaped by switching costs. When buyers cannot readily replace their suppliers, concentration in a product's pooled imports may describe a broader market than individual buyers can access.

A related debate concerns the link between concentration and market power. Concentration reflects conduct and technology, so its relationship with markups requires a model (Syverson, 2019). Oligopoly models map industry HHIs into aggregate markups (Grassi, 2018; Nocke and Schutz, 2025; Burstein et al., 2025). Supplier concentration alone is insufficient, however, when buyers also have market power (Hendricks and McAfee, 2010). The same supplier concentration can imply different

margins depending on suppliers' reliance on individual buyers.[1] We use the bilateral pricing rule of Alviarez et al. (2025), who estimate it using bilateral prices. We derive its aggregate concentration implications under alternative market boundaries and quantify how pooling transactions across trading partners changes the implied margins.

The second literature studies foreign supplier dependence and supply-chain resilience. Policy assessments screen products by the concentration of pooled imports across source countries (European Commission, 2021; The White House, 2021), Balteanu et al. (2025) relate such concentration to import prices across countries, and Antràs (2021) discusses the requirements for resilient global value chains. Evidence from natural disasters and firm failures shows how supply disruptions propagate through input linkages (Barrot and Sauvagnat, 2016; Boehm et al., 2019; Carvalho et al., 2021), with specific inputs and established relationships determining which buyers are affected. Work on firm-to-firm relationships helps explain why replacement is slow: relationships are persistent and valuable (Heise, 2024; Monarch, 2022; Martin et al., 2026), and suppliers can reinforce lock-in (Casal, 2025). We measure concentration within buyers' supplier bases, where these frictions operate, and use supplier exits to examine whether a diversified national import base makes replacement easier.

The third literature documents heterogeneity in firm-to-firm trade and its aggregate consequences. Trade is concentrated in few firms and few relationships (Freund and Pierola, 2015; Bernard et al., 2018; Eaton et al., 2026; Bernard and Moxnes, 2018), and its distribution across firms shapes aggregate volatility and the transmission of foreign shocks (Di Giovanni et al., 2014; Kramarz et al., 2020; Gaubert and Itskhoki, 2021; Di Giovanni et al., 2024). Bernard et al. (2018) develop a model in which buyer and seller heterogeneity and relationship-specific costs determine trading links, and show how supplier access affects downstream costs through input prices and available varieties. Di Giovanni et al. (2024) show that international linkages matter for foreign shock transmission even holding sectoral trade flows fixed. We study how pooling across trading relationships changes measured concentration and exposure to suppliers and countries, and how dependence on both sides of those relationships enters aggregate negotiated margins.

2 Measuring Supplier Dependence

This section presents the measurement framework. We define the concentration measures used in the paper, derive an exact decomposition linking them, and discuss their implications for dependence and exposure to supplier shocks.

[1] Hendricks and McAfee (2010) consider a homogeneous good traded at a single market-clearing price. Firm shares are market shares, and margins depend on seller and buyer concentration through supply and demand elasticities. We consider differentiated inputs with prices negotiated within each relationship, so the relevant shares measure each party's importance to the other. In our aggregate formula, pooled supplier shares yield the product-market HHI, while buyer-specific shares yield sourcing concentration.

2.1 Notation and key definitions

Fix a product and a year, and let $v_{ij} = p_{ij}q_{ij}$ denote that product's imports by buyer j from supplier i, written as the product of the bilateral price p_{ij} and quantity q_{ij}. Total imports of the product are $V = \sum_i \sum_j v_{ij} > 0$. We use the following notation throughout:

$$s_i = \frac{\sum_j v_{ij}}{V}, \qquad s_j = \frac{\sum_i v_{ij}}{V} \qquad \text{supplier } i\text{'s and buyer } j\text{'s shares of the product's imports,}$$
$$s_{i|j} = \frac{v_{ij}}{\sum_k v_{kj}} \qquad \text{supplier } i\text{'s share of buyer } j\text{'s purchases.}$$

All shares are shares of import value. We use a vertical bar in the subscript to indicate that a share is computed within a buyer's purchases rather than in the product market.

We define the *product-market Herfindahl–Hirschman index (HHI)* and, for each buyer j with $s_j > 0$, the *buyer-level HHI* as

$$HHI^S = \sum_i s_i^2, \qquad HHI_j^S = \sum_i s_{i|j}^2. \tag{1}$$

The superscript S marks the supplier side; the buyer-side counterparts, with superscript B, appear in Section 4 when we discuss pricing implications. The product-market HHI, calculated across supplying countries or firms, is commonly used to assess supplier concentration and dependence in international trade (e.g., European Commission, 2021; Bonfiglioli et al., 2021). We complement it with a product-level measure of concentration within each buyer's purchases.

Definition 1 (Sourcing concentration)**.** *Sourcing concentration* is the import-weighted average of buyer-level HHIs:

$$C^S \equiv \sum_j s_j \, HHI_j^S = \sum_j s_j \sum_i s_{i|j}^2. \tag{2}$$

Both HHI^S and C^S measure import concentration at the product level, but they aggregate purchases differently. The former pools purchases across buyers before calculating concentration; the latter calculates concentration for each buyer and then takes the import-weighted average.

A simple example illustrates the difference. Consider two equally sized buyers and two suppliers of a product. If each buyer splits its purchases equally between the suppliers, $HHI^S = C^S = 1/2$. If each buyer instead buys exclusively from a different supplier, each supplier still accounts for half of total imports, so HHI^S remains $1/2$, while sourcing concentration C^S rises to 1.

2.2 Sourcing segmentation

Differences in supplier shares across buyers account exactly for the gap between the two concentration measures.

Lemma 1 (Sourcing concentration and the product-market HHI)**.** *For any pattern of trade,*

$$C^S = HHI^S + D^S, \qquad D^S \equiv \sum_j s_j \sum_i \left(s_{i|j} - s_i\right)^2 \geq 0. \tag{3}$$

The two measures coincide if and only if every buyer sources in proportion to market shares, $s_{i|j} = s_i$ for all i and all j with $s_j > 0$.

The proof is in Appendix A. Each supplier's market share, s_i, is the import-weighted average of its shares in individual buyers' purchases, $s_i = \sum_j s_j\, s_{i|j}$. We call D^S *sourcing segmentation*. It equals the sum, across suppliers, of the import-weighted variance of each supplier's share across buyers, so it measures how much the composition of purchases differs across buyers. It is positive whenever buyers use different suppliers or buy from the same suppliers in different proportions. In the example above, segmentation is zero when both buyers split their purchases equally and one half when each buys exclusively from a different supplier.

The decomposition also holds in changes, $\Delta C^S = \Delta HHI^S + \Delta D^S$, and across products. Because segmentation can change independently of the product-market HHI, the two measures need not move together. Entry by new exporters can lower the product-market HHI while sourcing concentration rises, provided segmentation increases by more than the HHI falls. Conversely, a sufficiently large decline in segmentation can reduce sourcing concentration even as the product-market HHI rises. To describe a country's imports, we average the three statistics across products. With ω_{ht} the share of product h in total import value in year t, the same weights apply to all three measures, so the decomposition holds for the aggregates:

$$\overline{C}^S_t \equiv \sum_h \omega_{ht}\, C^S_{ht} = \sum_h \omega_{ht}\, HHI^S_{ht} + \sum_h \omega_{ht}\, D^S_{ht}. \tag{4}$$

Each statistic is computed within a product before aggregation, so the aggregate is an average of product-level indices rather than an HHI computed on imports pooled across products, which would treat exporters of unrelated products as competing suppliers.

2.3 Concentration and supplier dependence

We take supplier dependence to mean a buyer's exposure to shocks to the suppliers it uses. The two concentration measures then have an interpretation as exposures. Following Gabaix (2011), we denote by ε_i a small log change in supplier i's price, common to all its buyers, with shocks independent across suppliers, mean zero and common variance σ^2. Holding sourcing shares fixed,

buyer j's import price changes, to first order, by $g_j = \sum_i s_{i|j}\varepsilon_i$, with variance $\sigma^2 HHI_j^S$, and the product's pooled import price by $g = \sum_j s_j g_j = \sum_i s_i \varepsilon_i$. Thus,

$$\underbrace{\operatorname{Var}(g)}_{\text{exposure of pooled imports}} = \sigma^2 HHI^S, \qquad \underbrace{\sum_j s_j \operatorname{Var}(g_j)}_{\text{average exposure of buyers}} = \sigma^2 C^S, \tag{5}$$

and by Lemma 1 the average buyer's exposure exceeds that of pooled imports by $\sigma^2 D^S$. Pooling averages shocks across buyers as well as across suppliers, so it can show diversification even when every buyer relies on a single supplier: in the two-buyer example, exclusive sourcing raises each buyer's variance from $\sigma^2/2$ to σ^2 while the pooled variance stays at $\sigma^2/2$.[2]

2.4 Market boundaries

The exposure calculation of Section 2.3 holds sourcing shares fixed. A buyer that sources exclusively from one supplier may nonetheless have alternatives to which it could readily switch. The transaction data identify the suppliers a buyer uses, but they contain no information on the other suppliers it could have used or on the cost of switching to them. Which measure describes dependence therefore depends on the relevant market, whose boundary is set by the cost of switching suppliers. We consider the two polar definitions. If switching is costless, so that all exporters of a product are potential suppliers to every buyer, the relevant concentration is the product-market HHI. If switching costs confine each buyer to its incumbent suppliers, the relevant concentration is C^S. We use the two as benchmarks. Determining which outside suppliers constrain a buyer's incumbents in normal times requires evidence beyond observed purchases.[3]

Sourcing segmentation measures how much the assessment of dependence depends on this choice. When D^S is small, the two definitions give similar concentration and similar exposure. When it is large, they give different answers, and the product-market HHI understates buyers' exposure by $\sigma^2 D^S$ when buyers are confined to their incumbent suppliers, and by less in intermediate cases. Section 3 documents the size of D^S, identifies the products where the choice of market is most consequential, and follows buyers whose supplier exits to see whether the other exporters of the product served as alternatives.

[2]The calculation concerns import prices. Di Giovanni et al. (2024) use a similar argument to show how differences in firms' trade linkages shape the transmission of foreign shocks to aggregate output.

[3]We pursue this question in Alviarez et al. (2026).

3 Supplier Dependence in Colombian Imports

This section applies the framework to Colombian customs records. We describe the data, document four facts about the two concentration measures, and present event-study evidence on whether buyers turn to other exporters of the product after a supplier exits.

3.1 Data, coverage, and sample

We use the universe of Colombian import declarations collected by the customs authority (DIAN) between 2001 and 2025. Each declaration identifies the Colombian importer by its tax identifier, the foreign exporter by name and country, the 10-digit tariff code (HS10), the FOB value in U.S. dollars, and the net weight in kilograms. Exporters are followed over time with a country-specific longitudinal identifier built from exporter names, described in Appendix B.[4] We aggregate declarations to the importer–exporter–product–year level and drop declarations without a valid importer identifier, which in the early years mostly record purchases by natural persons. The remaining sample retains between 96 and 99.6 percent of the import value in the source records in each year and contains 14.2 million observations. The records match the official statistics. Annual FOB import value in the source records is within 1.1 percent of the total published by Colombia's statistical agency (DANE) in 2001 and within 0.2 percent in every later year, as shown in Appendix Table 7.

Unless stated otherwise, a product market is an HS10 product in a year, and aggregate statistics weight products by their import value, as in equation (4). Two further product definitions serve as robustness checks in Section 3.4: the HS6 product, and the HS10 product from a given supplier country. Because tariff codes are revised over the sample period, relationships and long differences are measured within time-consistent HS6 product families, which group codes that were split or merged in a nomenclature revision. The descriptive analysis covers all imports.

3.2 Facts about concentration

Fact 1. Importers buy a product from few suppliers, and the relationships are long-lasting. Table 1 compares participation in product markets with participation in trading relationships across all HS10 product-years.

The average product is imported from 72 foreign exporters, with a median of 18, but importers buy from 1.4 suppliers on average. In the average product market, 78 percent of importers use a single supplier. Larger product markets have more exporters, but buyers still use few of them: weighting product-years by import value raises the average number of exporters to 221 and the average number

[4]For more details on the construction of the dataset, see Morlacco (2026).

Table 1: Participation in product markets and in trading relationships, 2001–2025

	Mean	SD	P10	P50	P90	Import-weighted mean
Exporters per product	72.14	190.08	2.00	18.00	176.00	221.46
Suppliers per importer	1.41	0.54	1.00	1.30	1.93	2.01
Share of importers with one supplier	0.78	0.19	0.57	0.80	1.00	0.64
Product-market HHI, suppliers	0.35	0.30	0.06	0.25	0.93	0.20
Sourcing concentration	0.83	0.17	0.58	0.86	1.00	0.68

Note: Statistics across HS10 product-years, 2001–2025. The last column weights product-years by import value. Suppliers per importer and the share of importers with one supplier are averages over importers within each product-year.

of suppliers per importer to 2.0, while the share of single-supplier importers falls to 64 percent.[5] The last two rows of the table report the concentration measures defined in Section 2. Across product-years, sourcing concentration averages 0.83, compared with 0.35 for the product-market HHI.

Appendix Figure 4 shows that these relationships are persistent, another robust feature of firm-to-firm trade data (e.g., Monarch, 2022; Martin et al., 2026). Among importer-product units active in the preceding year, 87 percent of 2019 import value came from suppliers the importer had already used in 2018, and half of 2019 import value was traded in relationships at least five years old.

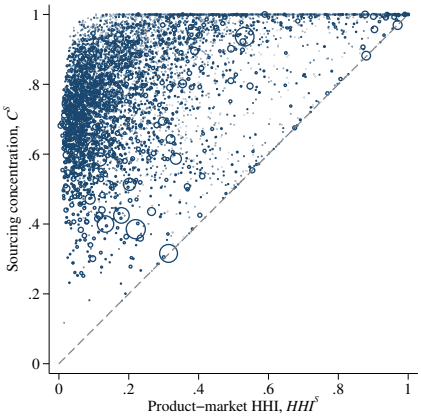
Fact 2. Sourcing segmentation is large, has grown since 2001, and is largest for differentiated products. The last column of Table 1 reports averages across product-years, weighted by import value. Sourcing concentration averages 0.68, compared with 0.20 for the product-market HHI. Segmentation, the difference between the two, averages 0.47 and accounts for 70 percent of sourcing concentration. This gap is widespread across products.

Panel A of Figure 1 plots the two measures for every HS10 product imported in 2019. All products lie on or above the 45-degree line, as implied by Lemma 1, and most lie well above it. Each product's vertical distance from the line equals its sourcing segmentation, D^S.

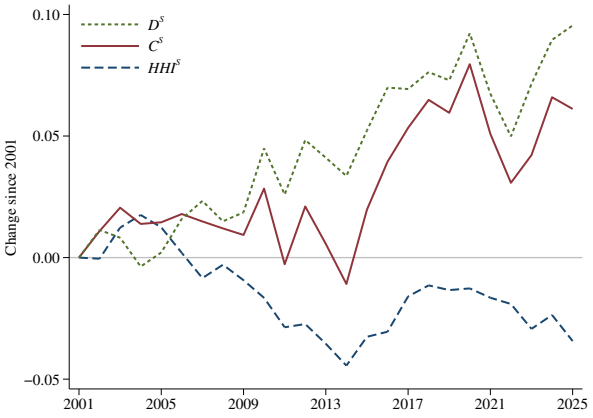
The gap has grown over time. In the annual import-weighted aggregates defined in equation (4), the product-market HHI declines from 0.22 in 2001 to 0.19 in 2025, while sourcing concentration rises from 0.64 to 0.70, so segmentation rises from 0.42 to 0.52. Appendix Table 8 reports selected years. Panel B of Figure 1 plots the changes since 2001: segmentation rises by 0.10, more than offsetting the 0.03 fall in the HHI. This divergence also occurs within products. In year-on-year changes at the product level, the two measures move in opposite directions for 30 percent of import value, as reported in Appendix Table 9.

[5]The uneven distribution of trading partners has also been documented in other firm-to-firm trade datasets (e.g., Bernard et al., 2018).

Figure 1: Product-market HHI and sourcing concentration



Panel A: Products imported in 2019



Panel B: Changes since 2001

Note: Panel A: each marker represents an HS10 product imported by Colombia in 2019, with size proportional to import value; the dashed line is the 45-degree line, and by Lemma 1 each marker's vertical distance from it equals sourcing segmentation. Panel B: changes since 2001 in the import-weighted averages across HS10 products, in index units; levels in 2001 are 0.22 for the product-market HHI, 0.42 for segmentation, and 0.64 for sourcing concentration, and the change in sourcing concentration equals the change in the product-market HHI plus the change in segmentation.

Appendix B.1 decomposes changes in sourcing concentration into changes within product families and shifts in their import shares. From 2001–2003 to 2023–2025, sourcing concentration rises by 6 percent of its initial level. Changes within products contribute an 8 percent increase, partly offset by a 2 percent decrease from imports shifting toward less concentrated products. The decomposition for 2005–2007 to 2017–2019 is similar. The product-market HHI follows a different pattern. Its 23 percent decline over the first period is split almost equally between changes within products and shifts in import shares, which contribute declines of 12 and 11 percent of its initial level, respectively. Thus, within-product changes, which include changes in the composition of buyers, account for the rise in sourcing concentration. Roughly half the decline in the HHI reflects shifts in import shares across products.

Table 2: Concentration by Rauch class, 2019

Rauch class	Import share	HHI suppliers	Sourcing conc.	Segmentation share
Differentiated	0.60	0.16	0.74	0.79
Reference	0.19	0.29	0.71	0.60
Homogeneous	0.16	0.32	0.57	0.45
Unclassified	0.06	0.19	0.59	0.67

Note: Import-weighted averages across HS10 products within each class, using the conservative Rauch classification at HS6. The segmentation share is sourcing segmentation divided by sourcing concentration.

The gap is largest for differentiated products. Table 2 reports the measures by Rauch class for 2019. Differentiated goods account for 60 percent of imports and have the lowest product-market HHI, at 0.16, but sourcing concentration of 0.74. Segmentation therefore accounts for 79 percent of their sourcing concentration, compared with 60 percent for reference-priced goods and 45 percent for homogeneous goods. Across HS sections, this share ranges from 37 percent in minerals and fuels to at least 80 percent in machinery and electrical equipment, plastics, textiles, and instruments, as reported in Appendix Table 10. The pattern is consistent with customization limiting buyers' alternatives.

Fact 3. The two measures rank products differently. Table 3 sorts the HS10 products imported in 2019 into thirds of import value by their product-market HHI. The HHI rises from 0.05 in the bottom third to 0.43 in the top third. Sourcing concentration barely moves: 0.67 in the bottom third and 0.76 in the top. Buyers of the products with the most dispersed set of exporters concentrate their purchases almost as much as buyers of the most concentrated products.

Table 3: Products ranked by the product-market HHI, 2019

Products ranked by HHI	Products	Import share	HHI range	HHI	Sourcing conc.	Segmentation share
Bottom third	1,257	0.33	0.01–0.09	0.05	0.67	0.92
Middle third	1,724	0.33	0.09–0.22	0.14	0.68	0.79
Top third	3,529	0.33	0.22–1.00	0.43	0.76	0.43

Note: HS10 products imported in 2019, sorted by the product-market HHI and split into thirds of import value. HHI, sourcing concentration, and the segmentation share are import-weighted averages within each third.

These findings matter for assessments that use import concentration to identify dependence on foreign suppliers. Ranking products by the product-market HHI directs attention to the top third of Table 3 and away from the bottom third, where buyers' sourcing is nearly as concentrated.

Fact 4. Pooling conceals exposure to supplier countries. Policy assessments measure dependence by the share of a product's imports that comes from one country. This share is a pooled measure that assigns every buyer of the product the same country mix. Table 4 compares it with the country mix that buyers actually hold. For each importer and HS10 product, we compute the share of purchases produced in each country and ask how much import value sits in buyer-product portfolios that come entirely, or at least 90 percent, from one country. China supplies 21 percent of Colombian imports. Portfolios sourced entirely from China hold 8.9 percent of all import value. If every buyer held its product's pooled Chinese share, that figure would be 0.1 percent, because almost no product is imported only from China at the national level. For the United States the figures are 6.3 and 0.3 percent, and with the 90 percent threshold they are 15.6 and 6.8 percent. Pooled country shares therefore miss most of the single-country dependence in buyers' portfolios. A

disruption in an origin country affects all of that country's suppliers at once, so the shock considered here is common to many suppliers, unlike the independent supplier shocks of Section 2.3. The table identifies the purchases that would have to be rerouted after such a disruption. How costly or how feasible rerouting would be is a question the customs data cannot answer.

Table 4: Aggregate and buyer-specific exposure to origin countries, 2019

	Import	At least 90% exposed		Fully exposed	
Origin country	share	Buyer-specific	Pooled	Buyer-specific	Pooled
United States	25.14	15.56	6.76	6.30	0.25
China	20.73	14.77	3.40	8.89	0.09
Mexico	7.51	3.86	1.28	2.19	0.00
Brazil	6.06	2.88	0.44	1.89	0.04
Germany	4.21	1.48	0.04	1.01	0.01

Note: All entries are percentages. Countries are the five largest origins by total import value; origin is the country of production recorded in the declaration. Import share is the country's share of all imports. The remaining columns report the share of total import value in buyer–HS10 portfolios sourcing at least 90 percent, or all, of their purchases from that country. Buyer-specific exposure uses observed purchases; pooled exposure assigns every buyer the country share of its product's total imports. Portfolios are weighted by their total imports, including purchases from other countries.

3.3 Evidence on dependence from supplier exits

The facts of Section 3.2 show that buyers use few of the exporters of a product. They do not establish whether they could turn to the other exporters if needed. This distinction separates the two market boundaries in Section 2.4. We examine it by following buyers whose suppliers stop selling to Colombia and asking whether they replace lost purchases through other exporters of the same product.

Design. Using longitudinal exporter identifiers, we define an exit in year t as an exporter that sold to at least two Colombian importers in $t-1$, also sold in $t-2$, and made no sales to any Colombian importer, in any product, in either t or $t+1$. Requiring at least two buyers distinguishes departure from the Colombian market from the end of a single trading relationship. We identify 24,031 exits between 2004 and 2022.

The unit of observation is a buyer–HS10 pair, followed from $t-3$ to $t+3$. Years without purchases enter as zeros. A pair is treated if exporters exiting in t supplied at least half its purchases of the product in $t-1$. Comparison pairs bought nothing from those exporters, and they are drawn from products that contain a treated pair in the same cohort. The main outcome is total purchases of the product divided by purchases in $t-1$. We also examine an indicator for any purchase and purchases grouped by suppliers' status in $t-1$. Of particular interest are purchases from suppliers

new to the buyer–product pair that already sold the product to other Colombian importers. These purchases show whether buyers turn to exporters already serving the market.

For pair jh in cohort c at event time τ, we estimate

$$Y_{jhc\tau} = \alpha_{jhc} + \delta_{hc\tau} + \sum_{k \neq -1} \beta_k T_{jhc} \mathbf{1}\{\tau = k\} + u_{jhc\tau}, \tag{6}$$

where T_{jhc} equals one for treated pairs, α_{jhc} is a pair-by-cohort fixed effect, and $\delta_{hc\tau}$ is a product-by-cohort-by-event-year fixed effect. Each β_k measures the change from $t-1$ to event year k in treated pairs' purchases relative to comparison pairs buying the same product in the same year and cohort (Cengiz et al., 2019). Observations are weighted by purchases in $t-1$, and standard errors are clustered by product.

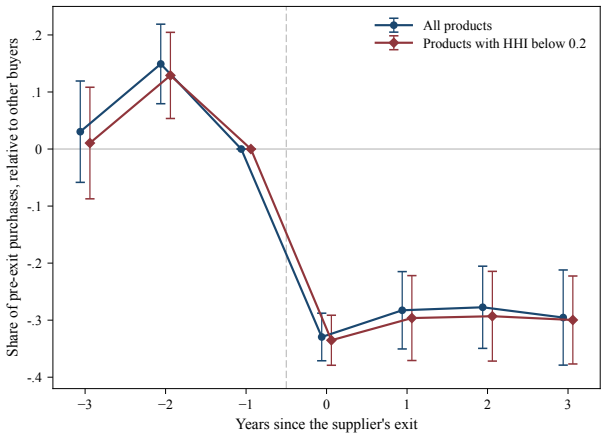
Interpreting β_k as the effect of supplier exit requires treated and comparison pairs to have followed the same purchasing path in the absence of exit. However, observed exits need not be exogenous, and there is some evidence that purchases were already declining among treated pairs relative to comparison pairs before exit. The coefficient at $t-2$ is 0.15 (standard error 0.04), indicating a relative decline between $t-2$ and the baseline year. We therefore interpret the estimates as descriptive comparisons between buyers exposed to supplier exit and other buyers of the same product. Appendix B.2 details the sample construction and pre-exit differences. It also reports a specification controlling for each pair's pre-exit change in purchases, which yields similar or larger declines.

Results. Figure 2 plots the coefficients; Appendix Table 13 reports them with standard errors. In the exit year, treated buyers' purchases fall relative to comparison buyers by an amount equal to 33 percent of pre-exit purchases (standard error 2 percentage points). The relative decline remains at 30 percent three years later. Two findings hold across specifications.

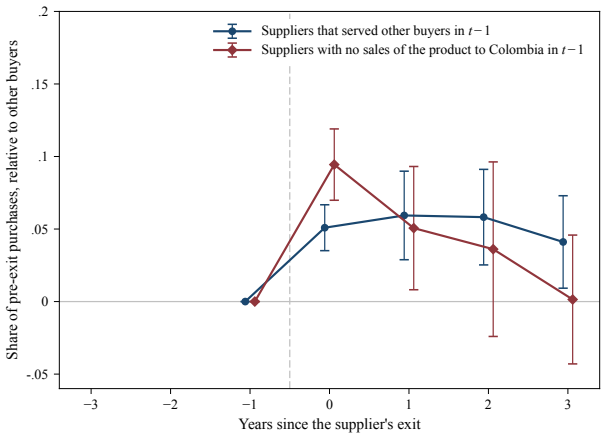
First, treated buyers make few additional purchases from exporters already serving the market. Purchases from suppliers new to the pair that sold the product to other Colombian importers in $t-1$ rise relative to comparison buyers by 5 percent of pre-exit purchases in the exit year and 4 percent after three years. Purchases from suppliers with no sales of the product to Colombia in $t-1$ rise by 9 percent relative to comparison buyers in the exit year, but the estimated difference falls to zero after three years. These coefficients measure additional purchases relative to comparison buyers, who also add suppliers over time. They are small compared with the purchases lost.

Second, the decline is no smaller in products with hundreds of exporters. Treated pairs belong to products with a median of 227 exporters in $t-1$, ranging from 29 at the 10th percentile to 1,016 at the 90th percentile. If a larger pool of exporters gives buyers more alternatives, purchases should fall less where more exporters are present. We test this by interacting the treated-by-year indicators with the log number of exporters. A tenfold increase in exporters is associated with

Figure 2: Purchases after the exit of a supplier



Panel A: Purchases of the product



Panel B: Purchases from suppliers new to the buyer

Note: Coefficients β_k from equation (6), $t-3$ to $t+3$, reference year $t-1$, weighted by $t-1$ purchases; bands are 95 percent confidence intervals with standard errors clustered by product. Panel A: purchases of the product divided by $t-1$ purchases, for all products and for products with a $t-1$ product-market HHI below 0.2. Panel B: purchases from suppliers that did not sell to the pair in $t-1$, split by whether the supplier sold the product to other Colombian importers in $t-1$; all products.

a 6-percentage-point larger decline in the exit year (standard error 4 points). The 95 percent confidence interval allows at most a 2-point reduction in the 33-point decline. Appendix Table 14 reports the full set of interaction estimates.

The results also hold in products with low measured concentration and under alternative specifications. Among the 85 percent of treated pairs in products with a product-market HHI below 0.2, purchases fall relative to comparison buyers by 34 percent of pre-exit purchases in the exit year and 30 percent after three years. Capping purchases at five times their $t-1$ level gives declines of 32 and 25 percent. Controlling for pre-exit changes in purchases gives declines of 36 and 32 percent. Appendix Table 15 collects these estimates.

The records do not reveal why buyers replace so little of their purchases. They do not measure search costs, the suitability of other exporters' inputs, or the prices those exporters would charge. Nor do they establish which outside suppliers constrain incumbents in normal times. The persistent relative declines and limited reallocation nevertheless show that a low product-market HHI or a large exporter count is insufficient evidence that buyers can readily replace a supplier. These findings support measuring dependence within buyers' incumbent supplier bases over a horizon of several years.

3.4 Robustness to the product definition

As Appendix Figure 5 shows, alternative product definitions change the levels of concentration but leave a substantial and growing gap between the two measures. With HS6 products, the product-market HHI falls from 0.20 to 0.16 over 2001–2025, while sourcing concentration rises from 0.63 to 0.68, following the same pattern as with HS10 products. Defining markets by HS10 product and supplier country raises the HHI mechanically to about 0.5 because fewer exporters are pooled. Under this narrower definition, the HHI rises by 0.03 over the period, but sourcing concentration rises by twice as much. Segmentation therefore still grows, from 0.28 to 0.31, and accounts for more than a third of sourcing concentration. Narrowing market boundaries brings the product-market HHI closer to buyers' own concentration, but a gap of about 0.3 remains even within a product and supplier country.

4 From Concentration to Market Power

What concentrated sourcing implies for the prices buyers pay depends on how those prices are set. When prices are negotiated, a buyer's importance to its supplier also matters. A buyer accounting for a large share of a supplier's sales may obtain a lower price even if its own sourcing is concentrated. Prices therefore depend on concentration on both sides of the relationship and on the parties' bargaining power.

We use the bilateral pricing rule of Alviarez et al. (2025) to derive an expression for aggregate import margins. The supplier shares entering the rule reflect the market boundary used to define buyers' alternatives, so the rule can be evaluated at each of the two boundaries discussed in Section 2.4. We compare the resulting margins under different assumptions about bargaining power.

4.1 Reciprocal dependence and customer concentration

As on the supplier side, a supplier's buyer base may be highly concentrated even when many firms buy the same product. For a product and year, let $s_{j|i} = v_{ij} / \sum_k v_{ik}$ be buyer j's share of supplier i's sales, and let $HHI^B = \sum_j s_j^2$ be the product-market HHI of importers. The counterpart of

Table 5: Customer concentration, selected years

	2001	2007	2013	2019	2025	Change
Product-market HHI of importers (HHI^B)	0.291	0.270	0.268	0.252	0.226	-0.065
+ Buyer-side segmentation ($D^{B,v}$)	0.539	0.530	0.552	0.567	0.602	0.063
= Customer concentration, value shares ($C^{B,v}$)	0.830	0.800	0.819	0.819	0.828	-0.002
Customer concentration, model statistic ($C^{B,q}$)	0.828	0.799	0.818	0.818	0.827	-0.001

Note: Import-weighted averages across HS10 products in each year. Buyer shares are shares of each exporter's sales of the product to Colombia. The model statistic $C^{B,q}$ uses quantity shares; the other rows use value shares.

sourcing concentration on the buyer side is *customer concentration*, the sales-weighted average of suppliers' customer HHIs,[6]

$$C^{B,v} \equiv \sum_i s_i \sum_j s_{j|i}^2 = HHI^B + D^{B,v}, \qquad D^{B,v} = \sum_i s_i \sum_j \left(s_{j|i} - s_j\right)^2 \geq 0, \tag{7}$$

where the decomposition follows from the proof of Lemma 1 with the roles of buyers and suppliers exchanged. Table 5 reports the aggregates. Customer concentration is high and stable, 0.82 in 2019, while the importer HHI is 0.25 and falling. Suppliers' sales to Colombia are even more concentrated across buyers than buyers' purchases are across suppliers: 90 percent of exporters in the average product-year sell to a single Colombian buyer.

The pricing rule below uses a buyer share defined on quantities, $x_{j|i} = q_{ij}/\sum_k q_{ik}$, because supplier marginal cost depends on physical output. The corresponding aggregate is the trade-weighted average quantity share, $C^{B,q} \equiv \sum_{ij} \omega_{ij}\, x_{j|i} = \sum_i s_i \sum_j s_{j|i}\, x_{j|i}$. While it does not inherit the decomposition in equation (7), it is numerically close to $C^{B,v}$, as Table 5 shows. We use $C^{B,v}$ to describe buyer-side segmentation and $C^{B,q}$ for pricing.

All buyer shares are measured within an exporter's sales to Colombia, because the customs records do not report its sales elsewhere. Interpreting them as the model's buyer shares requires that an exporter's supply to Colombia has its own marginal cost schedule, so that the quasi-rents a Colombian buyer can bargain over are those of the exporter's Colombian sales. Section 5.4 reports how the margins change when every buyer share is halved to allow for sales outside Colombia.

[6]The customers in question are importing firms. We avoid the term *buyer concentration* because it usually refers to concentration on the buyer side of a market as a whole, which here is the importer HHI, HHI^B. Customer concentration instead measures how concentrated each supplier's sales are across the firms it sells to, in the same way that sourcing concentration measures how concentrated each buyer's purchases are across the suppliers it buys from.

4.2 Bilateral pricing

The environment is that of Alviarez et al. (2025), and we summarize only what the aggregate result needs. Each importer j combines the inputs of a given set of suppliers with a CES aggregator with elasticity ρ, and sells its output in a market with constant elasticity; $\eta < \rho$ denotes the elasticity of its demand for the input bundle as a whole. Each exporter i produces with marginal cost increasing in output, $c_i \propto q_i^{(1-\theta)/\theta}$ with $0 < \theta \leq 1$, so that $\theta = 1$ is constant returns. The set of trading relationships is given. Each pair negotiates its price by Nash bargaining, taking the outcomes of all other negotiations as given (Horn and Wolinsky, 1988); the importer's bargaining weight is $\phi \in [0, 1]$. The negotiated price is a markup over the supplier's marginal cost,

$$\mu_{ij} = (1 - \varphi_{ij}) \frac{\varepsilon_{ij}}{\varepsilon_{ij} - 1} + \varphi_{ij}\, \theta\, \frac{1 - (1 - x_{j|i})^{1/\theta}}{x_{j|i}}, \qquad \varepsilon_{ij} = \rho - (\rho - \eta)\, s_{ij}. \tag{8}$$

Here $\varphi_{ij} \in [0, 1]$ is the importer's effective bargaining power. It differs from ϕ because the gains from trade that the parties split depend on their outside options, and the buyer's outside option, sourcing from its remaining suppliers, depends on the supplier's share of its purchases. φ_{ij} is therefore a function of s_{ij}: it equals ϕ when s_{ij} is zero or one and exceeds ϕ in between. Its expression is in Appendix A.

With $\varphi_{ij} = 0$ the supplier sets the price and the markup is $\varepsilon_{ij}/(\varepsilon_{ij} - 1)$, the Bertrand–Nash markup of a supplier facing CES demand; if in addition buyers substitute among all exporters of the product, s_{ij} is the supplier's market share and this is the markup of Atkeson and Burstein (2008), as in the oligopoly trade models of Grassi (2018) and Dhyne et al. (2022). With $\varphi_{ij} = 1$ the buyer sets the price, and the price-cost ratio is $\theta[1 - (1 - x_{j|i})^{1/\theta}]/x_{j|i}$, which is below one when $\theta < 1$ because a large buyer captures part of the supplier's quasi-rents, and equal to one under constant returns, when there are no quasi-rents to capture. Between the limits the negotiated markup is a weighted average of the two, so a supplier's share raises the price and a buyer's share lowers it.

The share s_{ij} in the elasticity is supplier i's share of the purchases among which buyer j substitutes. In the model, buyers substitute among their incumbent suppliers, so $s_{ij} = s_{i|j}$ and the relevant market is each buyer's supplier base. We keep the generic notation because the next subsection evaluates the rule at both boundaries of Section 2.4, and shows that the product-wide case reproduces the standard link between concentration and markups at the industry level.

4.3 Aggregate margins and concentration

We define the aggregate margin of a product as the trade-weighted average of bilateral Lerner indices, and the aggregate markup as the corresponding ratio of sales to cost:

$$L \equiv \sum_{ij} \omega_{ij} \left(1 - \mu_{ij}^{-1}\right), \qquad \mu = (1 - L)^{-1} = \Big(\sum_{ij} \omega_{ij}\, \mu_{ij}^{-1}\Big)^{-1}, \tag{9}$$

where $\omega_{ij} = v_{ij}/V$ is the pair's share of the product's imports.

Let $X^S \equiv \sum_{ij} \omega_{ij}\, s_{ij}$ denote the trade-weighted average of the supplier share that enters the elasticity in equation (8), and let

$$m_0 \equiv (1 - \phi)\frac{\rho}{\rho - 1} + \phi \tag{10}$$

denote the bilateral markup of equation (8) when both shares are zero. It averages the CES markup $\rho/(\rho - 1)$, which a supplier charges when its share of the buyer's purchases is negligible, and marginal-cost pricing, with weights given by the bargaining power.

Proposition 1 (Aggregate margins)**.** *A first-order expansion of the bilateral Lerner index around zero shares gives*

$$L \approx \beta_0 + \beta_S\, X^S - \beta_B\, C^{B,q}, \tag{11}$$

with

$$\beta_0 = 1 - \frac{1}{m_0}, \qquad \beta_S = \frac{(1 - \phi)(1 - \phi/2)(\rho - \eta)}{(\rho - 1)^2 m_0^2}, \qquad \beta_B = \frac{\phi(1 - \theta)}{2\theta m_0^2}. \tag{12}$$

The derivation is in Appendix A. In the first-order formula, supplier concentration enters with a nonnegative coefficient and customer concentration with a nonpositive one. The factor $(1-\phi/2)$ in β_S captures how supplier shares affect effective bargaining power, reducing the supplier-concentration contribution. The coefficient β_B is zero under constant returns and when suppliers set prices. Section 5 evaluates equation (9) directly, since the bilateral shares are observed. The formula connects the aggregate margin to the concentration indices of Section 2, and shows how the standard mapping from the product-market HHI to markups changes when buyers substitute only among their incumbent suppliers.[7]

[7]The remainder depends on higher moments and the joint distribution of bilateral shares, so the two indices are not sufficient statistics for the exact margin. Section 5 reports the exact margin alongside the approximation.

Market boundaries in the formula. Proposition 1 takes the market boundary as an input through X^S.[8] The two boundaries of Section 2.4 correspond to two values of the supplier share in the pricing rule, and hence to the two concentration measures of Section 2:

$$X^S = \begin{cases} C^S & \text{if each buyer substitutes among its incumbent suppliers, } s_{ij} = s_{i|j}, \\ HHI^S & \text{if each buyer substitutes among all exporters of the product, } s_{ij} = s_i. \end{cases} \tag{13}$$

The first case is the model: since $\omega_{ij} = s_j\, s_{i|j}$, $X^S = \sum_j s_j \sum_i s_{i|j}^2 = C^S$. The second is the pooled benchmark, $X^S = \sum_{ij} \omega_{ij} s_i = \sum_i s_i^2 = HHI^S$, which gives the formula of standard oligopoly models, where competition is industry-wide and the product-market HHI is the relevant index (Grassi, 2018; Nocke and Schutz, 2025). By Lemma 1, the two boundaries give margins that differ, to first order, by

$$L\big|_{X^S=C^S} - L\big|_{X^S=HHI^S} \approx \beta_S\, D^S. \tag{14}$$

To first order, the difference between the margins calculated with buyer-specific and with pooled supplier shares is therefore proportional to segmentation. The comparison holds the observed transactions fixed: the pooled calculation replaces the supplier share in the pricing rule with the market share, while the set of relationships and the quantities traded stay as observed. Under unilateral supplier pricing, the concentration indices also bound the exact margin, with no further information about the distribution of bilateral shares, as Corollary 1 in Appendix A shows. Section 5 compares these bounds with the exact margins at the two boundaries.

Across products, the national import margin is $L^{\text{all}} = \sum_h \omega_h L_h$, where ω_h is product h's share of total imports, and the corresponding markup is $\mu^{\text{all}} = (1 - L^{\text{all}})^{-1}$. With common parameters, equation (11) holds for the import-weighted average indices of Section 2.2. With parameters that differ across products, each product's coefficients apply before aggregation.

5 Quantification

We use the framework to evaluate how alternative concentration measures and pricing assumptions change the inferred aggregate markup on the same observed transactions. The exercise makes two changes relative to the standard calculation: it retains each firm's sourcing relationships in the supplier share, and it allows buyers to bargain. The two changes push the margin in opposite directions, so the net effect depends on their magnitudes. We compute bilateral prices and aggregate them exactly, and we use these results to assess the accuracy of the first-order concentration formula.

[8] The boundary is side-specific: whether a buyer can switch suppliers and whether a supplier can switch buyers are separate questions. With a broad boundary on the buyer side, the relevant buyer share would be the buyer's share of the product's total purchases and $C^{B,q}$ would be replaced by a quantity-based importer HHI; broad on both sides is the standard industry-wide model. We vary the supplier-side boundary, which is the dependence question of this paper, and hold the buyer side at its narrow boundary, as in the model.

5.1 Calibration

Four parameters map bilateral shares into margins: the elasticity of substitution between suppliers ρ, the elasticity of demand for the input bundle η, the curvature of supply θ, and the importer's bargaining weight ϕ. We set them to external values, because the exercise asks how the inferred margin changes with the market boundary and the pricing assumptions at given parameters. The baseline is $\rho = 7$, $\eta = 2.5$, $\theta = 0.65$, and $\phi = 0.5$. Section 5.4 repeats the calculation with $\rho = 4$, with $\theta = 1$, and with smaller buyer shares, and every table reports the bargaining weight at 0, 0.5, and 1.

Substitution elasticity ρ. The elasticity of substitution ρ determines how much a supplier's share of its buyer's purchases raises the negotiated price. In Belgian firm-to-firm data, Dhyne et al. (2022) estimate elasticities between 2.5 and 7 in a framework with differentiated varieties, and Alviarez et al. (2025) use 10. Product-level estimates for Colombia in Soderbery (2018) give a median elasticity of substitution across supplier countries of 2.9 at the HS4 level. Substitution among suppliers of the same variety is plausibly higher than substitution across countries, so we take 7 as the baseline and 4 as the alternative.

Demand elasticity η. The elasticity $\eta = 1 - \gamma + \nu\gamma$ combines the imported-input cost share γ with the elasticity of demand for the importer's output ν. A cost share of 0.2 to 0.3 and an output markup near 1.3 place it between 2 and 3, and the baseline uses 2.5. Only the difference $\rho - \eta$ enters the supplier-side coefficient in equation (12), so η matters through its distance from ρ.

Returns to scale θ. The supply curvature θ sets the quasi-rents that a buyer can bargain over. The baseline of 0.65 follows from the median inverse export supply elasticity for Colombia in Soderbery (2018), 0.55, through $\theta = 1/(1 + 0.55)$. The alternative, $\theta = 1$, is constant returns: suppliers then earn no quasi-rents, customer shares drop out of the pricing rule, and bargaining affects the margin only through the weight on the supplier's markup.

Bargaining power ϕ. The bargaining weight ϕ determines who sets prices. At $\phi = 0$ suppliers set prices unilaterally, which is the case of standard oligopoly models; at $\phi = 1$ buyers do; the baseline of 0.5 splits the gains from trade equally. We do not estimate ϕ on this panel. The estimate of Alviarez et al. (2025), 0.83, obtained on U.S. firm-to-firm import transactions, lies between the baseline and full buyer power.

Sample. The calculation uses the 2019 cross-section of all imports, 6,510 HS10 products, the sample of Section 3. We construct $s_{i|j}$ and s_i from import values and the buyer share $x_{j|i}$ from

net weight within each exporter's sales of the product to Colombia. For each buyer–supplier pair we evaluate equation (8) twice, with the supplier share set to $s_{i|j}$ at the incumbent-supplier boundary and to s_i at the all-exporters boundary, aggregate within products with equation (9), and average across products with import weights. Both calculations take the observed relationships and quantities as given; the all-exporters calculation changes only the share that enters the pricing rule. Appendix C shows that the concentration patterns of Section 3 also hold for intermediate goods; we compute margins for all imports only.

One measurement choice shapes the buyer side. The records cover an exporter's sales to Colombia only, so $x_{j|i}$ is a buyer's share of its supplier's Colombian sales. In the average product-year, 90 percent of exporters have a single Colombian buyer, whose measured share is therefore one. Under full buyer power the pricing rule then sets the price at the supplier's average cost, which is the right benchmark only if the exporter's Colombian sales have their own cost schedule. If the same capacity also serves other destinations, the measured share overstates the buyer's importance to the supplier. Section 5.4 reports the margins with every buyer share halved.

5.2 Implied margins under alternative boundaries and pricing

Table 6 reports the 2019 aggregate Lerner index, in percent, and the corresponding markup for the two market boundaries and the three bargaining weights. The standard calculation defines the market as all exporters of the product and lets suppliers set prices ($X^S = HHI^S$, $\phi = 0$). It gives a Lerner index of 17.4 percent, a markup of 1.21. Keeping supplier pricing and defining the market as each buyer's incumbent suppliers ($X^S = C^S$) raises the index to 29.7 percent, a markup of 1.42, an increase of 12.4 points. Keeping the incumbent-supplier boundary and giving buyers a bargaining weight of 0.5 lowers the index to 4.0 percent, a markup of 1.04, a decrease of 25.7 points. The change of market boundary and the change of pricing therefore move the margin in opposite directions, and the second change is twice the size of the first. With bargaining, the implied margin is 13.4 points below the standard calculation, although sourcing concentration, 0.70, is more than three times the product-market HHI, 0.21.

The difference between the two rows of the table is the part of the margin that a calculation with the product-market HHI in place of sourcing concentration leaves out. It is 12.4 points when suppliers set prices, 9.2 points at $\phi = 0.5$, and zero at $\phi = 1$, where the supplier share no longer enters the pricing rule. Under the alternative parameter values of Section 5.1, $\rho = 4$ and $\theta = 1$, the difference at $\phi = 0.5$ is 6.3 and 7.5 points, as shown in Appendix Table 21. When suppliers set prices, the difference does not rest on the particular distribution of bilateral shares behind the two indices. Corollary 1, evaluated at $C^S = 0.702$ and $HHI^S = 0.209$, places the exact margin between 26.0 and 32.3 percent at the incumbent-supplier boundary and between 16.5 and 19.7 percent at the

Table 6: Aggregate import margins by market boundary and bargaining weight, 2019

	$\phi = 0$	$\phi = 0.5$	$\phi = 1$
Exact aggregate Lerner index, percent			
All exporters ($X^S = HHI^S$)	17.4	-5.2	-41.9
Incumbent suppliers ($X^S = C^S$)	29.7	4.0	-41.9
Difference	12.4	9.2	0.0
Exact aggregate markup			
All exporters	1.210	0.950	0.705
Incumbent suppliers	1.423	1.042	0.705

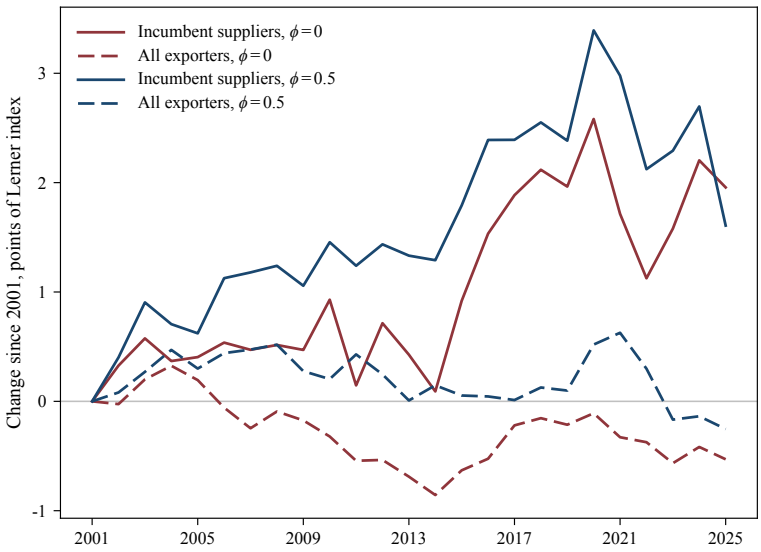
Note: All imports, 6,510 HS10 products, import-weighted. Bilateral markups from equation (8) with $\rho = 7$, $\eta = 2.5$, $\theta = 0.65$, aggregated exactly with equation (9). "All exporters" sets the supplier share in the elasticity to the market share s_i; "Incumbent suppliers" sets it to the share within the buyer, $s_{i|j}$. Buyer shares are measured within each exporter's Colombian sales, so the margins under bargaining are lower bounds at these parameters. At $\phi = 1$ the aggregate index of -41.9 percent corresponds to a price of 0.705 times marginal cost, which remains above average cost: with $\theta = 0.65$, average cost is 0.65 times marginal cost.

all-exporters boundary. Any distribution of shares with these two indices therefore produces a difference of at least 6.3 points; the observed distribution produces 12.4.

Bargaining lowers the margin at both boundaries, by 22.6 points at the all-exporters boundary, from 17.4 to -5.2 percent, and by 25.7 points at the incumbent-supplier boundary. The size of the decrease comes from the buyer's term in equation (8). At $\phi = 0.5$ the negotiated markup is a weighted average of the supplier's markup and the buyer's term $\theta[1 - (1 - x_{j|i})^{1/\theta}]/x_{j|i}$, which falls with the buyer's share of the supplier's sales and equals $\theta = 0.65$ when that share is one. The share is one for the 90 percent of exporters with a single Colombian buyer, so on their transactions the buyer's term takes its lowest value. At $\phi = 1$ only the buyer's term remains, supplier shares no longer matter, and the aggregate index is -41.9 percent at both boundaries, a price of 0.705 times marginal cost. These negative margins measure the leverage that the pricing rule assigns to buyers when an exporter's Colombian sales are treated as its whole market. Section 5.4 shows that halving every buyer share raises the $\phi = 0.5$ margin at the incumbent-supplier boundary from 4.0 to 11.7 percent and leaves the difference between the boundaries at 8.1 points.

The first-order formula of Proposition 1 gives the same ordering across the cells but a smaller difference between the boundaries: $\beta_S D^S$ is 4.5 points when suppliers set prices, against 12.4 in the exact calculation, as shown in Appendix Table 22. The bilateral margin is convex in the supplier share, and many observed shares are far from the zero point of the expansion. Section 5.4 reports the errors cell by cell.

Figure 3: Change in aggregate import margins under alternative market boundaries and pricing, 2001–2025



Note: Change since 2001 in the aggregate Lerner index, in points. All imports, HS10 products, import-weighted, exact aggregation of equation (9) with $\rho = 7$, $\eta = 2.5$, $\theta = 0.65$ in every year. Solid lines define the market as each buyer's incumbent suppliers ($X^S = C^S$); dashed lines as all exporters of the product ($X^S = HHI^S$). Levels in 2019 are in Table 6.

5.3 Changes over time

The measurement of Section 3 showed sourcing concentration rising and the product-market HHI falling over 2001–2025. Figure 3 applies the exact calculation of Table 6 to every year, at the baseline parameters, for the four combinations of market boundary and pricing. Because the parameters are held fixed, the series record what the observed changes in shares imply for margins.

Figure 3 plots changes since 2001; the 2019 levels are in Table 6. Under supplier pricing, the margin calculated with pooled shares declines slightly, from 17.6 percent in 2001 to 17.0 in 2025. With incumbent supplier shares it rises by about two percentage points, from 27.8 to 29.7 percent. With bargaining at $\phi = 0.5$, the broad-boundary margin changes little, from -5.3 to -5.6 percent, while the narrow-boundary margin rises from 1.6 to 3.2 percent, with a peak of 5.0 in 2020. The gap between the two calculations widens from 10.2 to 12.7 points under supplier pricing and from 6.9 to 8.8 at $\phi = 0.5$. These changes follow from the evolution of the share distributions at fixed parameters and mirror the widening segmentation gap documented in Section 3. Establishing whether actual markups rose over the period would require estimating changes in the parameters as well, which we do not attempt.

5.4 Accuracy and sensitivity

Concentration formula. Appendix Table 22 evaluates the first-order formula in equation (11) using the 2019 concentration indices and compares the results with the exact calculations in Table 6. The approximation preserves the ranking across market boundaries and bargaining weights, but the differences in levels can be large. Under supplier pricing, restricting the market to incumbent suppliers gives an approximate margin of 20.7 percent, compared with 29.7 percent under the exact calculation. Under full buyer power, the approximation gives −22.0 percent rather than −41.9 percent, understating the magnitude of the negative margin by about 20 percentage points. The margin gap between market boundaries under supplier pricing is also understated, at 4.5 points compared with 12.4 points exactly. Large bilateral shares make the nonlinear terms important. We therefore use the first-order formula to interpret the contributions of supplier and customer concentration, and the exact nonlinear calculation for quantitative comparisons.

Parameters. Appendix Table 21 repeats the calculations in Table 6 using the alternative parameter values described in Section 5.1. Reducing the elasticity of substitution ρ from 7 to 4 raises margins by 5 to 10 percentage points at $\phi = 0$ and $\phi = 0.5$, but leaves them unchanged under full buyer power. The margin gap between market boundaries under supplier pricing falls from 12.4 to 7.4 points. Under constant returns, customer shares no longer affect margins, although bargaining still does. The margin under full buyer power is zero, and the gap between market boundaries at $\phi = 0.5$ is 7.5 points rather than 9.2. Under both parameter changes, buyer-specific supplier shares continue to imply higher margins except under full buyer power. At $\phi = 0.5$, the margin with incumbent suppliers also remains below the corresponding benchmark with pooled shares and supplier pricing.

Buyer shares. We measure the buyer share $x_{j|i}$ within each exporter's sales to Colombia. If the exporter also sells elsewhere and its marginal cost depends on total output, this share overstates the buyer's importance to the supplier. The last rows of Appendix Table 21 examine this possibility by halving every buyer share. Under full buyer power, the implied margin rises from approximately −42 to −14 percent. At $\phi = 0.5$, the margin with incumbent suppliers rises from 4.0 to 11.7 percent, still below the conventional calculation of 17.4 percent. The gap between market boundaries narrows from 9.2 to 8.1 points. The size of the bargaining effect thus depends on how suppliers' markets are defined, as discussed in Section 5.1. Buyer bargaining still lowers margins, and the margin gap between the two supplier-share calculations remains positive at $\phi = 0.5$.

5.5 Implications for dependence assessments

A product with a low product-market HHI can still have high sourcing concentration. Reporting both measures makes these cases visible, including products that an aggregate screen would overlook. Under the fixed-share shock benchmark of Section 2.3, segmentation measures the difference between average buyer exposure and exposure in pooled imports. This comparison does not require a pricing model.

Whether that exposure amounts to dependence turns on the suppliers buyers can use and the time needed to switch. The two indices describe broad and narrow sets of alternatives. The exit evidence in Section 3.3 supports the narrower benchmark for replacing purchases over several years. It leaves open which outside suppliers buyers could credibly turn to when negotiating with incumbents in normal times.

The pricing calculations also depend on suppliers' reliance on their buyers. A buyer's share of its supplier's Colombian sales may overstate its importance if the supplier sells substantially elsewhere. The low benchmark margin under bargaining therefore depends on how this customer market is defined, as well as on the pricing parameters. Section 5.4 examines that sensitivity. The calculations compare what different market boundaries and pricing assumptions imply for the same observed transactions.

6 Conclusion

Product-level HHIs are routinely used to assess competition and, increasingly, dependence on foreign suppliers. In input markets, both uses depend on whether the exporters serving a country are alternatives for its buyers. A country can import a product from many exporters while individual firms remain tied to one or two. Pooling their purchases then gives a picture of diversification that may offer those firms little protection when a supplier stops delivering or raises prices.

In the Colombian context, buyers that lose a main supplier buy less for several years relative to other buyers of the product, with little additional purchasing from exporters already in the market. The decline is no smaller in products with hundreds of exporters than in products with a few dozen. For these buyers, a large national supplier base did not translate into much replacement of lost purchases. This gives reason to study the costs of using suppliers already present in a market alongside the costs of attracting new exporters.

Dependence on a supplier does not, by itself, tell us how much pricing power that supplier has. A buyer may account for a large share of the supplier's sales and use this position to negotiate a lower price. Our bargaining model shows how dependence on both sides of a relationship enters aggregate margins, with supplier and customer concentration summarizing the relevant shares. A buyer can

therefore obtain favorable terms from a supplier it would struggle to replace. Its bargaining position and its ability to withstand a disruption are different questions.

An open question is why sourcing within firms has become more concentrated as the number of exporters has grown. Falling costs of selling abroad may encourage entry, while input customization, qualification requirements and changes in production technology may make individual relationships harder to replace. A model that separates market-entry costs from the costs of forming relationships could examine whether lower entry costs alone can account for both trends. The answer matters for the gains from variety, since adding exporters to a country need not expand the range of inputs available to each firm.

Data on supplier searches, qualification procedures and price offers would help distinguish the absence of suitable alternatives from the costs of finding and using them. Exporters' sales in other destinations would also improve the measurement of buyers' importance to their suppliers. Combined with a model in which firms can change suppliers and quantities, this evidence would allow a comparison of policies that encourage exporter entry with policies that make switching easier. Supplier qualification and backup relationships are concrete places to begin.

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A Identities and Derivations

This appendix proves the sourcing and customer segmentation decompositions and the exact aggregation of bilateral margins, states the effective bargaining weight, and derives the concentration formula from the bargaining rule, retaining the share dependence of effective bargaining power.

Proof of Lemma 1. Write $V_j = \sum_k v_{kj}$. Then $\omega_{ij} = v_{ij}/V = (V_j/V)(v_{ij}/V_j) = s_j\, s_{i|j}$, and summing over j gives $s_i = \sum_j s_j\, s_{i|j}$: a supplier's market share is the purchase-weighted average of its shares across buyers. HHI^S is therefore a sum of squared averages and C^S a sum of averaged squares, and their difference is a variance. Formally, let $d_{ij} = s_{i|j} - s_i$, so that $\sum_j s_j d_{ij} = 0$ for every i. Then

$$C^S = \sum_j s_j \sum_i (s_i + d_{ij})^2 = \sum_i s_i^2 \sum_j s_j + 2 \sum_i s_i \sum_j s_j d_{ij} + \sum_j s_j \sum_i d_{ij}^2 = HHI^S + D^S,$$

since $\sum_j s_j = 1$. $D^S = 0$ if and only if $d_{ij} = 0$ for all i and all j with $s_j > 0$.

Average-share identities and the buyer-side decomposition. Since $\omega_{ij} = v_{ij}/V = s_j\, s_{i|j} = s_i\, s_{j|i}$, the trade-weighted average of a bilateral share is a concentration index:

$$\sum_{ij} \omega_{ij}\, s_{i|j} = \sum_j s_j \sum_i s_{i|j}^2 = C^S, \qquad \sum_{ij} \omega_{ij}\, s_{j|i} = \sum_i s_i \sum_j s_{j|i}^2 = C^{B,v},$$

$$\sum_{ij} \omega_{ij}\, x_{j|i} = \sum_i s_i \sum_j s_{j|i}\, x_{j|i} = C^{B,q}.$$

The decomposition $C^{B,v} = HHI^B + D^{B,v}$ in equation (7) follows from the proof of Lemma 1 with i and j exchanged: $s_j = \sum_i s_i\, s_{j|i}$, so HHI^B is a sum of squared averages and $C^{B,v}$ a sum of averaged squares.

Exact aggregation. With $p_{ij} = \mu_{ij} c_i$ and $\omega_{ij} = p_{ij} q_{ij} / \sum_{kl} p_{kl} q_{kl}$,

$$\sum_{ij} \omega_{ij}\, \mu_{ij}^{-1} = \sum_{ij} \frac{p_{ij} q_{ij}}{\sum_{kl} p_{kl} q_{kl}} \frac{c_i}{p_{ij}} = \frac{\sum_{ij} c_i\, q_{ij}}{\sum_{ij} p_{ij} q_{ij}},$$

which is the last equality in equation (9); $L = 1 - \sum_{ij} \omega_{ij} \mu_{ij}^{-1}$ is then the trade-weighted average of the bilateral Lerner indices $1 - \mu_{ij}^{-1}$.

Effective bargaining weight. In Alviarez et al. (2025), the importer's effective bargaining power in equation (8) is

$$\varphi_{ij} = \frac{\phi\,\lambda_{ij}}{1-\phi+\phi\,\lambda_{ij}}, \qquad \lambda_{ij} = \frac{s_{ij}}{1-(1-s_{ij})^{\frac{\eta-1}{\rho-1}}} \cdot \frac{\eta-1}{\varepsilon_{ij}-1} \geq 1, \tag{15}$$

with $\varepsilon_{ij} = \rho - (\rho-\eta)s_{ij}$. The factor λ_{ij} is the ratio of the two parties' gains from trade relative to their outside options, which depend on the supplier's share of the buyer's purchases. It equals one at $s_{ij}=0$ and at $s_{ij}=1$, so that $\varphi_{ij}=\phi$ at both ends, and exceeds one in between.

Derivation of Proposition 1. Write the bilateral markup as $\mu(s,x) = (1-\varphi(s))\,m(s)+\varphi(s)\,g(x)$ with $m(s) = \varepsilon(s)/(\varepsilon(s)-1)$ and $g(x) = \theta[1-(1-x)^{1/\theta}]/x$. At zero shares, $m(0) = \rho/(\rho-1)$, $g(0)=1$ and $\varphi(0)=\phi$, so $\mu(0,0)=m_0$ as defined in equation (10). The first derivatives at zero are

$$m'(0) = \frac{\rho-\eta}{(\rho-1)^2}, \qquad g'(0) = -\frac{1-\theta}{2\theta}, \qquad \varphi'(0) = \phi(1-\phi)\,\lambda'(0) = \frac{\phi(1-\phi)(\rho-\eta)}{2(\rho-1)}.$$

The first follows from $m' = -\varepsilon'/(\varepsilon-1)^2$ with $\varepsilon' = -(\rho-\eta)$. The second from $(1-x)^{1/\theta} = 1 - x/\theta + (1-\theta)x^2/(2\theta^2) + O(x^3)$. For the third, let $a=(\eta-1)/(\rho-1)$; then $s/[1-(1-s)^a] = a^{-1}[1+(a-1)s/2]+O(s^2)$ and $(\eta-1)/(\varepsilon-1) = a[1+(\rho-\eta)s/(\rho-1)]+O(s^2)$, whose product is $1+(\rho-\eta)s/[2(\rho-1)]+O(s^2)$ because $a-1 = -(\rho-\eta)/(\rho-1)$; and $d\varphi/d\lambda = \phi(1-\phi)$ at $\lambda=1$. Hence

$$\mu_s(0,0) = (1-\phi)\,m'(0) - \varphi'(0)\,[m(0)-1] = \frac{(1-\phi)(1-\phi/2)(\rho-\eta)}{(\rho-1)^2},$$

$$\mu_x(0,0) = \phi\,g'(0) = -\frac{\phi(1-\theta)}{2\theta},$$

where the term in $\varphi'(0)$ is the first-order effect of the supplier share on effective bargaining power. The bilateral Lerner index is $L_{ij} = 1 - 1/\mu(s_{ij}, x_{j|i})$, with $L_s = \mu_s/\mu^2$ and $L_x = \mu_x/\mu^2$, so

$$L_{ij} = \beta_0 + \beta_S\,s_{ij} - \beta_B\,x_{j|i} + R_{ij}, \qquad \beta_0 = 1-\frac{1}{m_0}, \quad \beta_S = \frac{\mu_s(0,0)}{m_0^2}, \quad \beta_B = -\frac{\mu_x(0,0)}{m_0^2},$$

which are the coefficients of equation (12), and R_{ij} is the second-order remainder. Taking trade-weighted averages and using the identities above gives equation (11), with remainder $\sum_{ij}\omega_{ij}R_{ij}$. The remainder depends on $\sum_{ij}\omega_{ij}s_{ij}^2$, $\sum_{ij}\omega_{ij}x_{j|i}^2$ and $\sum_{ij}\omega_{ij}s_{ij}x_{j|i}$, which are not functions of X^S and $C^{B,q}$.

Supplier-pricing bounds. Under supplier pricing, concentration alone bounds the aggregate margin without a small-share approximation.

Corollary 1 (Supplier-pricing bounds)**.** *Suppose* $\phi = 0$ *and* $\rho > \eta > 1$ *are common across relationships. For* $X^S = \sum_{ij} \omega_{ij} s_{ij}$*,*

$$\frac{1}{\rho - (\rho - \eta) X^S} \leq L \leq \frac{1 - X^S}{\rho} + \frac{X^S}{\eta}. \tag{16}$$

The same bounds hold for the national margin using the import-weighted average of X^S *when the elasticities are common across products.*

Under supplier pricing, the bilateral margin is $1/[\rho - (\rho - \eta) s_{ij}]$, an increasing, convex function of the supplier share. Evaluating it at the average share gives the lower bound; averaging the line joining its values at zero and one gives the upper bound. Substituting C^S or HHI^S gives bounds for the buyer-specific or pooled-share pricing benchmark. The bounds apply only under unilateral supplier pricing. With bilateral bargaining the bilateral margin depends on the buyer share as well, and the convexity argument no longer applies.

Proof of Corollary 1. When $\phi = 0$, equation (8) implies $L = \sum_{ij} \omega_{ij} f(s_{ij})$, where $f(s) = [\rho - (\rho - \eta) s]^{-1}$. For $s \in [0, 1]$ and $\rho > \eta > 1$,

$$f''(s) = \frac{2(\rho - \eta)^2}{[\rho - (\rho - \eta) s]^3} > 0.$$

Jensen's inequality gives $L \geq f(\sum_{ij} \omega_{ij} s_{ij}) = f(X^S)$. Convexity also gives $f(s) \leq (1 - s) f(0) + s f(1) = (1 - s)/\rho + s/\eta$. Averaging this inequality gives the upper bound in equation (16). With common elasticities across products, the same argument applies to all transactions weighted by their shares of national imports, whose mean supplier share is $\sum_h \omega_h X_h^S$.

B Data Construction and Additional Evidence

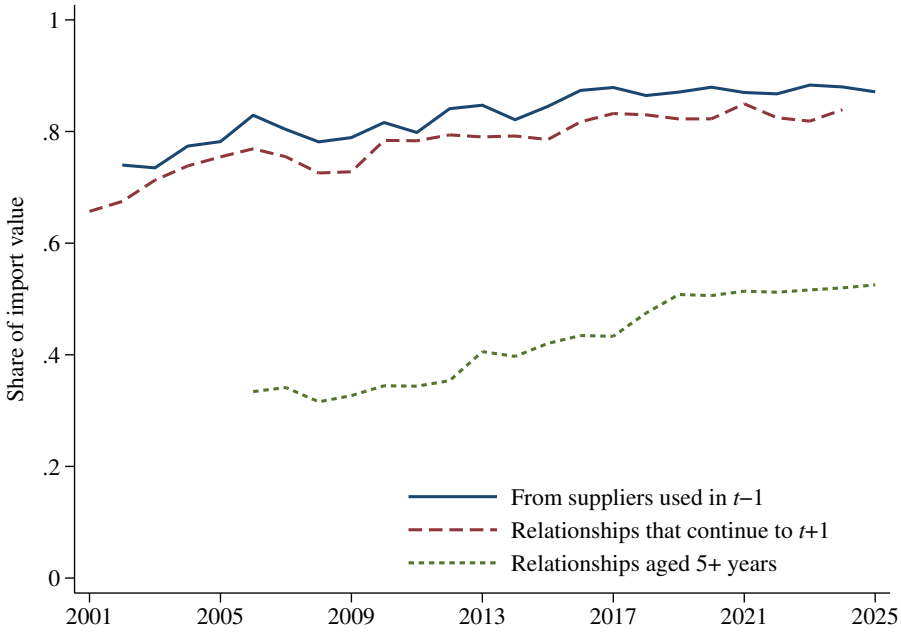
The interpretation of relationship-level concentration depends on the consistency of the firm identifiers and the coverage of the customs data. This appendix documents those choices and reports the supporting evidence on alternative product definitions, persistent sourcing, and variation across products. The exporter identifier links name variants within a supplier country and does not join distinct legal entities; the time-consistent product families link HS6 codes that map into one another across revisions of the nomenclature. Both constructions are described in the data appendix of Morlacco (2026), which uses the same records.

Coverage of the customs records. Table 7 compares the annual FOB import value in the source records with the official total published by DANE. The two agree to within 0.2 percent in

every year after 2001; in 2001 the records fall 1.1 percent short. The sample used in the paper, which drops declarations without a valid importer identifier, retains 95.4 percent of the official total in 2001 and between 97.2 and 99.6 percent in later years. The excluded declarations are concentrated in the early years and, as noted in Section 3.1, mostly record purchases by natural persons.

Prices within exporter. If each exporter sold to an integrated market, it would charge all its Colombian buyers of a product the same price, up to differences in costs. We decompose the variance of log unit values (FOB per kilogram) within each HS10 product-year into a component across exporters and a component across the buyers of the same exporter, in the sample of exporters that sell the product to at least two Colombian buyers. Variation across the buyers of the same exporter accounts for 15 to 20 percent of the within-product variance in every year, and for 17 percent in 2019 (11 percent when observations are weighted by value). These buyer-specific differences persist: the deviation of a buyer's price from its exporter's average has a correlation of 0.46 across consecutive years. Unit values also reflect differences in quality, lot size, and timing within a product code, so these statistics are an imperfect measure of price discrimination.

Figure 4: Persistence of supplier relationships



Note: Relationships are importer × exporter × time-consistent HS6 product family, so that revisions of the tariff nomenclature do not break them. "From suppliers used in $t-1$" is the share of the import value of importer-products active in $t-1$ that comes from exporters supplying the same importer-product in $t-1$; "Relationships that continue to $t+1$" is the share of the value in relationships active in t that are also active in $t+1$. Relationship age counts consecutive years since 2001, so the five-year series starts in 2005. All three measures rise over the sample period.

Table 7: Annual import value: customs records and official statistics

Year	DANE (USD bn)	Source records (USD bn)	Ratio (percent)	Sample (USD bn)	Ratio (percent)
2001	12.0	11.9	98.9	11.4	95.4
2002	11.9	11.9	100.0	11.6	97.2
2003	13.0	13.0	100.0	12.7	97.8
2004	15.6	15.6	100.0	15.3	98.0
2005	19.8	19.8	100.0	19.5	98.3
2006	24.5	24.5	100.0	24.1	98.3
2007	30.8	30.8	100.0	30.3	98.4
2008	37.2	37.1	100.0	36.6	98.6
2009	31.2	31.2	100.0	30.7	98.5
2010	38.2	38.2	100.0	37.6	98.6
2011	51.6	51.6	100.0	50.9	98.7
2012	56.1	56.1	100.0	55.3	98.6
2013	56.6	56.6	100.0	56.1	99.0
2014	61.1	61.1	100.0	60.5	99.1
2015	51.6	51.6	100.0	51.2	99.2
2016	42.8	42.8	100.0	42.5	99.1
2017	44.0	44.0	100.0	43.3	98.5
2018	48.9	48.9	100.0	48.3	98.7
2019	50.3	50.2	99.9	49.9	99.3
2020	41.2	41.1	99.8	40.9	99.2
2021	56.6	56.6	100.0	56.4	99.5
2022	71.4	71.4	100.0	71.1	99.6
2023	59.4	59.4	100.0	59.2	99.6
2024	60.4	60.4	100.0	60.1	99.6
2025	66.6	66.6	100.0	66.3	99.6

Note: Billions of current U.S. dollars, FOB. "DANE" is the annual import total in DANE's *Balanza comercial anual 1980–2026p* (source DIAN–DANE, updated 21 October 2026; figures provisional from 2009). "Source records" is the sum of FOB value over all import declarations in the customs microdata; "Sample" excludes declarations without a valid importer identifier. Ratios are relative to the DANE total.

Table 8: Decomposition of sourcing concentration, selected years

	2001	2007	2013	2019	2025	Change
Product-market HHI, suppliers	0.222	0.214	0.187	0.209	0.188	-0.034
+ Sourcing segmentation	0.420	0.444	0.461	0.493	0.516	0.095
= Sourcing concentration	0.643	0.658	0.648	0.702	0.704	0.061

Note: Import-weighted averages across HS10 products. The last column is the change from 2001 to 2025.

Table 9: Year-on-year changes in the product-market HHI and sourcing concentration

Year-on-year change	Share of imports	Share of product-years
Both rise	0.342	0.298
Both fall	0.357	0.306
HHI falls or flat, sourcing conc. rises	0.164	0.155
HHI rises, sourcing conc. falls or flat	0.132	0.180
No change	0.005	0.061

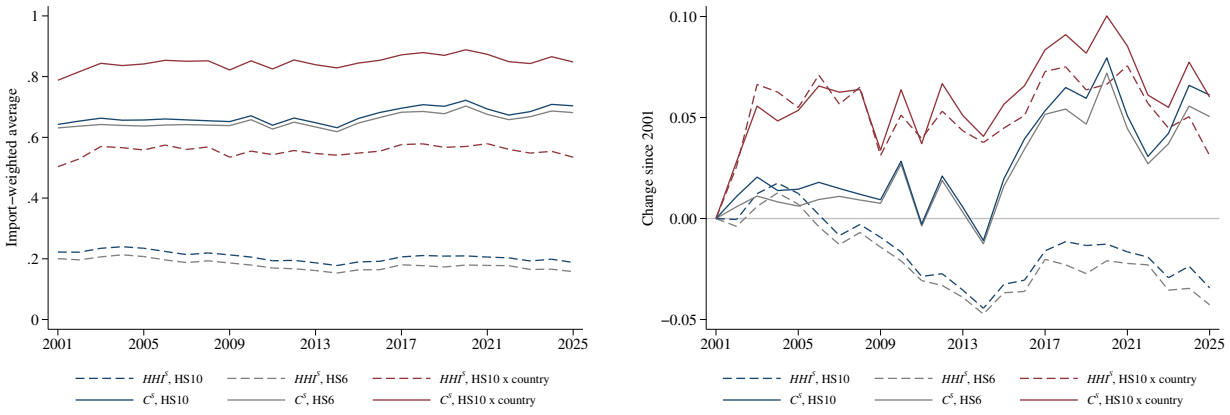
Note: HS10 products observed in consecutive years, 2002–2025. Import shares use the previous year's import value.

Table 10: Concentration by HS section, 2019

HS section	Import share	HHI suppliers	Sourcing conc.	Segmentation share
Machinery and electrical	0.23	0.15	0.74	0.80
Chemicals	0.16	0.24	0.77	0.69
Transport equipment	0.12	0.23	0.74	0.69
Minerals and fuels	0.09	0.38	0.61	0.37
Base metals	0.07	0.22	0.71	0.68
Plastics and rubber	0.06	0.12	0.67	0.82
Food, beverages, tobacco	0.05	0.29	0.74	0.61
Vegetables	0.05	0.21	0.50	0.57
Textiles	0.04	0.11	0.66	0.83
Instruments	0.03	0.09	0.70	0.88
Paper	0.02	0.30	0.66	0.55
Miscellaneous manufactures	0.02	0.11	0.70	0.85
Animals	0.01	0.17	0.54	0.68
Fats and oils	0.01	0.29	0.79	0.63
Stone, ceramics, glass	0.01	0.15	0.66	0.78
Footwear	0.01	0.11	0.68	0.84
Other	0.01	0.11	0.49	0.78
Wood	0.00	0.46	0.86	0.47
Hides and leather	0.00	0.07	0.60	0.87
Precious metals	0.00	0.30	0.73	0.59
Arms	0.00	0.65	0.84	0.23
Art	0.00	0.38	0.93	0.59

Note: Import-weighted averages across HS10 products within each section, sorted by import share. The segmentation share is sourcing segmentation divided by sourcing concentration.

Figure 5: Concentration under alternative product definitions, 2001–2025



Panel A: Levels

Panel B: Changes since 2001

Note: Import-weighted averages across products under three market definitions: HS10 products (the baseline), HS6 products, and HS10 products from a given supplier country. Dashed lines: product-market HHI of suppliers; solid lines: sourcing concentration. Panel A reports levels and Panel B the changes since 2001 in the same units.

B.1 Changes within and between products

We separate changes in aggregate sourcing concentration into changes within products and shifts in their import shares. For a fixed set of products observed in periods 0 and 1, normalize import shares to sum to one in each period and write $\Delta\omega_h = \omega_{h1} - \omega_{h0}$ and $\Delta C_h^S = C_{h1}^S - C_{h0}^S$. The change decomposes exactly as

$$\Delta\overline{C}^S = \underbrace{\sum_h \frac{\omega_{h0} + \omega_{h1}}{2} \Delta C_h^S}_{\text{Within products}} + \underbrace{\sum_h \frac{C_{h0}^S + C_{h1}^S}{2} \Delta\omega_h}_{\text{Between products}}. \tag{17}$$

The within term averages changes in product-level sourcing concentration; the between term captures shifts in import shares toward products with higher or lower concentration. Using midpoint weights treats the two periods symmetrically and splits the interaction between changes in shares and concentration equally between the terms. The same decomposition applies to the product-market HHI and segmentation. Within-product changes can also reflect entry, exit, and reallocation across buyers, rather than changes in continuing buyers' sourcing alone.

We implement the decomposition on time-consistent HS6 product families observed in both endpoint periods. Each period's family-level index is an import-weighted average of its annual indices, and family weights are their shares of imports in the common sample. This avoids changes in tariff codes and excludes families present in only one period. The product definition and period averaging differ from the annual HS10 aggregates in the main text.

Table 11 reports the results. Between 2001–2003 and 2023–2025, sourcing concentration rises from 0.635 to 0.674: within-product changes contribute 0.051, while shifts in import shares offset 0.012. The 4,270 common families cover 98.0 and 99.8 percent of imports in the two periods. Between 2005–2007 and 2017–2019, a within-product increase of 0.048 is similarly offset by a between-product decline of 0.009.[9]

Changes also vary substantially across products, as Figure 6 and Table 12 show. Weighting the changes in families' three-year average indices by initial imports, the mean change in the HHI is close to zero, but the 10th and 90th percentiles are -0.17 and 0.18. Sourcing concentration rises in 68 percent of initial import value, and in 27 percent it rises while the HHI falls. These fixed-weight comparisons describe the distribution of product-level changes; equation (17) separately accounts for changing product weights.

[9]With initial weights, the first comparison instead gives three terms: within, 0.085; between, 0.022; and their interaction, -0.068. The midpoint decomposition assigns half the interaction to each term. Its negative between component therefore reflects reallocation evaluated at average concentration levels across the two periods, rather than at initial levels alone.

Table 11: Within- and between-product changes in concentration

	Initial	Final	Change	Within	Between
2001–2003 to 2023–2025					
Sourcing concentration	0.635	0.674	0.039	0.051	-0.012
Product-market HHI	0.198	0.153	-0.045	-0.024	-0.021
Sourcing segmentation	0.436	0.520	0.084	0.075	0.009
2005–2007 to 2017–2019					
Sourcing concentration	0.638	0.677	0.039	0.048	-0.009
Product-market HHI	0.191	0.167	-0.024	-0.001	-0.023
Sourcing segmentation	0.447	0.510	0.063	0.049	0.014

Note: Time-consistent HS6 product families observed in both endpoint periods: 4,270 in the first comparison and 4,342 in the second. Each period's family-level index is an import-weighted average of its annual indices; family weights are shares of total imports among common families in that period. Within and between terms use midpoint weights as in equation (17). Common families cover 98.0 and 99.8 percent of imports in the first comparison, and 99.0 and 99.8 percent in the second. Figures are in index units; components may differ from totals due to rounding.

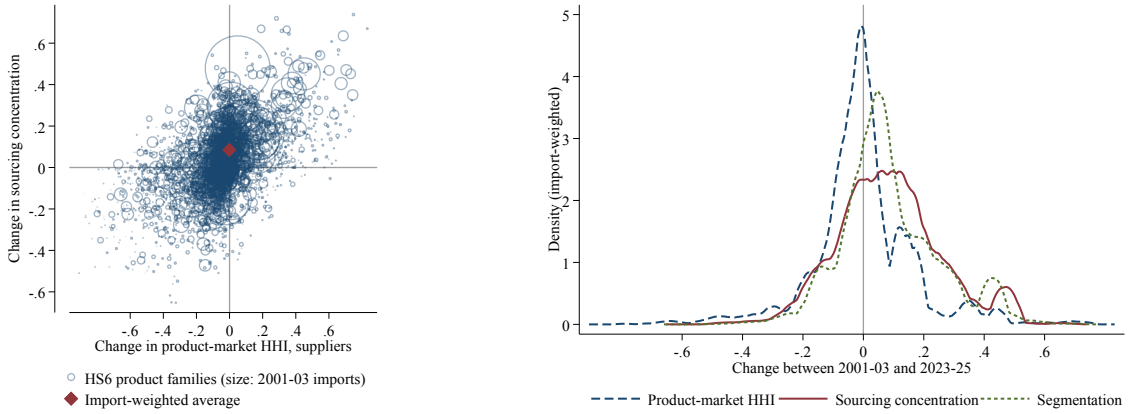
Table 12: Product-level changes in the HHI and sourcing concentration

Change, 2001–2003 to 2023–2025	Import share	Share of families	Contribution to change in HHI	in sourcing conc.	in segmentation
HHI falls, sourcing conc. rises	0.268	0.274	-0.021	0.031	0.052
Both rise	0.413	0.266	0.053	0.086	0.033
Both fall	0.272	0.377	-0.036	-0.027	0.009
HHI rises, sourcing conc. falls	0.048	0.084	0.002	-0.004	-0.007

Change, 2005–2007 to 2017–2019	Import share	Share of families	Contribution to change in HHI	in sourcing conc.	in segmentation
HHI falls, sourcing conc. rises	0.281	0.237	-0.014	0.041	0.055
Both rise	0.375	0.285	0.045	0.066	0.021
Both fall	0.266	0.369	-0.028	-0.030	-0.001
HHI rises, sourcing conc. falls	0.078	0.108	0.004	-0.005	-0.009

Note: Time-consistent HS6 product families observed in both periods, weighted by imports in the initial period. Contributions are each group's import-weighted change, so they sum across groups to the aggregate change. Top: 2001–2003 to 2023–2025. Bottom: 2005–2007 to 2017–2019.

Figure 6: Product-level changes in concentration, 2001–2003 to 2023–2025



Note: Long differences between 2001–2003 and 2023–2025 averages for time-consistent HS6 product families, weighted by 2001–2003 imports. Left: each marker is a family, sized by its imports; the diamond is the import-weighted average. Right: import-weighted densities of the changes.

B.2 Supplier exit event study

This appendix gives the construction of the event-study sample of Section 3.3, the evidence on pre-exit differences between treated and comparison pairs, and the robustness of the estimates.

Events. The data are the annual importer–exporter–HS10 panel of Section 3.1. An exporter is defined to exit in year t if its longitudinal identifier has positive sales to at least two Colombian importers in $t-1$, positive sales in $t-2$, and no sales to any Colombian importer, in any product, in t and $t+1$. Two buyers in $t-1$ excludes the end of a single relationship, which may be initiated by the buyer; a sale in $t-2$ excludes one-off shipments; two years without sales excludes most breaks in the name-based exporter identifier, which are concentrated in single years. Exits are defined for t from 2004 to 2022, so that three years precede and three years follow each event within the sample. There are 24,031 exits, between 968 and 1,560 a year, accounting for 0.7 to 1.7 percent of imports in the year before exit. The records do not say why an exporter stopped selling to Colombia; the design below does not require the reason to be unrelated to the product, only to the particular buyers, as discussed under identification.

Treated and comparison pairs. The unit of observation is a buyer–HS10 pair. The cohort for exit year t consists of all pairs with positive purchases of the product in $t-1$. For each pair, exposure is the share of its $t-1$ purchases of the product that came from exporters exiting in t. A pair is treated if its exposure is at least one half, so that the exiting exporter or exporters supplied the majority of what the buyer bought of the product. A pair is a comparison pair if it bought nothing from exporters exiting in t; pairs in between are excluded. Comparison pairs are restricted to products that contain at least one treated pair in the same cohort, and a 15 percent random sample of them is retained to keep the panel tractable. The nineteen cohorts are stacked, and a pair appears in each cohort in which it qualifies. A comparison pair is dropped from a cohort if it is treated in an earlier cohort or within three years after the exit, and a treated pair is dropped if it is treated in another cohort in the preceding five or following three years. The stacked panel has 107,614 treated pairs with \$4.5 billion of $t-1$ purchases and 727,844 comparison pairs.

Outcomes. Each pair is followed from $t-3$ to $t+3$, including years in which it buys nothing, which enter as zeros. The main outcome is the pair's purchases of the product in a year divided by its purchases in $t-1$, so that a value of one means purchases at the pre-exit level and zero means no purchases. The second outcome is an indicator for any purchase in the year. The remaining outcomes split purchases by the supplier's status in $t-1$: suppliers the pair already used in $t-1$ other than the exiting ones; suppliers new to the pair that sold the product to at least one other Colombian importer in $t-1$; and suppliers that sold the product to no Colombian importer in $t-1$.

The second group is the set of exporters that pooled statistics count as alternatives. Because the groups are defined relative to $t-1$, these outcomes are reported from t on.

Identification. The coefficients measure the effect of the exit under the assumption that, absent the exit, treated pairs' purchases would have followed the same path, relative to $t-1$, as those of comparison pairs in the same product and year. Two features of the data bear on this assumption. First, exits are not random, and the records do not say why an exporter left. An exporter may leave Colombia because its Colombian buyers' demand fell, in which case the comparison attributes to the exit a decline that would have occurred anyway. The product-by-cohort-by-year effects remove declines common to all buyers of the product, and the two-buyer condition means that a buyer-specific decline must have affected several buyers of the same exporter at once for it to drive the exit. Second, treated pairs differ from comparison pairs before the exit. As Table 13 shows, they are 16 percentage points less likely to have bought the product in $t-3$ and 9 points less likely in $t-2$: relationships whose supplier exits are younger, and young relationships end more often for any reason. Because every pair buys in $t-1$ by construction, part of the later gap in the probability of buying reflects this difference, and we do not read that gap as an effect of the exit. Purchases relative to $t-1$ are 15 percent higher for treated pairs in $t-2$ (standard error 4), so relationships about to lose their supplier were already shrinking in the year before the exit. The robustness exercise below addresses this pre-exit decline by comparing buyers whose purchases had moved similarly before the exit. The estimates remain the difference between buyers who lost a supplier and other buyers of the same product, which is the object of interest for the market-boundary question, rather than the effect of a randomly removed supplier.

Robustness. Three checks bear on the reading of these estimates. First, the decline does not fall with the number of alternatives. Treated pairs are in products with a median of 227 exporters in $t-1$ (10th percentile 29, 90th percentile 1,016). Under the broad market boundary the decline should shrink as the number of exporters grows. Interacting the treated-by-year indicators with the log number of exporters of the product in $t-1$, as in Table 14, a tenfold increase in the number of exporters changes the exit-year decline by -6 points (standard error 4); the upper end of the 95 percent confidence interval is a reduction of 2 points in a decline of 33. After three years the estimate, 6 points (7), is too imprecise to bound the change. Capping purchases at five times their $t-1$ level, so that a few very large ratios among comparison pairs do not drive the result, gives -7 points (3) and -10 points (4), which exclude any reduction in both years. In the 85 percent of treated pairs in products with a product-market HHI below 0.2, the decline is 34 percent in the exit year and 30 percent after three years. Second, capping purchases at five times their $t-1$ level, which limits the influence of a few comparison pairs whose purchases grew many times over, leaves the decline at 32 percent in the exit year and 25 percent after three years. Third, the pre-exit decline of treated pairs does not account for the result. Among established pairs, those with positive

purchases in both $t-2$ and $t-1$, treated pairs' purchases in $t-2$ exceed their $t-1$ purchases by 37 percent relative to comparison pairs. Adding fixed effects for the decile of the pair's change in purchases from $t-2$ to $t-1$, interacted with cohort and event year, compares each treated pair with comparison pairs of the same product whose purchases had changed by a similar proportion before the exit. The $t-2$ coefficient is then -0.00 (0.02), as the controls are built on that change, and the $t-3$ coefficient is -0.10 (0.04), so the controls remove the decline before the exit but not every pre-exit difference. With these controls the decline is 36 percent in the exit year and 32 percent after three years, and additional purchases from suppliers already serving other buyers are 5 and 3 percent of pre-exit purchases. Table 15 collects these estimates.

Table 13 reports the full set of coefficients of equation (6): all products, and products with a $t-1$ product-market HHI below 0.2 and above 0.5. Table 16 reports them for established pairs, those with positive purchases in both $t-2$ and $t-1$ (397,615 treated and comparison pairs), without and with fixed effects for the decile of the $t-2$ to $t-1$ change in purchases interacted with cohort and event year, which compare treated and comparison pairs of the same product whose purchases had changed by a similar proportion before the exit (the second panel of the table, labelled "matched on the pre-exit change"). Table 14 reports the interactions with the number of exporters and with the HHI. The interaction with the product-market HHI is not distinguishable from zero without the cap, 0.06 (0.18) per unit of HHI in the exit year and 0.23 (0.36) after three years; with the cap it is 0.11 (0.17) and 0.42 (0.15). Additional purchases from suppliers already serving other buyers do not rise with the number of exporters either, -0.010 (0.007) per log point in the exit year and 0.015 (0.011) after three years. Splitting products at an HHI of 0.2 gives the same picture as the interactions: the 91,360 treated pairs in products below 0.2, 85 percent of the total, have a decline of 34 percent in the exit year and 30 percent after three years, while the 2,794 pairs in products above 0.5 have coefficients of the same sign, -0.27 and -0.23, with standard errors of 10 to 17 points. Among established pairs without the pre-exit change controls, the decline is 30 percent in the exit year and 23 percent after three years. All regressions are estimated with `reghdfe` in Stata, absorb the two sets of fixed effects, and cluster standard errors by product. Comparison pairs come from a 15 percent random sample, drawn once with a fixed seed, of pairs with exposure below one tenth in products that contain a treated pair in the same cohort, from which we keep pairs with zero exposure that meet the conditions of Section 3.3. The supplier-group outcomes are reported from t on, since the groups are defined relative to the pair's $t-1$ suppliers. Two checks follow the logic of Callaway and Sant'Anna (2021) and Sun and Abraham (2021). The first compares treated and comparison pairs within each cohort and product and averages the differences with weights equal to treated purchases. It covers 89 percent of treated purchases. With purchases capped at five times their $t-1$ level, the decline is 27 percent in the exit year and 22 percent after three years, and the probability of buying is 15 and 7 points lower, against 4 points in $t-3$. Without the cap the estimates are too noisy to be informative, because comparison cells are thin. These gaps are smaller than the regression estimates, probably because the regression gives more weight to products with

many comparison pairs. The second estimates the coefficients separately by cohort and averages them with weights equal to each cohort's share of treated purchases. It gives a decline of 33 percent in the exit year and 30 percent after three years, a probability of buying 25 and 20 points lower, and replacement from suppliers already serving other buyers of 5 and 4 percent, close to the pooled estimates.

Table 13: Supplier exit event study: coefficients by sample and outcome

Outcome	$t-3$	$t-2$	t	$t+1$	$t+2$	$t+3$
All products						
Purchases of the product	0.03	0.15	-0.33	-0.28	-0.28	-0.30
	(0.05)	(0.04)	(0.02)	(0.03)	(0.04)	(0.04)
Purchases, capped at five times $t-1$	-0.04	0.07	-0.32	-0.27	-0.25	-0.25
	(0.04)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
Any purchase	-0.16	-0.09	-0.25	-0.25	-0.22	-0.20
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
From suppliers already serving other buyers			0.05	0.06	0.06	0.04
			(0.01)	(0.02)	(0.02)	(0.02)
From suppliers new to Colombia for the product			0.09	0.05	0.04	0.00
			(0.01)	(0.02)	(0.03)	(0.02)
Products with HHI below 0.2						
Purchases of the product	0.01	0.13	-0.34	-0.30	-0.29	-0.30
	(0.05)	(0.04)	(0.02)	(0.04)	(0.04)	(0.04)
Purchases, capped at five times $t-1$	-0.06	0.06	-0.32	-0.27	-0.27	-0.27
	(0.04)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
Any purchase	-0.17	-0.09	-0.25	-0.24	-0.22	-0.21
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
From suppliers already serving other buyers			0.05	0.06	0.06	0.04
			(0.01)	(0.02)	(0.02)	(0.02)
From suppliers new to Colombia for the product			0.08	0.03	0.02	-0.01
			(0.01)	(0.02)	(0.03)	(0.02)
Products with HHI above 0.5						
Purchases of the product	-0.08	0.02	-0.27	-0.34	-0.29	-0.23
	(0.21)	(0.19)	(0.17)	(0.15)	(0.10)	(0.15)
Purchases, capped at five times $t-1$	-0.19	-0.04	-0.28	-0.37	-0.21	-0.13
	(0.17)	(0.15)	(0.10)	(0.13)	(0.08)	(0.13)
Any purchase	-0.28	-0.14	-0.33	-0.27	-0.28	-0.14
	(0.08)	(0.08)	(0.07)	(0.07)	(0.06)	(0.08)
From suppliers already serving other buyers			0.05	0.02	-0.03	-0.00
			(0.05)	(0.04)	(0.03)	(0.01)
From suppliers new to Colombia for the product			0.16	0.04	-0.07	-0.12
			(0.13)	(0.05)	(0.05)	(0.07)

Note: Coefficients on treated-by-year indicators, reference year $t-1$, standard errors in parentheses clustered by product. Outcomes are purchases divided by purchases in $t-1$, or an indicator for any purchase. Treated: exposure to exiting exporters of at least 0.5; comparison: zero. Purchases capped at five times their $t-1$ level are reported as a robustness check.

Table 14: Supplier exit event study: heterogeneity in the number of alternatives

	Log number of exporters		Product-market HHI	
Event year	Treated	Treated × moderator	Treated	Treated × moderator
Purchases of the product				
$t-3$	0.039 (0.047)	-0.011 (0.036)	0.060 (0.057)	0.372 (0.294)
$t-2$	0.166 (0.042)	-0.022 (0.029)	0.181 (0.048)	0.399 (0.285)
t	-0.311 (0.031)	-0.024 (0.017)	-0.324 (0.029)	0.062 (0.184)
$t+1$	-0.294 (0.049)	0.015 (0.027)	-0.285 (0.046)	-0.029 (0.241)
$t+2$	-0.286 (0.054)	0.011 (0.030)	-0.262 (0.049)	0.193 (0.250)
$t+3$	-0.317 (0.054)	0.028 (0.030)	-0.277 (0.065)	0.233 (0.360)
Purchases, capped at five times $t-1$				
$t-3$	-0.031 (0.031)	-0.009 (0.031)	-0.015 (0.042)	0.290 (0.200)
$t-2$	0.097 (0.031)	-0.029 (0.023)	0.104 (0.038)	0.367 (0.225)
t	-0.291 (0.025)	-0.032 (0.014)	-0.307 (0.025)	0.109 (0.171)
$t+1$	-0.249 (0.029)	-0.025 (0.016)	-0.273 (0.027)	-0.057 (0.181)
$t+2$	-0.228 (0.030)	-0.035 (0.018)	-0.237 (0.028)	0.219 (0.176)
$t+3$	-0.219 (0.025)	-0.043 (0.015)	-0.218 (0.025)	0.422 (0.148)
Purchases from suppliers that served other buyers in $t-1$				
t	0.059 (0.012)	-0.010 (0.007)	0.052 (0.010)	0.010 (0.058)
$t+1$	0.064 (0.022)	-0.006 (0.012)	0.065 (0.020)	0.070 (0.093)
$t+2$	0.050 (0.014)	0.010 (0.011)	0.062 (0.019)	0.051 (0.080)
$t+3$	0.030 (0.012)	0.015 (0.011)	0.051 (0.022)	0.119 (0.113)

Note: Equation (6) with the treated-by-year indicators also interacted with a product characteristic measured in $t-1$ and centered at its purchase-weighted mean over treated pairs (61 exporters in geometric mean, HHI 0.204). "Treated" is the coefficient at the mean; "Treated × moderator" is the change per unit of the moderator, a log point for the number of exporters and one unit for the HHI. All products, weighted by $t-1$ purchases, standard errors in parentheses clustered by product.

Table 15: Purchases after a supplier exit: baseline and robustness

	Purchases of the product (share of $t-1$ purchases)				From suppliers already serving other buyers	
Sample	$t-3$	$t-2$	t	$t+3$	t	$t+3$
All pairs	0.03	0.15	−0.33	−0.30	0.05	0.04
	(0.05)	(0.04)	(0.02)	(0.04)	(0.01)	(0.02)
All pairs, capped at five times $t-1$	−0.04	0.07	−0.32	−0.25		
	(0.04)	(0.03)	(0.02)	(0.02)		
Products with HHI below 0.2	0.01	0.13	−0.34	−0.30	0.05	0.04
	(0.05)	(0.04)	(0.02)	(0.04)	(0.01)	(0.02)
Established pairs	0.16	0.37	−0.30	−0.23	0.06	0.05
	(0.06)	(0.04)	(0.03)	(0.05)	(0.01)	(0.02)
Established pairs, pre-exit change controls	−0.10	−0.00	−0.36	−0.32	0.05	0.03
	(0.04)	(0.02)	(0.03)	(0.05)	(0.01)	(0.02)

Note: Coefficients β_k from equation (6), reference year $t-1$, weighted by $t-1$ purchases, standard errors in parentheses clustered by HS10 product. Treated pairs: exposure to exiting exporters of at least one half; comparison pairs: zero exposure. Established pairs have positive purchases in both $t-2$ and $t-1$. "Pre-exit change controls" adds fixed effects for the decile of the pair's change in purchases from $t-2$ to $t-1$, interacted with cohort and event year, so that treated pairs are compared with comparison pairs of the same product whose purchases had changed by a similar proportion before the exit. The last two columns are purchases from suppliers new to the pair that sold the product to other Colombian importers in $t-1$, over and above those of comparison buyers; they are not available for the capped specification. All estimates are taken from Tables 13 and 16.

Table 16: Supplier exit event study: established pairs

Outcome	$t-3$	$t-2$	t	$t+1$	$t+2$	$t+3$
Established pairs						
Purchases of the product	0.16	0.37	-0.30	-0.24	-0.21	-0.23
	(0.06)	(0.04)	(0.03)	(0.04)	(0.04)	(0.05)
Purchases, capped at five times $t-1$	0.04	0.24	-0.30	-0.26	-0.24	-0.25
	(0.05)	(0.03)	(0.02)	(0.03)	(0.02)	(0.02)
Any purchase	-0.13		-0.23	-0.23	-0.21	-0.18
	(0.02)		(0.02)	(0.02)	(0.02)	(0.02)
From suppliers already serving other buyers			0.06	0.08	0.07	0.05
			(0.01)	(0.02)	(0.02)	(0.02)
Established pairs, matched on the pre-exit change						
Purchases of the product	-0.10	-0.00	-0.36	-0.31	-0.29	-0.32
	(0.04)	(0.02)	(0.03)	(0.04)	(0.04)	(0.05)
Purchases, capped at five times $t-1$	-0.10	0.02	-0.32	-0.27	-0.25	-0.26
	(0.03)	(0.01)	(0.02)	(0.03)	(0.02)	(0.02)
Any purchase	-0.13		-0.22	-0.22	-0.20	-0.17
	(0.02)		(0.02)	(0.02)	(0.02)	(0.02)
From suppliers already serving other buyers			0.05	0.06	0.05	0.03
			(0.01)	(0.02)	(0.02)	(0.02)

Note: As Table 13, for pairs with positive purchases in both $t-2$ and $t-1$. The probability of buying has no $t-2$ coefficient because all these pairs buy in that year. The second panel adds fixed effects for the decile of the pair's $t-2$ to $t-1$ change in purchases, interacted with cohort and event year; "matched" in the panel title refers to these controls, not to one-to-one matching. Purchases from suppliers new to Colombia are omitted; they are defined as in Table 13.

C Intermediate Goods

The measurement in Section 3 covers all imports. The model of Section 4 concerns inputs, so this appendix repeats the main exhibits for intermediate goods only.

Classification. Each HS6 code is assigned to an end use with the UNSD correspondence between the HS edition in force in the year and the Broad Economic Categories (BEC Rev. 4). Intermediate goods are BEC categories 111, 121, 21, 22, 31, 322, 42 and 53; capital goods 41 and 521; consumption goods 112, 122, 522, 61, 62 and 63. Three groups are left out of the subsample because BEC does not assign them an end use: goods not elsewhere specified (BEC 7), passenger cars (51), and refined fuels (32), whose Colombian tariff lines map to the two-digit code rather than to motor spirit (321) or other processed fuels (322). A small residual of national tariff headings (chapter 98) has no HS6 counterpart. Table 17 reports the shares. Intermediate goods are 55 percent of import value in 2001 and 47 percent in 2025; the fall in the early 2010s reflects the rise of fuel and car imports, which are outside the classification, rather than a change in the classification itself.

Table 17: Imports by end use, percent of import value

	2001	2007	2013	2019	2025
Intermediate goods	54.7	52.2	42.7	46.8	47.4
Capital goods	25.9	26.4	24.5	21.6	18.4
Consumption goods	14.8	13.0	15.8	17.7	19.9
Not classified by end use	3.6	7.5	15.9	13.0	12.8
Not matched to HS6	1.1	0.9	1.1	0.9	1.5
HS6 codes classified as intermediate	2,807	2,831	2,834	2,837	2,923

Note: Shares of FOB import value by BEC end-use group in selected years. "Not classified by end use" is BEC 7, 51 and 32; "Not matched to HS6" is national headings of chapter 98.

Results. Tables 18 to 20 repeat Tables 1, 8 and 2 for the subsample. The picture is the same as for all imports. The average intermediate product-year has 68 exporters, each importer buys from 1.4 of them, and 77 percent of importers use a single supplier. Weighting product-years by imports, the product-market HHI averages 0.22 and sourcing concentration 0.67, against 0.20 and 0.68 for all imports. In 2019 the HHI is 0.23 (all imports: 0.21), sourcing concentration 0.69 (0.70) and segmentation 0.46 (0.49), two thirds of sourcing concentration in both samples. Over 2001–2025 the HHI falls by 0.03 and segmentation rises by 0.09 in both samples. The subsample has fewer differentiated goods (46 percent of value against 60) and more goods with reference prices (34 against 19); within each Rauch class the measures are close to those for all imports.

Table 18: Participation in product markets and in trading relationships, intermediate goods, 2001–2025

	Mean	SD	P10	P50	P90	Import-weighted mean
Exporters per product	68.10	186.38	2.00	16.00	157.00	194.35
Suppliers per importer	1.44	0.56	1.00	1.33	2.00	2.06
Share of importers with one supplier	0.77	0.19	0.53	0.78	1.00	0.61
Product-market HHI, suppliers	0.37	0.30	0.07	0.27	0.96	0.22
Sourcing concentration	0.82	0.18	0.57	0.85	1.00	0.67

Note: As Table 1, for HS10 product-years classified as intermediate goods.

Table 19: Decomposition of sourcing concentration, intermediate goods, selected years

	2001	2007	2013	2019	2025	Change
Product-market HHI, suppliers	0.239	0.238	0.214	0.227	0.205	-0.034
+ Sourcing segmentation	0.390	0.391	0.446	0.463	0.478	0.088
= Sourcing concentration	0.629	0.629	0.661	0.690	0.683	0.054

Note: As Table 8, for intermediate goods. Import-weighted averages across HS10 products in each year.

Table 20: Concentration by Rauch class, intermediate goods, 2019

Rauch class	Import share	HHI suppliers	Sourcing conc.	Segmentation share
Differentiated	0.46	0.16	0.71	0.78
Reference	0.34	0.30	0.71	0.58
Homogeneous	0.14	0.28	0.57	0.50
Unclassified	0.06	0.23	0.70	0.68

Note: As Table 2, for intermediate goods.

D Calibration and Quantitative Checks

This appendix compares the first-order concentration formula with the exact aggregate margin and reports how the 2019 margins change with the parameters and with the measurement of buyer shares.

Table 21: Sensitivity of the 2019 margins to parameters and to the buyer-share measurement

		$\phi = 0$	$\phi = 0.5$	$\phi = 1$
Baseline ($\rho = 7$, $\theta = 0.65$)	All exporters	17.4	-5.2	-41.9
	Incumbent suppliers	29.7	4.0	-41.9
	Difference	12.4	9.2	0.0
$\rho = 4$	All exporters	27.4	3.7	-41.9
	Incumbent suppliers	34.8	10.0	-41.9
	Difference	7.4	6.3	0.0
$\theta = 1$ (constant returns)	All exporters	17.4	9.1	0.0
	Incumbent suppliers	29.7	16.5	0.0
	Difference	12.4	7.5	0.0
Buyer shares halved	All exporters	17.4	3.5	-13.9
	Incumbent suppliers	29.7	11.7	-13.9
	Difference	12.4	8.1	0.0

Note: Exact aggregate Lerner index, percent, as in Table 6; $\eta = 2.5$ throughout. "Buyer shares halved" sets $x_{j|i}$ to one half of its measured value in every pair, to represent exporters whose Colombian sales are half of their output.

Table 22: First-order concentration formula against exact aggregation, 2019

	$\phi = 0$	$\phi = 0.5$	$\phi = 1$
First-order Lerner index, percent			
All exporters ($X^S = HHI^S$)	16.2	-0.9	-22.0
Incumbent suppliers ($X^S = C^S$)	20.7	1.1	-22.0
Difference ($\beta_S D^S$)	4.5	2.0	0.0
Exact minus first-order, points			
All exporters	1.1	-4.4	-19.9
Incumbent suppliers	9.0	2.9	-19.9

Note: Equation (11) evaluated at $HHI^S = 0.209$, $C^S = 0.702$ and $C^{B,q} = 0.818$ with $\rho = 7$, $\eta = 2.5$, $\theta = 0.65$, compared with the exact aggregates of Table 6.