Markups and Cost Pass-through Along the Supply Chain*

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Abstract

We use a novel dataset of production costs, wholesale prices, and retail prices from a large global manufacturer to study markups and pricing behavior along the supply chain. We document several facts about markups covering the period July 2018 through June 2023, and we propose a model of supply chain pricing behavior that rationalizes key patterns in our data. We find substantial dispersion in markups across products at each supply chain level. Manufacturer and retail markups are negatively correlated in the cross section and over time. Despite time-series variation in firm-level markups, total markups—reflecting the relationship between retail prices and production costs—are stable over time, even when prices increased along with general inflation in the United States in 2022. We apply our model to quantify factors that determine relative bargaining power between the manufacturer and retailers. Finally, we consider the dynamics of cost pass-through and the mediating role of manufacturer-retailer bargaining in price dynamics.

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1 Introduction

Firm pricing decisions along the supply chain affect product markups and play a key role in the transmission of cost shocks to final consumer prices. When upstream and downstream firms have market power, firm-level markups compound on one another, leading to higher prices and lower quantities for consumers (Spengler, 1950). Dynamically, the price-setting interactions between manufacturers and retailers can affect the rate at which shocks to production costs are transmitted to consumer prices. A large prior literature has focused on markups and cost pass-through for retailers and manufacturers separately. However, understanding these phenomena as a product moves along the supply chain can better inform economic questions related to equilibrium prices, firm profits, and inflation.

We use product-level data to provide direct evidence on markups and pricing behavior along the supply chain. Unlike most of the existing literature, we observe production costs and prices at the manufacturer level and directly link these to the final prices of the same products at the retail level. This allows us to measure markups at the manufacturer and retailer level and study the drivers of variation in wholesale and retail prices—in the cross section and over time. Motivated by our descriptive analysis, we propose a model of supply chain pricing behavior that rationalizes several of the patterns in our data, and we use the model to quantify factors that determine relative bargaining power between the manufacturer and retailers.

The dataset originates from a collaboration between a large global manufacturer of non-durable household products and the Pricing Lab at Harvard Business School. The manufacturer data contains product prices and costs, with a detailed breakdown into expected and unexpected costs, along with consumer survey-based quality indicators. Retail prices were sourced from PriceStats, a private company related to the Billion Prices Project (Cavallo and Rigobon, 2016). The dataset spans five years, from July 2018 through June 2023, and encompasses data from the United States, the United Kingdom, Canada, and Mexico. The combined dataset includes monthly production and retail information for approximately 2,000 products.

We document new facts about *total markups*, which we define as in terms of the relationship between retail prices and production costs, as well as the markups for each segment of the supply chain. We report markups in terms of the Lerner index.[1] Across countries, average total markups are similar: 0.67 in the US, 0.64 in the UK, 0.65 in Canada, and 0.60 in Mexico. In the US, the average manufacturer markup is 0.54 and the average retail markup is 0.27, implying an average firm-level markup of 0.41 for the products in our sample. In magnitudes, these markups are roughly in line with recent evidence using the demand approach (Döpper et al., 2025) and the production approach (De Loecker et al., 2020; De Loecker and Eeckhout, 2018) to estimate markups.[2]

[1]The Lerner index for price p and cost c is given by $\frac{p-c}{p}$, and typically ranges from 0 to 1. An alternative measure, p/c, has also been used in the literature. For a given value $L = \frac{p-c}{p}$, the price-over-cost markup p/c is equal to $\frac{1}{1-L}$.

[2]The demand and production approaches are empirical methods developed to recover markups either by esti-

In the US, total markups were stable over time. Our sample period, July 2018 through June 2023, included the onset of the COVID-19 pandemic and general inflation after 2021. In our data, retail prices increased in 2022, but total markups did not. For the products in our sample, the primary driver of increased consumer prices was an increase in production costs, rather than a net increase in markups. Thus, we do not find evidence for a discrete change in firm conduct during this period, despite the "greedflation" hypothesis that has been popular in the media.

However, for individual stages of the supply chain, we do find meaningful time–series variation in markups. In the second half of 2020, manufacturer markups increased while retail markups fell. In 2022, retail markups increased while manufacturer markups fell. In our data, markup changes in one stage of the supply chain are offset by adjustments in the other. As a result, total markups are remarkably stable, despite time-series variation in markups at the firm or sector level.

In the cross section, we document a large degree of within-country heterogeneity in total markups and markups at each stage of the supply chain. Markups are negatively correlated along the supply chain, such that a higher manufacturer markup corresponds to a lower retail markup. One channel that drives heterogeneity in markups is product quality. Manufacturer margins and markups are positively correlated with product quality, but there is a weak relationship between margins and quality for retailers. Because retailers pay more for higher-quality products, retail markups are negatively correlated with quality.

Overall, we observe similar patterns across countries. One notable exception is that, in contrast to the US, retailers in the United Kingdom, Canada, and Mexico capture a greater share of total margins, translating to higher retail markups and lower manufacturer markups. Over time, total markups are less volatile than manufacturer or retail markups for all four countries. Total markups are stable in the UK and Canada and show a slight increase in Mexico during our sample, coinciding with an increase in manufacturer markups. Controlling for these trends, we find a negative relationship between changes in manufacturer and retail markups in the time series.

We propose a model of supply chain pricing behavior based on our findings. Prices are determined in two stages. In the first stage, the manufacturer sets retail prices to maximize overall supply chain profits for the manufacturer's products. In the second stage, the supplier and the buyer negotiate the wholesale price, splitting the supply chain profits according to Nash bargaining. This model can be interpreted as one in which the retailer follows the manufacturer's suggested pricing policies, and the bargaining weight implicitly captures the (unmodeled) threat that the retailer deviates from these suggestions in the future. The model allows us to rationalize several key facts in our data, including the negative correlation in markups

mating consumer demand on transaction data or firm production function on production data. See De Loecker and Scott (2022) for an overview and a comparison of the two methods.

along the supply chain, which is more challenging to rationalize with other models of vertical conduct. We use the model to estimate bargaining weights for each product-country-month combination.

As a first step to understanding the determinants of bargaining power between manufacturers and retailers, we present a descriptive analysis that relates bargaining weights to features of the product and market. Our analysis, which leverages variation across products, countries, and time, indicates that the manufacturer captures larger margin shares in markets characterized by greater market penetration and higher income levels. In contrast, retailers secure larger margin shares in response to higher production costs and to inflation, the latter of which may proxy for overall consumer demand.[3]

Finally, we consider the dynamic aspect of pricing behavior. We start by studying how production cost shocks translate into retail prices, highlighting the differential dynamics between the manufacturing and retail sectors. Our findings reveal distinct price adjustment strategies in the US depending on the nature of the cost shock. For aggregate cost shocks, both the manufacturer and retailers adjust prices gradually over time, with complete pass-through typically occurring within three months. In contrast, idiosyncratic shocks generate an immediate price response at the manufacturer level, with nearly complete pass-through. Retailers, however, respond only partially to idiosyncratic shocks—even after six or twelve months—suggesting that product-specific cost changes are not fully reflected in final retail prices.[4] We also find that cost pass-through of production costs to retail prices is greater for expected costs relative to unexpected costs. We see similar differences between the response to aggregate and idiosyncratic shocks by the manufacturer and retailers in other countries. These patterns underscore consistent differences in the degree of pass-through across stages of the supply chain, shaped by both the nature of the shock and the firm's position within the chain.

We return to our bargaining model to examine dynamics in bargaining power between the manufacturer and retailers. We introduce lagged costs into our regressions that predict bargaining weights, and we find that changes in production costs affect bargaining power gradually rather than immediately. Moreover, when distinguishing between expected and unexpected costs, we find that expected cost changes have persistent negative effects on manufacturer bargaining power, while unexpected cost changes show only temporary effects.

Taken together with the reduced-form findings, these results indicate a novel channel that can explain dynamics in cost pass-through. The translation of product costs to wholesale prices and wholesale prices to retail prices may not be determined by independent steps at the firm level, but may instead reflect ongoing bargaining between the manufacturer and retailers. Thus,

[3] In Appendix A, we consider alternative assumptions that estimate a fixed bargaining weight in each country and instead examine variation in outside options.

[4] This suggests that the manufacturer weighs more heavily product-specific characteristics, while the retailer price-setting process may prioritize broader market conditions, such as aggregate demand and supply dynamics within product categories, over individual product characteristics (Nakamura, 2008).

empirical findings of dynamics in pass-through may in part be driven by dynamics in bargaining power that determine wholesale prices—which is the dependent variable in a manufacturer pass-through regression and the key independent variable in the retail pass-through regression.

Our paper contributes to the empirical literature on markups and cost pass-through. In relation to the first, our total markup values are consistent in magnitude with structural estimates resulting from the demand approach in the United States (Döpper et al., 2025) and the production approach in the United States (De Loecker et al., 2020), as well as estimates using the production approach in Canada, Mexico, and the United Kingdom (De Loecker and Eeckhout, 2018; Díez et al., 2021). We complement this literature by presenting unique evidence of the breakdown of markups along the supply chain, and of the relatively stable evolution in total markups over recent years, therefore showing a changing trend with respect to the previous decades. This provides further support in rejecting the hypothesis that the high level of inflation during the 2021-23 period was generated by firms increasing markups (Leduc et al., 2024; Bilyk et al., 2023).

In addition, our results may be relevant for methodological and empirical papers related to the estimation of markups. Existing structural approaches tend to rely on restrictive assumptions about pricing behaviors in either the upstream or downstream sectors (see, e.g., the discussion in De Loecker and Scott, 2022), which cannot rationalize our findings of frequent and active changes in markups in both sectors. We provide insights into pricing behaviors and statistics about markups along the supply chain that can help inform appropriate assumptions for future work.

Given the high-frequency nature of our data, we also relate to the literature focusing on short-run markup fluctuations that has produced contrasting results. Anderson et al. (2025) documents mildly procyclical markups in the retail sector, whereas Vaona (2016) finds countercyclical behavior in the manufacturing sector and Bils et al. (2018) finds countercyclical behavior in the entire economy.[5] We reconcile these seemingly conflicting findings by exploiting the vertical structure of the supply chain. Manufacturer and retailer markups move asymmetrically over the cycle—tending to offset one another—so that sector-level or economy-wide averages conceal important stage-specific dynamics.[6]

A large literature has analyzed the degree of cost pass-through, often finding incomplete transmission of costs to prices (recent examples include Amiti et al., 2019; Auer et al., 2018, 2021; Bonadio et al., 2020). While these studies typically focus on pass-through elasticities, we estimate pass-through in levels in order to be able to compare and compound the effect of a shock along the supply chain. Analyses along the supply chain are rare. Exceptions include

[5]Other studies that focus on the cyclical behavior of markups are Stroebel and Vavra (2019), Kryvtsov and Midrigan (2013), Rotemberg and Woodford (1999), Bils (1987), Galeotti and Schiantarelli (1998), Bils and Kahn (2000), and Nekarda and Ramey (2020).

[6]Our evidence also complements the aggregation results in Burstein et al. (2020), which emphasize differences between firm- and sector-level markups.

Nakamura (2008), which finds a limited role of manufacturing shocks for retailers' observed behavior, and Nakamura and Zerom (2010), which shows that retailers completely pass on commodity shocks, thus playing a limited role in the incomplete transmission along the supply chain. Koujianou Goldberg and Hellerstein (2013) finds similar results in the beer market in the United States. Minton and Wheaton (2023) highlights the role of supply chain networks in delaying the transmission of shocks. Finally, our results complement studies that distinguish between price-setting responses to expected and unexpected cost shocks, including MacKay and Remer (2024) and Meyer and Sheng (2024).

The paper proceeds as follows: Section 2 presents the data and evidence on total markups. Section 3 focuses on time series and cross-sectional patterns of markups, documenting the negative correlation along the supply chain and investigating pricing behaviors along the quality distribution. Section 4 presents a supply chain pricing model to rationalize the findings. We use the model to recover bargaining weights and assess the factors that predict them. Section 5 examines dynamic pricing aspects, providing empirical evidence on cost pass-through at different stages of the supply chain and expanding the analysis in the theoretical framework. Finally, Section 6 concludes.

2 Data

2.1 Prices, Costs, and Quantities

Our analysis relies on two distinct data sources that together allow us to measure markups and examine pricing behavior along the value chain. The first source comprises detailed product-level information from a global manufacturer. The second consists of a vast collection of retail prices provided by PriceStats, a private company related to the Billion Prices Project (Cavallo and Rigobon, 2016). Developed in the Pricing Lab at Harvard Business School, this combined dataset offers a unique opportunity to study price formation and pass-through mechanisms along the entire supply chain, from production to retail.

The first dataset, originating from a large global manufacturer active in the sector of non-durable household products, includes monthly SKU-level records of revenues, quantities, and costs from Canada, Mexico, the United Kingdom, and the United States. Our definition of a product is a combination of a brand, a product form, a package size, and a variant (for example, fragrance). Our raw data have multiple SKUs that correspond to identical products according to our definition. To prepare the data for the analysis, we aggregate across these SKUs, and we then link these products to the retail online prices in the second dataset. We calculate unit prices and unit costs by dividing revenues and costs by the quantity sold.[7] The measure of

[7]Revenues are recorded net of all volume- or quantity-based rebates that the manufacturer grants to individual retailers. The resulting figure therefore reflects an average transaction price per product. We use this average price throughout, while noting that marginal prices could diverge if the manufacturer applies additional ad-hoc discounts.

costs we obtained reflects variable costs, including raw materials, packaging, manufacturing operating expenses, transportation, and warehousing.

The manufacturer dataset features two additional features that are useful for our purposes: indicators of product quality and a detailed breakdown of costs into expected and unexpected categories. Quality measures, ranging from 0 to 5, are derived from consumer surveys in which respondents rank the uniqueness of the product relative to competitors and rate perceived quality. The resulting indicators, Differentiation and Perceived Quality, are available only for products sold in the United States. As for the cost breakdown, the manufacturer relies on an in-house team of experts to forecast costs for each product, which are recorded as *expected* costs. Any discrepancies between these forecasts and the actual realized costs are recorded as *unexpected* costs. These features of the data allow us to examine how pricing behaviors vary with quality and in response to different types of cost shocks.

The second dataset includes retail prices and is provided by PriceStats, a private firm that collects prices from online retailers using web-scraping techniques and uses them to provide insights into daily price changes and product details, including category and sale status. Although the products in our data are also sold through brick-and-mortar channels, we view online prices as a reasonable measure for our purposes.[8] We aggregate daily observations to monthly average prices for each product-retailer. Since for each product we have a single wholesale price and multiple retail prices, we construct an average retail price per product in two steps. Within each country, we run the following specification:

$$\tilde{p}^R_{ijt} = b + \delta_i + \delta^{s(i)}_t + \delta_j + \varepsilon_{ijt}, \tag{1}$$

where δ_i, $\delta^{s(i)}_t$, and δ_j are product, time, and retailer fixed effects, respectively. Time fixed effects are calculated separately by category, $s(i)$. In the second step, we subtract the retailer fixed effect (δ_j) from the raw retail price ($\tilde{p}^R_{ijst}$) and average within product and period to compute retail prices, $p^R_{it} = \frac{1}{|J_{it}|}\sum_{j\in J_{it}}(\tilde{p}^R_{ijt} - \delta_j)$.

Once we have a single retail price per product, we manually match them with the manufacturer's production data. We drop observations with negative values for revenues or costs and instances in which costs exceed revenues (implying negative markups), and we winsorize all variables at the 1% level.[9]

The resulting sample of analysis includes more than 1,900 matched products, divided into seven product categories and 13 brands, over the period from July 2018 to June 2023. Table B.1 shows the number of observations, products, brands, and retailers available for each country. We were able to match more than 93% of the manufacturer's sales to the retail data in the

[8] Cavallo (2017) shows that online prices are very similar to offline ones, even identical in 72% of the cases. Other papers using this data include Cavallo (2013), Cavallo et al. (2024); Cavallo and Kryvtsov (2023); Cavallo (2018), and Alvarez et al. (2022).

[9] We further classify as outliers, and drop, observations that double in size and prices/costs over one month. This includes around 240 observations in the US.

United States, and around 87% considering all countries. Table B.2 reports summary statistics for the matched sample.

2.2 Product Markups and Margin Shares

A key object of interest for our study is the supply chain *total markup*. For product i at time t, we compute this value as the Lerner index in terms of retail price (p_{it}^R) and production cost (c_{it}), $\mu_{it}^{TOT} = \frac{p_{it}^R - c_{it}}{p_{it}^R}$. This markup reflects the wedge between the price that consumers pay and the production costs, and it takes on values between 0 (price equals cost) and 1 (prices substantially greater than costs).

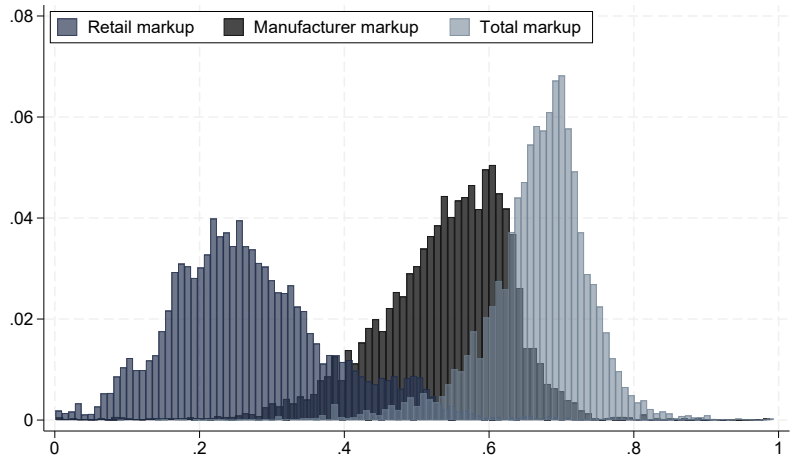
Our data also allow us to construct markups at the manufacturer and retailer level separately for individual products. We compute manufacturer markups as the Lerner index in terms of wholesale prices (p_{it}^M) and production costs, $\mu_{it}^M = \frac{p_{it}^M - c_{it}}{p_{it}^M}$. We note that our price and cost measures are constructed as the average of revenues and variable costs, which may not always correspond to revenues and costs for the marginal unit. However, due to the nature of the products in our sample and the fact that these data are used by the manufacturer to assess margins, we think they provide reasonable approximations.

We compute retail markups as the Lerner index with retail and wholesale prices, $\mu_{it}^R = \frac{p_{it}^R - p_{it}^M}{p_{it}^R}$, following other papers that study retail markups (e.g., Aguirregabiria, 1999; Eichenbaum et al., 2011; Anderson et al., 2025). The rationale for this approach is that the marginal cost of a product for a retailer is its replacement cost, with other retailing costs fixed over short horizons (Gopinath et al., 2011). To the extent that additional variable retailing costs (such as home delivery costs) exist, our measure of retail markups will be biased upward. In that case, our retail markups may be interpreted as upper bounds.[10] Similarly, our measure of total markups omits these additional retailer marginal costs and may also be biased upward. In our regressions, we employ fixed effects to control for certain types of unobserved costs that are common across products.

Finally, we construct the manufacturer and retailer *margin share*—the share of total markups (or dollar margins) that are obtained by each stage of the supply chain. Margin shares are calculated as $\frac{p_{it}^M - c_{it}}{p_{it}^R - c_{it}}$ and $\frac{p_{it}^R - p_{it}^M}{p_{it}^R - c_{it}}$. To illustrate the difference in the two measures, note that an increase in cost while holding fixed wholesale and retail prices will increase the retail margin share but leave retail markups unchanged. Also, because the wholesale price enters the denominator of the retail markup, a retailer may have a lower markup than the manufacturer but a higher margin share. Our measures of margin shares have a direct connection to the model we present in Section 4.

[10] Sangani (2022) compares retail markups measured using replacement costs with estimates resulting from structural methods based on demand and production models, thereby incorporating a richer notion of marginal costs, and finds similar markup levels.

Figure 1: Markups Along the Supply Chain



Notes: This figure shows the sales-weighted frequency distribution of markups along the supply chain in the United States. Retail markups ($\frac{p^R - p^M}{p^R}$) are shown in dark blue, manufacturer markups ($\frac{p^M - c}{p^M}$) in dark grey, and total markups ($\frac{p^R - c}{p^R}$) in light blue.

3 Supply Chain Markups

In this section, we analyze markups and pricing behavior in four countries: the United States, the United Kingdom, Canada, and Mexico. We begin by discussing the distribution of markups and time-series variation for the largest market in our sample, the US market. Subsequently, we expand the analysis by comparing it with the UK, Canadian, and Mexican markets.

3.1 Markup Levels and Heterogeneity

In Figure 1, we plot the distribution of markups for each stage of the supply chain, along with total markups, in the US. Manufacturer markups are substantially larger than retailer markups. The mean manufacturer markup is 0.54, nearly twice the mean retailer markup of 0.27. This indicates a mean firm-level markup of 0.41, while the mean total markup, reflecting the entire supply chain, is 0.67. These direct measurements are consistent with estimates from the literature that use indirect (econometric) approaches to recover markups. Using the production approach, De Loecker et al. (2020) estimate an average firm-level markup (across manufacturers, retailers, and other sectors) of 0.38 in 2016, which is close to our value of 0.41. Papers that use the demand approach to estimate markups for non-durable household products have employed assumptions about vertical conduct between manufacturers and retailers that implicitly recover the total markup. With this approach, Döpper et al. (2025) estimates a median markup of 0.63 in 2019, comparing favorably to our estimate of 0.67. Brand (2021) and Atalay et al. (2025) report slightly lower median markups and 75th percentile markups of 0.69 and 0.64. Using direct measures of prices and wholesale costs, Sangani (2022) finds a retail markup of

0.24 in 2007, close to our estimate of 0.27, albeit from a period over 10 years prior.[11]

Retail markups, manufacturer markups, and total markups exhibit substantial heterogeneity. The 90-10 percentile range for retail markups and manufacturer markups are 0.43-0.15 and 0.64-0.42, respectively. The 90-10 percentile range for total markups is 0.75-0.58. Though Figure 1 displays markups for all years in our data, we observe similar levels of dispersion in the cross section (see Figure B.1 for separate plots by year). This degree of heterogeneity is particularly striking because the products in our study come from a single manufacturer in a limited set of product categories.

These findings have important implications for firm behavior and consumer demand. First, to accurately capture product-level cost and price variation, models of supply and demand should allow markups for a single firm to vary meaningfully across products. Second, the differences in markups at each segment of the supply chain suggest that manufacturers and retailers are not symmetric in terms of, e.g., competitive pressures, bargaining positions, or conduct. The differences in markups between the two segments are not simply due to the fact that retailer markup is calculated with a larger denominator. Figure B.7 shows that the margin share—i.e., the share of the variable profits in dollar terms—is much higher for manufacturers.

Summary statistics for the distribution of markups and margin shares are presented in Table B.3.

3.2 Markups Over Time

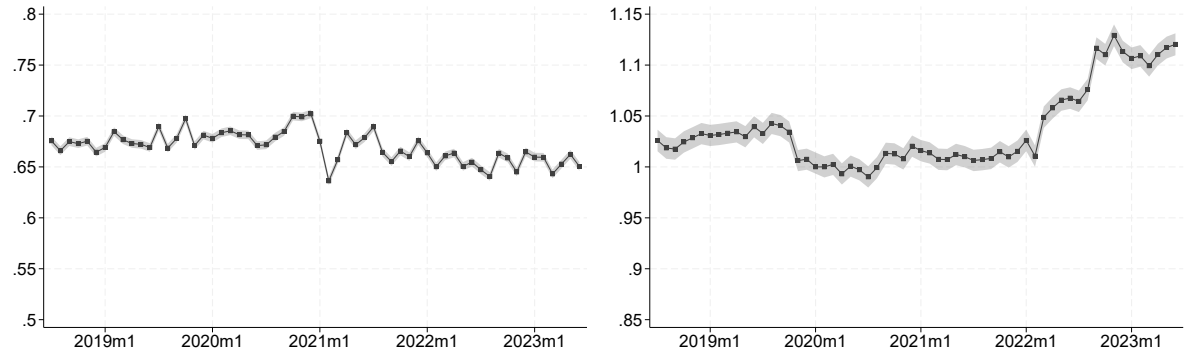
We now consider time-series variation in markups. We first examine the pattern in total markups from July 2018 through June 2023. We estimate time series trends by regressing our outcomes of interest on product and period (month-year) fixed effects, and then reporting the coefficients from the period fixed effects.[12]

Figure 2 displays the results for total markups and retail prices. Panel (a) shows that the average total markup in the US was fairly stable over time. Monthly values hewed close to the average value of 0.67, with slightly higher values in 2020 and a slight decline starting in 2021. The degree of stability is striking, especially with the inflationary period occurring in the US toward the end of our sample. Panel (b) shows the time series for retail prices, which increased approximately 10 percent in 2022. Despite the sharp rise in retail prices, we see no corresponding change in total markups. Thus, for the products in our sample, retail price changes coincided with increases in production costs. This finding indicates that, during this period, there was no discrete change in pricing practices across the supply chain, as would be implied by narratives for which inflation was driven primarily by higher markups, such as the "greedflation" hypothesis.

[11] De Loecker et al. (2020) and Sangani (2022) report price-over-cost markups of 1.6 and 1.32, respectively, which we translate to the Lerner index values.

[12] We weight observations by sales. The inclusion of product fixed effects controls for changes in the composition of products over time.

Figure 2: Time Series of Prices and Total Markups



(a) Total Markups (b) Retail Prices

Notes: This figure shows the time series trends in total markups (a) and retail prices (b) and in the United States. Total markups are defined as the Lerner Index using retail prices and manufacturing costs. Point estimates and 95% (robust) confidence intervals are obtained from a regression on period and product fixed effects using sales weights.

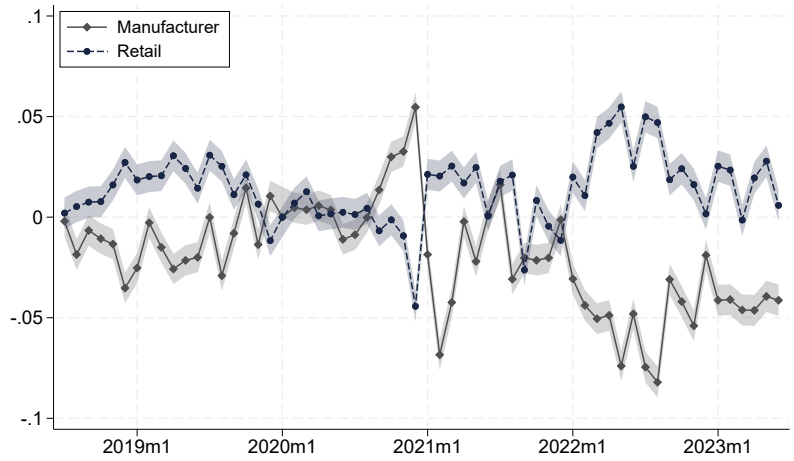
In contrast to total markups, there are meaningful fluctuations in markups at individual stages in the supply chain. In Figure 3, we plot the time series of manufacturer and retailer markups separately, normalizing January 2020 to 0. Manufacturer markups increased sharply at the end of 2020, returned to previous levels in 2021, then declined in 2022. Retailer markups followed an inverse pattern, declining at the end of 2020 and increasing in 2022. Even at a monthly frequency, we observe that changes in one sector's markups are often offset by inverse changes in the other, contributing to stable total markups.

These time series patterns yield two main implications for supply chain behavior. First, vertical conduct along the supply chain may stabilize total markups, even in the face of significant shocks to production costs or wholesale prices that generate variation in manufacturer or retailer markups. Second, the empirical relationship between firm profitability and consumer prices can depend on where the firm is in the supply chain. During the period of increased consumer prices starting in 2022, variable profits, as captured by the markup, were relatively higher for retailers and relatively lower for the manufacturer. Thus, attempts to connect inflation to firm profitability are complicated by supply chain conduct.

3.3 Exploring Cross-Sectional Markup Variation

The distribution of markups displayed in Figure 1 shows that the variance in total markups is smaller than the variation in manufacturer and retail markups. This is due to the fact that manufacturer and retail markups are negatively correlated in the cross section. To demonstrate this more formally, we plot a binscatter of manufacturer versus retailer markups in Figure 4. The plot displays three sets of values: the raw data, the residual markups after controlling for category fixed effects, and the residuals after controlling for category-period fixed effects. In

Figure 3: Markup Dynamics



Notes: This figures shows the negative dynamic correlation of markups along the supply chain in the United States. Changes in average markups and 95% (robust) confidence intervals resulting from a regression on period and product fixed effects using sales weights.

all three specifications, we find a statistically significant negative correlation, with a correlation coefficient ranging from -0.19 to -0.27. Our proposed model in Section 4, which invokes bargaining between the manufacturer and retailers, provides a way to rationalize the negative correlation in markups across products.

To explore the determinants of these patterns, we document the correlation between product quality and margins and markups in Table 1. We find that higher product quality is associated with higher total margins and markups, consistent with consumers having a less elastic demand for high-quality products. However, examining the patterns separately for the manufacturer and the retailer reveals stark differences in pricing behavior. The manufacturer achieves higher margins and markups with higher quality products.[13] In contrast, retail margins exhibit a much weaker relationship with quality, which leads to a negative correlation between retail markups and product quality. Interestingly, product quality explains a larger share of the variance in margins than in markups for all stages of the supply chain. We find similar patterns with our alternative measure of quality (product differentiation), which we report in Table B.4.[14]

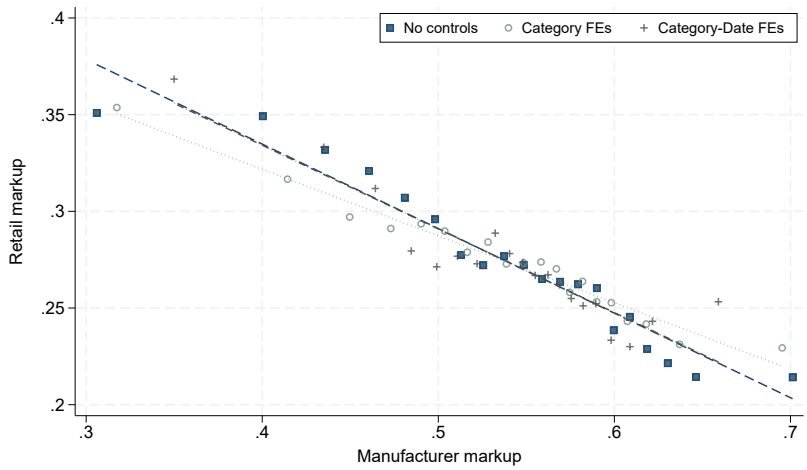
These results highlight the importance of considering separate stages of the supply chain for questions related to profitability, markups, and price levels. Our results indicate that product quality matters more to the manufacturer than it does to the retailer (in equilibrium). We proposed a two-stage pricing-bargaining framework in Section 4 to rationalize these patterns.[15]

[13] Since we observe only variable costs, this could reflect higher fixed costs for installing production factors and quality improvements.

[14] Figure B.2 and Figure B.3 show binscatter plots along the entire distribution of the two quality indicators.

[15] This pattern would also be consistent with a uniform-margin strategy set by a multi-product firm facing a logit

Figure 4: Markup Correlation Along the Supply Chain



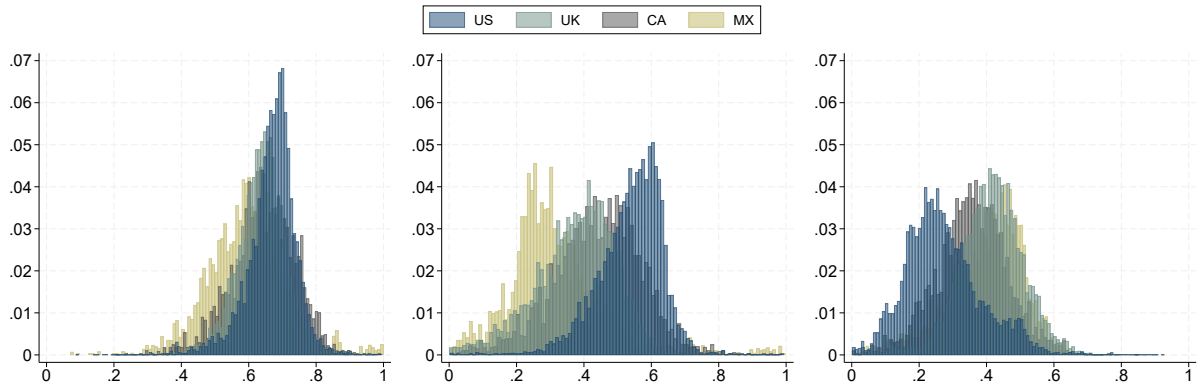
Notes: This figure shows the negative correlation of markups along the supply chain in the United States. Bins include sales-weighted values and values residualized on category fixed effects and on category times period fixed effects.

Table 1: Margins and Quality

	Margins			Markup		
	Total	Manu.	Retail	Total	Manuf.	Retail
Perceived Quality	0.83***	0.75***	0.08***	0.46***	1.63***	-1.38***
	(0.02)	(0.01)	(0.02)	(0.03)	(0.05)	(0.05)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.79	0.80	0.55	0.38	0.34	0.28
N	16,114	16,114	16,114	16,114	16,114	16,114

Notes: This table shows the linear relation between margins or markups and product quality estimated from the following linear model: $y_{it} = a + \alpha q_i + \beta X_{it} + \phi_{it} + \varepsilon_{it}$, with y_{it} being the variable of interest, margins or markups, for product i at time t, q_i product quality, X_{it} controls including linear and quadratic package size to account for quantity discounts, ϕ_{it} fixed effects including product category interacted with time, and ε_{it} a mean zero error. Robust standard errors are reported in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 5: Markups Distributions



(a) Total (b) Manufacturer (c) Retail

Notes: This figure shows the sales-weighted frequency distribution of markups along the supply chain. The total markup is defined as the Lerner index of retail prices and production costs, $(p^R - c)/p^R$, the manufacturer markup as the Lerner index of wholesale prices and production costs, $(p^M - c)/p^M$, while the retail markup as the Lerner index of retail prices and wholesale costs, $(p^R - p^M)/p^R$.

3.4 The UK, Canada, and Mexico

We now examine markup patterns across the four countries in our data. Figure 5a shows total markups in Canada, Mexico, the United Kingdom, and the United States.[16] The distribution of total markups is remarkably similar across countries, with average values of 0.64 in the UK, 0.65 in Canada and 0.60 in Mexico, compared to 0.67 in the US, which displays a less disperse distribution.

Despite comparable total markup levels, we find substantial heterogeneity in the distribution of markups along the supply chain between the US and other countries (Figure 5b and Figure 5c). In Canada, manufacturer and retailer markups are more evenly distributed, with the manufacturer having slightly higher markups on average. This pattern intensifies in the UK, where retail markups are systematically higher than manufacturer markups. Finally, Mexico presents the most pronounced divergence, characterized by the lowest manufacturer markups and the highest retailer markups in the sample. These findings stand in stark contrast to the US market structure, as retailers in these three countries capture a substantially larger proportion of total markups (see Figure B.7). Our markup estimates at the firm level (averaging across the manufacturer and retail markup) are consistent with estimates reported in the literature.[17]

Total markups remain relatively stable over time in all countries, as shown in Figure B.6. This stability reflects the negative correlation between manufacturing and retail markups over

demand (de Roos, 2011).

[16] Figure B.4 shows total markup distributions using retail prices rather than adjusted ones.

[17] In the UK, De Loecker and Eeckhout (2018) and Díez et al. (2021) obtain values of 0.40 and 0.23, close to our estimate of 0.40. In Mexico, De Loecker and Eeckhout (2018) obtain an estimate of 0.35, compared to 0.37 in our data. In Canada, De Loecker and Eeckhout (2018) obtain an estimate of 0.35, which is slightly lower than our estimate of 0.40.

Table 2: International Comparison

	Countries			
	US	UK	Canada	Mexico
Average Total Markup (μ_t^T)	0.67	0.64	0.65	0.60
Average Manufacturer Markup (μ_t^M)	0.54	0.38	0.46	0.33
Average Retail Markup (μ_t^R)	0.27	0.42	0.35	0.41
Average Product Markup (μ_t)	0.41	0.40	0.40	0.37
Average Manufacturer Margin Share ($\tilde{M}_t^M$)	0.60	0.35	0.46	0.32
Average Retail Margin Share ($\tilde{M}_t^R$)	0.40	0.65	0.54	0.68
Negative Time Series Corr(μ_t^M,μ_t^R)	Yes	Yes	Yes	No
Negative Cross-Sectional Corr(μ_{it}^M,μ_{it}^R)	Yes	Yes	Yes	No

Notes: This table summarizes the main results across the countries included in our sample. Margin shares are computed as manufacturing or retail margin over total margins, i.e., $\tilde{M}_t^M = M_t^M/(M_t^M + M_t^R)$ and $\tilde{M}_t^R = M_t^R/(M_t^M + M_t^R)$.

time, confirming the pattern documented for the US. Figure B.6 displays this dynamic relationship, where increases in manufacturer markups correspond to decreases in retailer markups, and vice versa. This compensatory mechanism helps maintain overall markup stability by balancing fluctuations between different stages of the supply chain. We test the time-series negative relationship of markups at the product level by regressing retail prices on manufacturer markups and product fixed effects, using sales weights. The resulting coefficient is negative and statistically different from zero in all countries, except Mexico. There, the coefficient is slightly positive (0.01) but not significantly different from zero.[18]

Table 2 summarizes our findings across countries. We report means of our measures of markups, as well as the manufacturer and retailer margin shares. The margin share patterns are similar to the markup patterns, with the exception of Canada: retailers have a lower markup than manufacturers but a higher margin share.[19]

4 Model

We propose a model of supply chain pricing behavior that rationalizes several of our key findings. The framework considers a manufacturer that supplies a set of products, $\mathcal{I}$, to multiple retailers. The supplier-buyer network is fixed, and pricing occurs in two stages. First, the manufacturer determines the optimal retail prices (p_i^R) that maximize joint manufacturer-retailer profits for the set of products $\mathcal{I}$. Second, the manufacturer and the retailer negotiate wholesale prices (p_i^M) through a bargaining process for each product separately. The model is consistent with conversations with the manufacturer and captures features of our data that standard models do not readily account for, including the negative correlation between manufacturer and

[18] Figure B.5 in the Appendix shows that this negative correlation persists in the cross-sectional analysis across all countries.

[19] As an example, consider $P^R = \$2.75$, $P^M = \$1.75$, and $c = \$1.00$. The retailer has a higher margin share ($1.00 out of the $1.75 total margin) but a lower markup.

retailer markups described in Section 3.

A feature of our model is that the second-stage bargaining process does not influence retail prices, quantities, or joint profits. Thus, our model allows us to assess the determinants of manufacturer and retailer bargaining power without imposing additional structure on demand, supply, or competition. We quantify the Nash bargaining weights that determine equilibrium wholesale prices while taking retail prices and quantities as given. We then exploit variation across products, countries, and time to examine the different factors that predict relative bargaining power in our model.

4.1 Supply Chain Pricing

In the first stage, the manufacturer determines the retail prices that maximize supply-chain profits for its own products:

$$\max_{\{p_i^R\}} \sum_{i \in \mathcal{I}} \left(p_i^R - c_i\right) q_i \tag{2}$$

where p_i^R is the retail price, c_i is the production cost, and q_i is the total retail quantity for product i. Without loss of generality, we write the model as if there is a single downstream retailer.

In practice, manufacturers often avoid directly setting retail prices through contracts. Instead, they incentivize retailers to adhere to preferred prices using a combination of "list prices" at the retail level (MSRP) and "promotional" rebates to the retailer. Moreover, manufacturers tend to focus on the behavior of the end consumer and spend extensive resources analyzing them.[20] Our specification is consistent with these dynamics and captures them in a reduced form.

At this stage, the manufacturer internalizes downstream consumer substitution patterns across products in $\mathcal{I}$, to products of other manufacturers sold by the retailer, and to the outside option. In general, one could put additional structure on demand to estimate substitution patterns and conduct counterfactuals. For our current purposes, no additional structure is necessary.

In the second stage, the manufacturer and the retailer bargain over the wholesale price for each product. Total supply-chain profits were fixed in stage 1, so only the split of those profits—implemented through the wholesale price—remain to be determined. Let $\pi_i^M(p_i^M, q_i)$ and $\pi_i^R(p_i^M, q_i)$ denote manufacturer and retailer profits on product i at quantity q_i, and let $\bar{\pi}_i^M$

[20] As one typical example, in a March 2023 earnings call, the executives of General Mills discuss pricing and elasticities several times, referring to retail consumer behavior. `https://seekingalpha.com/article/4589620-general-mills-inc-gis-q3-2023-earnings-call-transcript`

and $\bar{\pi}_i^R$ be their outside options. The Nash problem is:

$$\max_{p_i^M} \left[\pi_i^M(p_i^M, q_i) - \bar{\pi}_i^M\right]^{\tau_i}, \left[\pi_i^R(p_i^M, q_i) - \bar{\pi}_i^R\right]^{1-\tau_i}, \qquad \forall i \in \mathcal{I}. \tag{3}$$

We make the following assumptions regarding the disagreement payoffs. First, we abstract from strategic considerations across products or spillover from individual negotiations to other products. Bargaining is conducted product-by-product: the manufacturer and the retailer negotiate over thousands of products, and the median item accounts for less than one percent of volumes and sales within its product category, so any single product does not affect the others. Second, if negotiations break down, the retailer can immediately replace the product with a close substitute supplied by a competitive fringe making zero profits. Finally, negotiations occur at high frequency. Therefore, this implies that the production process of the manufacturer is already set, and the marginal cost of producing an additional unit of product is only the additional material to purchase. If the negotiation breaks down, the manufacturer incurs no costs. Under these assumptions, the disagreement payoffs satisfy $\bar{\pi}_i^M = \bar{\pi}_i^R = 0$, i.e., the outside options are effectively zero for both sides.

Under these conditions, Equation (3) simplifies to:

$$\max_{p_i^M} \left[\left(p_i^M - c_i\right) q_i\right]^{\tau_i} \left[\left(p_i^R - p_i^M\right) q_i\right]^{1-\tau_i}, \qquad \forall i \in \mathcal{I}. \tag{4}$$

The first component represents the profits of the manufacturer, expressed as manufacturer margin ($p_i^M - c_i$) times quantity. The second component is retailer profits, expressed as retail margins ($p_i^R - p_i^M$) times quantity. Here, τ_i and $(1 - \tau_i)$ represent the bargaining weights of the manufacturer and retailer, respectively, reflecting their relative bargaining power.

Because q_i is fixed from stage 1, the problem reduces to:

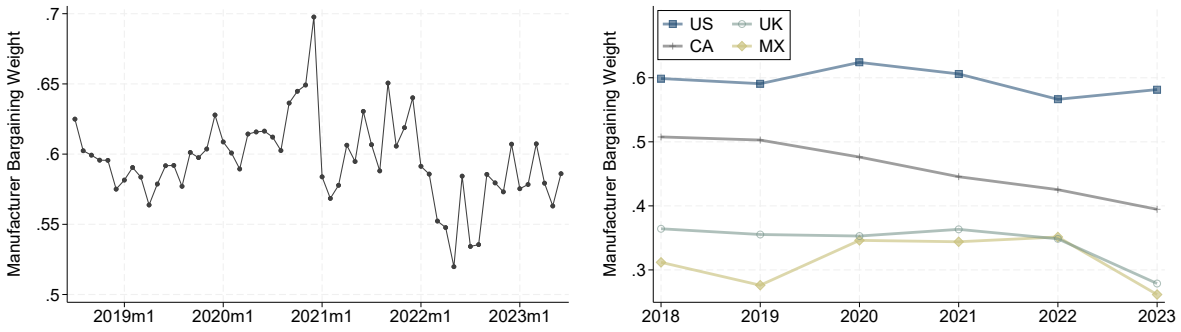
$$\max_{p_i^M} \left(p_i^M - c_i\right)^{\tau_i} \left(p_i^R - p_i^M\right)^{1-\tau_i}, \ \forall i \in \mathcal{I}. \tag{5}$$

In equilibrium, the solution to the bargaining problem yields a share of margins for the manufacturer that is equal to the bargaining weight, τ_i. This can be expressed as

$$\frac{p_i^M - c_i}{p_i^R - c_i} = \tau_i. \tag{6}$$

Using our data on retail prices, wholesale prices, and production costs, we can recover the manufacturer's bargaining weights directly from the data.

Figure 6: Manufacturer Bargaining Power



(a) The United States

(b) All countries

Notes: This figure shows the time series of the manufacturer's bargaining weights in the US (a) and across all countries (b). Bargaining weights are calculated using (6) and aggregated at the country-month level, weighted by sales.

4.2 Quantifying Manufacturer-Retailer Bargaining Power

Using the expression derived from our model, we can examine the relative shifts in markups between manufacturers and retailers and changes in bargaining power. We construct the sales-weighted average bargaining weights for the manufacturer at the monthly level for the US and at the annual level for cross-country comparisons.

Figure 6 plots the time series of manufacturer bargaining weights. In the US (Figure 6a), the manufacturer consistently held higher bargaining power than retailers, averaging 0.62 over the observed period. Moreover, the bargaining weight remained relatively stable until late 2020, when it experienced a sharp increase and subsequent decline due to changes in production costs. By 2022, bargaining power decreased significantly, coinciding with rising production costs.

The manufacturer exhibits lower bargaining power outside of the US (Figure 6b) when negotiating wholesale prices. The average bargaining weight is 0.47 in Canada, 0.33 in Mexico, and 0.36 in the United Kingdom. The evolution over time also varies across countries: in Canada, bargaining power has steadily declined since late 2019; in the United Kingdom, it remained unchanged over the period until a significant drop in 2023; while in Mexico, the manufacturer's bargaining power increased substantially in 2020 but fell again in 2023.

We examine the correlation between bargaining weights and economic factors to identify potential determinants of the manufacturer's bargaining power. Factors considered include production costs (which reflect supply shocks), total margins (which reflect market structure and competition), product-level sales per capita (market penetration), GDP per capita (income levels)[21], and the Consumer Price Index (CPI) as a proxy for overall demand (once production costs and margins are controlled for). Using variation across products, time, and countries, this

[21] We adjust GDP per capita for PPP to compare across countries.

Table 3: Bargaining Weight Predictors

	(1)	(2)	(3)	(4)	(5)
Production Cost	-0.488***	-0.487***	-0.468***	-0.471***	-0.482***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.005)
Margins	0.563***	0.552***	0.602***	0.487***	0.483***
	(0.002)	(0.002)	(0.003)	(0.004)	(0.005)
Sales per Capita	0.050***	0.051***	0.065***	0.048***	0.048***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
GDP	0.424***	-0.133***	0.586***	0.354***	0.419***
	(0.007)	(0.042)	(0.014)	(0.088)	(0.107)
CPI	-0.213***	-0.002	-0.286***	-0.173***	-0.130**
	(0.024)	(0.029)	(0.039)	(0.054)	(0.065)
Quality					1.015***
					(0.120)
Country FEs		X			
Non US			X		
US Only				X	X
Observations	41,739	41,739	17,919	23,820	16,114
R^2	0.661	0.663	0.674	0.479	0.479

Notes: This table shows the outcome of regressing the (log) manufacturer bargaining weights on (log) production costs, (log) total margins, (log) product sales, (log) GDP per capita, and (log) CPI. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

analysis aims to provide qualitative insights into the predictors of bargaining power.

The results in Table 3 shed light on the economic factors that influence the manufacturer's bargaining power and their relative importance in different contexts. All variables are in logs, allowing for the interpretation of coefficients as elasticities. The first column shows that production costs are negatively correlated with bargaining weights. This suggests that higher production costs, such as those observed during the post-pandemic surge in input costs, are linked to lower manufacturer bargaining power. A 10 percent increase in production costs is associated with a 4.9 percent decline in margin share. Conversely, total margins show a positive relationship with bargaining weights. Because higher margins persist for products with fewer close substitutes, this suggests that lower competition in the downstream sector strengthens the manufacturer's position.

The coefficients of product-level sales per capita and GDP per capita show that higher market penetration and higher income are also associated with higher manufacturer bargaining power. This suggests that products with a larger presence in the market and access to wealthier consumer bases may increase leverage in negotiations. Finally, the coefficient of CPI shows that higher demand, as captured by aggregate price levels after accounting for costs and product-specific margins, is associated with lower manufacturer bargaining power. This suggests that positive aggregate demand shocks may lead to disproportionate gains for retailers. Together, these factors help explain more than 66% of the variation in bargaining weights.

In columns (2) through (4), we examine alternative specifications by introducing country fixed effects, restricting the sample to non-US countries, and focusing solely on the US. Across all specifications, the estimated coefficients are remarkably stable. In column (2), the inclusion of country fixed effects emphasizes within-country variation. Relative to our baseline specification, the coefficient on GDP per capita becomes negative and there is a decrease in the magnitude of the coefficient on CPI, with almost no change in R^2.[22] The stability in the other coefficients and R^2 suggests that our chosen variables effectively capture persistent cross-country differences in bargaining power. In column (3), we limit the analysis to Canada, Mexico, and the UK, while column (4) narrows the focus to the US. The coefficients are very similar across these specifications, underscoring the robustness of our results.

Finally, in column (5) we introduce our measure of product quality, which we have only for the US. Our earlier evidence indicated that higher product quality is associated with higher manufacturer markups but lower retailer markups (Section 3). Our analysis here provides corroborating evidence in terms of bargaining power: higher quality is associated with higher manufacturer bargaining power.

5 Price Dynamics Along the Supply Chain

Thus far, we have treated pricing behavior as static. However, it is well known that prices may take time to reflect upstream cost shocks. Here, we consider the dynamics of cost pass-through. We provide reduced-form estimates of how cost shocks propagate along each part of the supply chain, and we document dynamic patterns that differ between the manufacturer and retailers. As in Section 3, we start with evidence from the United States before extending our analysis to the United Kingdom, Canada, and Mexico. We close this section by adding dynamic adjustments to bargaining weights in our model of supply chain pricing. Our estimates illustrate how dynamics in bargaining power can generate dynamics in cost pass-through.

5.1 Cost Pass-Through Along the Supply Chain

We begin by examining how costs are transmitted to prices in the United States. First, we look at how costs are transmitted down each stage of the supply chain. Second, we consider the differential impact of expected and unexpected cost shocks. Third, we examine whether cost transmission differs for products of higher versus lower quality.

We measure the pass-through mechanisms at both the manufacturer and the retail levels to unravel the complementary dynamics between manufacturing costs and retail pricing strategies. Specifically, we compute the pass-through of costs at the manufacturer level using the

[22] The sign flip of the coefficient on GDP is mostly driven by the negative correlation in Mexico, and to a lesser extent in Canada.

following specification:

$$p_{ist}^{M} = a + \sum_{z=0}^{T} \alpha_z^M \hat{c}_{ist-z}^{M} + \sum_{z=0}^{T} \beta_z^M C_{st-z}^{M} + \phi_i + \varepsilon_{ist} \tag{7}$$

where p_{ist}^{M} represents the manufacturer prices for product i in category s at time t, and c_{ist}^{M} represents its production cost. We divide the latter into its product-specific component, $\hat{c}_{ist}^{M}$, by demeaning it, and the category common component, C_{st}^{M}, representing the product category average cost. ϕ_i are product fixed effects and ε_{ist} is a mean-zero error term. This specification, where the identification of pass-through coefficients $\{\alpha_z^M\}_{z=0}^{T}$ and $\{\beta_z^M\}_{z=0}^{T}$ is based on within-product variation over time, allows us to disentangle the effects on prices of product-idiosyncratic costs and changes in aggregate common components.

Similarly, the pass-through at the retailer level is estimated using the following specification:

$$p_{ist}^{R} = b + \sum_{z=0}^{T} \alpha_z^R \hat{p}_{ist-z}^{M} + \sum_{z=0}^{T} \beta_z^R P_{st-z}^{M} + \gamma_i + \nu_{ist} \tag{8}$$

where p_{ist}^{R} represents the retail price for product i in category s at time t, and p_{ist}^{M} represents the manufacturer's price, which is the cost incurred by the retailers to purchase the product. As in the wholesale analysis, we divide the latter into a product-specific component, $\hat{p}_{ist}^{M}$, and a common component, P_{st}^{M}, representing the average cost of the product category. γ_i are product fixed effects. Although we study a single manufacturing firm that produces multiple products for the wholesale cost pass-through, we have information on several retailers selling the same product which we average as described in Section 2. Therefore, the pass-through coefficients at the retail level, $\{\alpha_z^R\}_{z=0}^{T}$ and $\{\beta_z^R\}_{z=0}^{T}$, reflect the average impact across retailers for the same product.

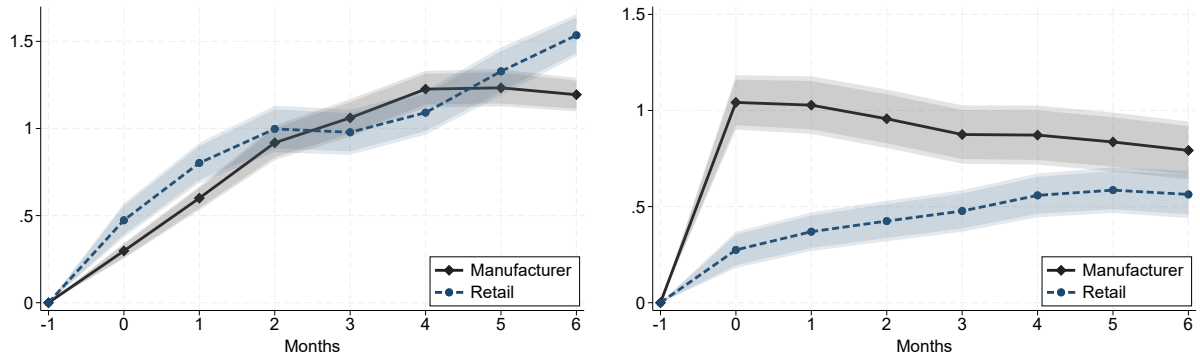
Due to product attrition, we restrict our baseline specification to analyze price responses within the first six months.[23] Moreover, we include period fixed effects and run the same analysis. Table B.6 and Table B.8 show the resulting coefficients when controlling for aggregate conditions, and we find consistent results.

Figure 7a shows the cumulative price adjustments following an aggregate increase in costs, while Figure 7b examines the cumulative price responses to idiosyncratic cost changes. The figures reveal different pricing strategies, both with respect to idiosyncratic and aggregate components, and with respect to the manufacturer and retailers.

For both the manufacturer and retailers, substantial and fast price adjustments follow aggregate cost shocks. Specifically, a \$1 increase in aggregate costs results in an immediate \$0.30-0.40 increase at both stages of the supply chain. Despite a slightly heterogeneous cumulated

[23] Table B.5 and Table B.7 present pass-through coefficients for different lags, showing cumulative price responses over extended periods.

Figure 7: Cost Pass-through Along the Supply Chain



(a) Aggregate (b) Idiosyncratic

Notes: This figure shows the cumulative pass-through of costs to wholesale prices and of wholesale prices to retail prices, estimated using Equation (7) and Equation (8). Panel (a) includes responses to aggregate shocks, and panel (b) to idiosyncratic ones. Solid lines are the point estimates, and shaded areas are the 95 and 90 percent confidence bands computed using the Delta method.

reaction in specific months, the figure highlights a similar overall trend. Both stages of the supply chain attain a pass-through close to 1 (in levels) within two months of the change. The largest difference appears in the sixth month, when the retailer seems to achieve a higher pass-through than the manufacturer.

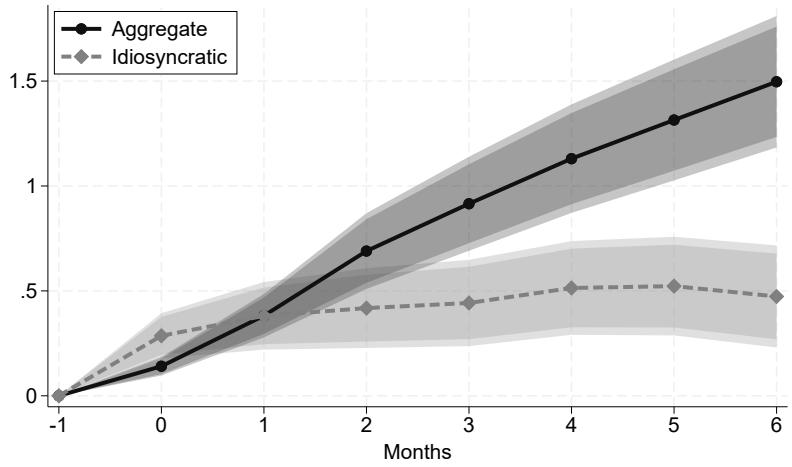
The manufacturer's and retailers' price responses to idiosyncratic costs are significantly different. Figure 7b shows that the manufacturer's response when isolating product-specific costs is even more pronounced than to aggregate costs, with wholesale prices increasing by \$1.07 immediately following a \$1 increase in manufacturing costs. In contrast, retailers adopt a more conservative pricing strategy, adjusting retail prices by only \$0.32 following a \$1 increase in wholesale price and not fully passing through product-specific costs even after six months.[24] This behavior is consistent with the disconnect between retail margins and quality we observed within a category, suggesting that retailers may make pricing decisions primarily at the product category level and in equilibrium put less weight on product-specific conditions.

To further contextualize these dynamics, we use pass-through estimates to calculate the change in retail prices due to a \$1 increase in production cost, incorporating adjustments at both the manufacturing and retail levels, as shown in Figure 8. The cumulative response at time t, following a shock at time $t = 0$, is calculated as $\theta_t^{\text{AGG}} = \sum_{i=0}^{t} \beta_i^R (\sum_{j=0}^{t-i} \beta_j^M)$, and as $\theta_t^{\text{IDIO}} = \sum_{i=0}^{t} \alpha_i^R (\sum_{j=0}^{t-i} \alpha_j^M)$, with θ_t^{AGG} and θ_t^{IDIO} being the cumulative retail price adjustment at time t to aggregate or idiosyncratic costs, and α^X and β^X with $X = \{M, R\}$ recovered from Equation (7) and (8).[25] Adding up coefficients from different regressions allows us to use more

[24] Table B.7 shows that idiosyncratic cost components are not passed through by the retailers even after one year.

[25] This method of calculating the cumulative response accounts for delayed adjustments in both the manufacturing and retail sectors. For instance, a \$1 increase in aggregate production cost results in an immediate pass-through at period 0, which will be $\theta_0^{\text{AGG}} = \beta_0^R \beta_0^M$; after one month, $\theta_1^{\text{AGG}} = \theta_0^{\text{AGG}} + \beta_0^R \beta_1^M + \beta_1^R \beta_0^M = \beta_0^R (\beta_0^M + \beta_1^M) + \beta_1^R \beta_0^M$, and so on.

Figure 8: Pass-through from Production Cost to Retail Price



Notes: This figure shows the cumulative pass-through of production costs to retail prices. The cumulative responses are calculated as $\theta_t^{\text{AGG}} = \sum_{i=0}^{t} \beta_i^R (\sum_{j=0}^{t-i} \beta_j^M)$, and as $\theta_t^{\text{IDIO}} = \sum_{i=0}^{t} \alpha_i^R (\sum_{j=0}^{t-i} \alpha_j^M)$, with θ_t^{AGG} and θ_t^{IDIO} being the cumulative retail price adjustment at time t to aggregate or idiosyncratic costs, and α^X and β^X with $X = \{M, R\}$ recovered from Equation (7) and (8). Standard errors are constructed by bootstrapping 100 times with replacement.

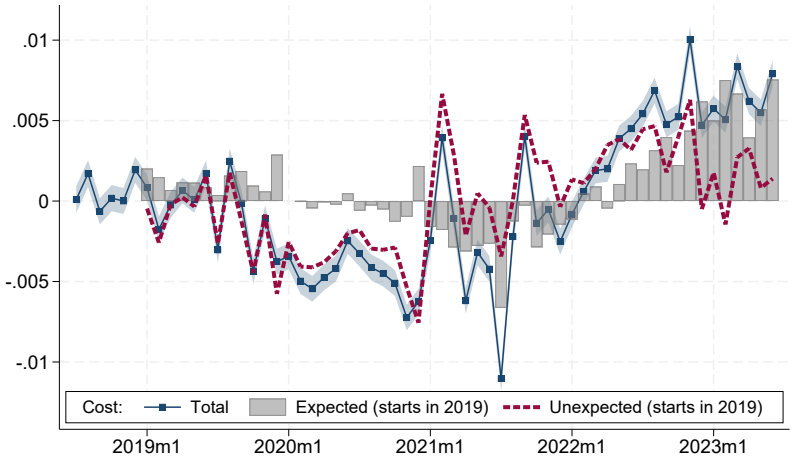
data than estimating pass-through from production costs to retail prices due to product attrition. To validate our results, we also estimate these pass-through coefficients directly, finding almost identical results as shown in Figure B.8.[26]

The figure indicates that an aggregate shock to manufacturing costs, affecting the entire product category, is passed on to the final consumer within 3 to 4 months, with delays due to temporary cost absorption attributable to both the manufacturer and the retailers. Importantly, two months after the shock, when the manufacturer has already passed it through completely, retail prices have changed only by \$0.50, underscoring the role played by retailers and the supply chain in general in delaying cost transmission (Minton and Wheaton, 2023). Furthermore, while the manufacturer responds to product-specific shocks with immediate and complete price adjustments, these changes do not fully reach the final consumer, due to the pricing behavior of the retailers. In fact, retail prices increase only by \$0.50 throughout the six-month period. In Figure B.8, we obtain the same result by means of a unique regression of retail prices on manufacturing costs, in line with the specifications of Equation (7) and (8).

Expected and Unexpected Cost The period under examination was characterized by significant global shocks that were largely unforeseen. In Figure 9, we leverage the detailed cost breakdown from the dataset to illustrate the changes in overall, expected, and unexpected

[26]Figure B.8 presents the cumulative response estimated by regressing retail prices directly on production costs using the following specification: $p_{ist}^R = b + \sum_{z=0}^{T} \alpha_z^R \hat{c}_{ist-z}^M + \sum_{z=0}^{T} \beta_z^C C_{st-z}^M + \gamma_i + \nu_{ist}$, where product-specific production costs are decomposed into idiosyncratic and aggregate components, as in Equation (8). Unsurprisingly, the results are identical to those shown in Figure 8. Table B.9 shows the estimated coefficients.

Figure 9: Expected and Unexpected Costs Changes Over Time



Notes: The figure displays changes in production, expected and unexpected costs relative to January 2020. The y-axis reports values in U.S. dollars. Each point reflects monthly averages from a regression of costs on date and product fixed effects, weighted by per-period sales, with 95% (robust) confidence intervals.

costs. As highlighted by the coefficient of variation in Table B.2, unexpected costs, despite having an average close to zero, significantly contributed to the overall cost variation, similarly to expected costs. Given the significant impact of unexpected shocks during this period, we investigate whether the manufacturer reacts differently to expected and unexpected shocks, potentially influencing the observed dynamics of cost pass-through.

To explore potential deviations in pass-through from normal conditions, we use information on expected and unexpected cost shocks to estimate the differential price responses with the following specification:

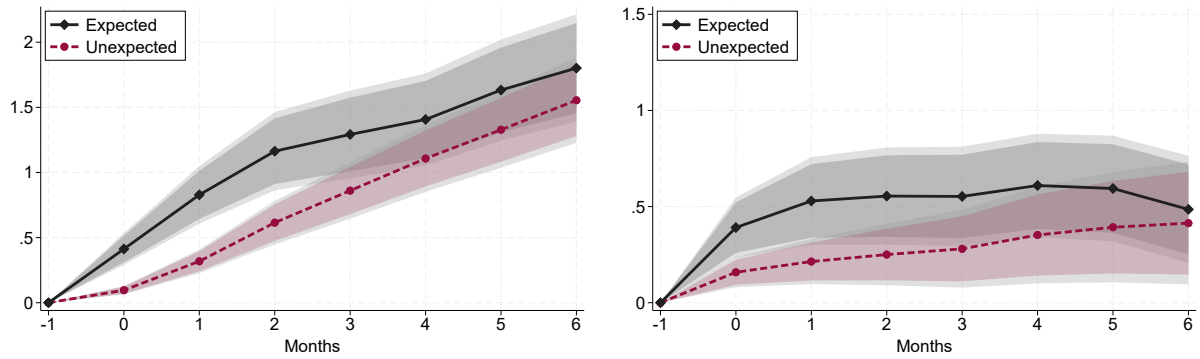
$$p^M_{ist} = a + \sum_{z=0}^{T} \left\{ \alpha^M_{e,z} \hat{c}^{e,M}_{ist-z} + \beta^M_{e,z} C^{e,M}_{st-z} + \alpha^M_{u,z} \hat{c}^{u,M}_{ist-z} + \beta^M_{u,z} C^{u,M}_{st-z} \right\} + \phi_i + \varepsilon_{ist} \tag{9}$$

where $c^{e,M}_{ist}$ represents the expected price change at time t and $c^{u,M}_{ist}$ the unexpected one, which we split into a demeaned component and the product category average. Given that we do not have the cost breakdown for retailers, we limit our focus to the manufacturer and assume retailers cannot distinguish between expected and unexpected cost changes.

Figure 10 shows the cumulative pass-through from production costs to retail prices, combining the responses at both the manufacturing and retail stages, following the approach used in Figure 8.[27] The analysis reveals that expected costs, both aggregate and idiosyncratic, are transmitted faster to retail prices, while unexpected costs take up to three months to reach the same level of pass-through as for expected costs.

[27]While the manufacturer exhibits heterogeneous responses depending on the nature of the shock recovered from Equation (9), we apply the coefficients for retailers estimated from Equation (8).

Figure 10: Pass-through from Production Cost to Retail Price by Cost Type



(a) Aggregate Cost (b) Idiosyncratic Cost

Notes: These figure show the cumulative pass-through of production costs to retail prices for expected and unexpected costs. The cumulative responses are calculated separately for expected and unexpected costs as $\theta^{\text{AGG}}_{y,t} = \sum_{i=0}^{t} \beta^{R}_{i} (\sum_{j=0}^{t-i} \beta^{M}_{y,j})$, and $\theta^{\text{IDIO}}_{y,t} = \sum_{i=0}^{t} \alpha^{R}_{i} (\sum_{j=0}^{t-i} \alpha^{M}_{y,j})$, with $\theta^{\text{AGG}}_{y,t}$ and $\theta^{\text{IDIO}}_{y,t}$ being the cumulative adjustment of the retail price at time t to aggregate or idiosyncratic costs with $y = \{e, u\}$ for expected and unexpected changes. α^{X}_{e} and α^{X}_{u} are recovered from Equation (9), and β^{X} from Equation (8) with $X = \{M, R\}$. Standard errors are constructed by bootstrapping 100 times with replacement.

The results indicate that for aggregate costs, expected shocks are transmitted to retail prices almost immediately, reaching full pass-through within two months. In contrast, the pass-through of unexpected costs is complete only after five months. For idiosyncratic costs, where the transmission to retail prices is only partial, each $1 increase in expected costs leads to a $0.50 increase in retail prices after just one month, whereas it takes significantly longer for unexpected costs to reach that level.

These findings highlight the differential behaviors throughout the supply chain in response to both the type of shock (aggregate or idiosyncratic) and its nature (expected or unexpected). The manufacturer, which achieves full pass-through for both aggregate and idiosyncratic costs, responds more strongly to expected changes, possibly indicating prudence or delays caused by nominal rigidities.[28] Retailers' slower price adjustments, as seen in Figure 7, further exacerbate the delay in price adjustment when the manufacturer responds more gradually to unexpected costs.

Product Quality Finally, we investigate the role of of quality differentiation in the transmission of cost shocks to prices. For that, we use the following specification for the manufacturer:

$$p^{M}_{ist} = a + \sum_{z=0}^{T} \left\{ \alpha^{M}_{z} \hat{c}^{M}_{ist-z} + \beta^{M}_{z} C^{M}_{st-z} + \mathrm{I}_{q,i} \times \left(\alpha^{M}_{q,z} \hat{c}^{M}_{ist-z} + \beta^{M}_{q,z} C^{M}_{st-z} \right) \right\} + \phi_{i} + \varepsilon_{ist} \qquad (10)$$

[28] Figure B.9 shows the individual estimated responses.

and for retailers:

$$p^R_{ist} = b + \sum_{z=0}^{T} \left\{ \alpha^R_z \hat{p}^M_{ist-z} + \beta^R_z P^M_{st-z} + \mathrm{I}_{q,i} \times \left(\alpha^R_{q,z} \hat{p}^M_{ist-z} + \beta^R_{q,z} P^M_{st-z} \right) \right\} + \gamma_i + \nu_{ist} \tag{11}$$

with $\mathrm{I}_{q,i}$ being a dummy variable taking value 1 for products with quality above the average within a category, else 0.

We find no significant differences between pass-through estimates for high- and low-quality products in response to aggregate and idiosyncratic cost shocks, as shown in Figure B.12. Thus, the evidence suggests that quality does not significantly influence the degree of pass-through for the products in our sample.[29]

5.2 Pass-through in the UK, Canada, and Mexico

Finally, we study cost transmission in the United Kingdom, Canada, and Mexico. While the matched manufacturer-retailers dataset allows us to infer markup dynamics from the cross-section of products, focusing on the time series dimension requires data imputation for these countries. Indeed, gaps in the time series for each product lead to a significant reduction in the sample used to estimate cost pass-through over a six-month period.

We address this by imputing missing data by bringing forward production costs and wholesale prices for gaps up to 90 days. Table B.10 shows the extent of data imputation by country. The table highlights that the number of imputed observations is actually rather small compared to the total number of observations, averaging around 10% for the manufacturer data and 5% for retailers. However, the imputed data significantly increase the number of observations available for the regression analysis, where products need to be observed for six continuous months. For instance, in Canada, the 13% imputed data increase the number of manufacturer regression observations by 78%, from 9,013 to 16,029, and the retailer regression observations by 42%, from 3,044 to 4,308. Similarly, in Mexico, the imputed data increase the manufacturer regression observations from 3,115 to 5,720 and the retailer regression observations from 1,747 to 2,519.

To analyze the dynamics of cost pass-through in Canada, Mexico, and the United Kingdom, we use the same specifications as in the US: Equation (7) for the manufacturer and Equation (8) for the retailers. This ensures consistency and comparability across countries. We estimate pass-through jointly by interacting coefficients and fixed effects with country dummies to capture country-specific dynamics. Figure B.13 shows the cumulative pass-through of production costs to wholesale prices, of wholesale prices to retail prices, and of production costs to retail prices for the United Kingdom, Canada, and Mexico, respectively.[30]

[29] The manufacturer's and retailers' individual responses are provided in Figure B.11.

[30] The cumulative response of retail prices to production cost changes is constructed using the same calculation as for Figure 8.

Overall, the patterns that we documented for the United States largely hold for Canada and the United Kingdom. The manufacturer in all three countries adjusts wholesale prices on impact after idiosyncratic cost shocks and more gradually after aggregate shocks, while retailers move sluggishly and mainly in response to the aggregate component. The difference lies in the magnitude of the price adjustment. In the UK, the manufacturer does not fully transmits aggregate shocks within six months, while in Canada idiosyncratic shocks are passed through incompletely by both the manufacturer and the retailers.

Mexico is the clear outlier. Neither stage of the supply chain attains full pass-through for either type of shock: six months after a 1$ increase in production cost, whether idiosyncratic or aggregate, the manufacturer's cumulative response is well below 1$, and the retailer raises prices by only about $0.50 per $1 increase in wholesale price. These findings underscore the role of retailers in moderating the impact of changes in production cost on consumer prices and maintaining price stability within product categories.

5.3 Dynamic Evolution of Bargaining Power

The results in this section indicate that wholesale and retail prices adjust dynamically to cost shocks, while our earlier results showed there was a negative correlation in markups between the manufacturer and the retailer. Taken together, this suggests that dynamic adjustments in bargaining power may explain the divergence between manufacturer and retailer cost pass-through.

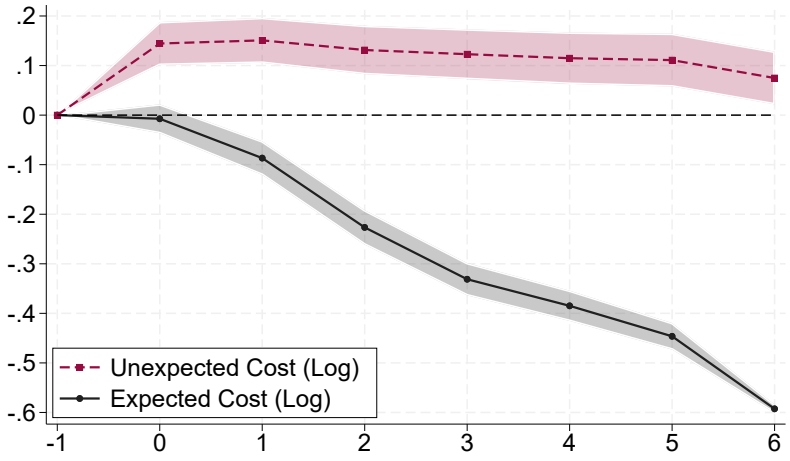
To explore this more directly, we use our estimates of bargaining weights from the model of Section 4 to examine how these weights evolve over time in response to cost changes. Given the differences in estimated pass-through in response to expected and unexpected costs, we include these costs separately when examining dynamics. We follow closely the descriptive regressions from Section 4 by adding lags to the measures of cost shocks and report the regression output in Table B.11.

We start by linking the results to the cost-pass through rates estimated in the previous section to better understand the determinants of bargaining power. Following a positive cost shock, the manufacturer would capture a larger margin share—that is, enhance its bargaining power—if the percentage change in its margin (i.e., $\Delta M^M/M^M$) exceeds the percentage change in the total margin ($\Delta M^T/M^T$). In our framework, this condition can be written as:

$$\rho^M - 1 > (\rho^T - 1)m_0,$$

where ρ^M is the manufacturer's pass-through, ρ^T is the total pass-through from production cost to retail price (equal to the product $\rho^R\rho^M$), and m_0 is the initial manufacturer's margin share. Using the pass-through estimates from Table B.5 and Table B.7, along with the margin share from Table 2, we confirm that this condition is not satisfied on impact, thus rationalizing the

Figure 11: Cumulative Responses of Manufacturer Bargaining Weight



Notes: This figure shows the cumulative pass-through of production costs to manufacturer bargaining weight. The cumulative responses are calculated summing the coefficients from Table B.11, while standard errors are constructed using the Delta method.

negative coefficient in Column (1).[31] Intuitively, the manufacturer is not able to pass through the cost shock quickly enough to enhance its bargaining power, especially given its initial large margin share. However, the evidence suggests that, despite the stronger initial position, the manufacturer is able to gain from the cost shock over a longer time horizon, i.e., six months after the shock.

Thereafter, we split costs into expected and unexpected components. In magnitudes, we find a slightly larger response to expected costs (-0.539) and a much smaller response to unexpected costs (-0.118), compared to the coefficient of -0.488 on production costs. This implies that the response to production costs reflects a weighted average of expected and unexpected costs, with the former comprising a greater portion of total cost. This asymmetry parallels our previous finding that expected costs are transmitted more rapidly through the supply chain, and may be driven, for example, if retailers raise prices by more when wholesale price increases are expected.

Figure 11 reports the cumulative response of manufacturer bargaining weight to expected and unexpected costs up to six months after the shock. The introduction of lagged cost shocks reduces the contemporaneous response on expected costs. With six-month lags, this coefficient is nearly zero. The lagged coefficients are negative, statistically significant, and economically meaningful.[32] These coefficients suggest that changes in production costs affect bargaining power gradually rather than immediately. Dynamic adjustments to bargaining power may lead

[31] Here we refer to the estimate for aggregate cost shocks, which represent the bulk of production costs considered in Table B.11.

[32] The sum of the expected cost coefficients is -0.572 in the specification with two-month lags and -0.593 with six-month lags, which are similar to the estimated contemporaneous effect. This indicates that the immediate effect captured in our baseline specification reflects the combined impact of current and past cost changes.

to differential speeds of price adjustment between the manufacturer and retailers, as our earlier evidence indicated.

When incorporating lagged shocks, contemporaneous unexpected cost changes show a positive effect on manufacturer bargaining power. However, this dissipates over the following months and the longer-run effect of a permanent unexpected cost shock is negative, as indicated by the sum of the current and lagged unexpected cost coefficients.

One possible explanation for this pattern is the following: at the arrival of an unexpected cost shock, the manufacturer can immediately push for higher wholesale prices that the retailer does not immediately pass on. Given some time to respond, the retailer adjusts retail prices or pushes back against these cost increases. The net long-run effect of unexpected cost shocks is directionally the same as expected cost shocks: higher costs are correlated with reduced manufacturer bargaining power, even if a cost shock may temporarily improve the manufacturer's margin share.

These dynamic patterns may help explain the observed stability in total markups despite significant cost fluctuations. When costs increase, the manufacturer's bargaining power decreases gradually, leading to a smoother adjustment of margins between supply chain participants.

6 Conclusion

This study analyzes markups and pricing strategies along the supply chain in the United States, the United Kingdom, Canada, and Mexico. We created a unique dataset combining detailed product price and cost information from a major global manufacturer with corresponding retail prices collected online. With data from around 2,000 products, we measure markups for both the manufacturer and retailers without relying on strong assumptions.

Our findings reveal that total markups are similar in magnitude across countries, averaging around 0.65, but there is significant heterogeneity along the supply chain. This indicates substantial market power at both the manufacturer and the retailer levels and suggests that economic models that assume a single sector or perfect competition in upstream or downstream sectors may not be well-suited to capture the richness of markup patterns in the real world.

Total markups are stable and shared between the manufacturer and retailers. We do not find evidence that inflation is driven by higher markups; in the time series, higher prices are driven by higher costs and total markups are fairly stable. These findings are not consistent with the "greedflation" hypothesis, which suggests that in recent years inflation was driven by firms increasing their markups. Total markup stability over time is due to the negative correlation along the supply chain, where adjustments in the manufacturing and retail sectors are asymmetric and partially offset each other.

We develop a two-stage supply chain pricing model to rationalize these findings. Our model fits key facts in our data that are not readily explained by standard models in the industrial

organization and macroeconomic literature. This model can be adapted for future research on how supply chain relationships influence various economic phenomena.

Our model allows us to quantify the relative bargaining power between the manufacturer and retailers. The analysis reveals that the manufacturer holds greater bargaining power than retailers in the US, while retailers have greater bargaining power than the manufacturer in other countries. Over time, the manufacturer's bargaining power has declined in the United States and Canada, remained stable in the United Kingdom, and increased significantly in Mexico in 2020.

Using variation across products, countries, and time, we analyze different predictors of bargaining power. We find that the manufacturer bargaining weights increase with income and market penetration and decrease with production costs and inflation. Manufacturer bargaining weights also increase with the total margin of a product, indicating the manufacturer captures a greater share when fewer close substitutes are available.

Finally, we show that the manufacturer and the retailers adjust their prices at different rates and magnitudes. Differences in the pass-through along the supply chain have significant implications for the transmission of various shocks. Idiosyncratic shocks are passed on quickly in the short run due to full pass-through by the manufacturer, but overall pass-through is smaller because retailers often ignore these shocks. In contrast, aggregate shocks are passed on more slowly, but long-run pass-through is larger as both the manufacturer and retailers eventually fully pass on these costs. Additionally, the more unexpected the shock, the slower the pass-through. Our model of supply chain pricing can rationalize these patterns as dynamic changes in bargaining power in response to cost shocks.

From a policy perspective, these findings underscore the importance of considering supply chain dynamics when addressing inflation and market power. The differing speeds at which cost changes propagate through the supply chain can delay consumer price responses to supply-side shocks. Furthermore, shifts in economic conditions can reshape the bargaining positions of suppliers and buyers, affecting price setting and market outcomes. Accounting for these factors is crucial to developing effective strategies that promote price stability and competitive markets.

References

Aguirregabiria, V. (1999). The dynamics of markups and inventories in retailing firms. *The Review of Economic Studies*, 66(2):275–308.

Alvarez, F., Lippi, F., and Oskolkov, A. (2022). The macroeconomics of sticky prices with generalized hazard functions. *The Quarterly Journal of Economics*, 137(2):989–1038.

Amiti, M., Itskhoki, O., and Konings, J. (2019). International shocks, variable markups, and domestic prices. *The Review of Economic Studies*, 86(6):2356–2402.

Anderson, E., Rebelo, S., and Wong, A. (2025). Markups across space and time. *Review of Economic Studies*.

Atalay, E., Frost, E., Sorensen, A. T., Sullivan, C. J., and Zhu, W. (2025). Scalable demand and markups. *Journal of Political Economy*.

Auer, R., Burstein, A., and Lein, S. M. (2021). Exchange rates and prices: evidence from the 2015 swiss franc appreciation. *American Economic Review*, 111(2):652–686.

Auer, R. A., Chaney, T., and Sauré, P. (2018). Quality pricing-to-market. *Journal of International Economics*, 110:87–102.

Bils, M. (1987). The cyclical behavior of marginal cost and price. *The American Economic Review*, pages 838–855.

Bils, M. and Kahn, J. A. (2000). What inventory behavior tells us about business cycles. *American Economic Review*, 90(3):458–481.

Bils, M., Klenow, P. J., and Malin, B. A. (2018). Resurrecting the role of the product market wedge in recessions. *American Economic Review*, 108(4-5):1118–1146.

Bilyk, O., Grieder, T., and Khan, M. (2023). Markups and inflation during the covid-19 pandemic. Technical report, Bank of Canada.

Bonadio, B., Fischer, A. M., and Sauré, P. (2020). The speed of exchange rate pass-through. *Journal of the European Economic Association*, 18(1):506–538.

Brand, J. (2021). Differences in differentiation: Rising variety and markups in retail food stores. *Available at SSRN 3712513*.

Burstein, A., Carvalho, V. M., and Grassi, B. (2020). Bottom-up markup fluctuations. Technical report, National Bureau of Economic Research.

Cavallo, A. (2013). Online and official price indexes: Measuring argentina's inflation. *Journal of Monetary Economics*, 60(2):152–165.

Cavallo, A. (2017). Are online and offline prices similar? evidence from large multi-channel retailers. *American Economic Review*, 107(1):283–303.

Cavallo, A. (2018). Scraped data and sticky prices. *Review of Economics and Statistics*, 100(1):105–119.

Cavallo, A. and Kryvtsov, O. (2023). What can stockouts tell us about inflation? evidence from online micro data. *Journal of International Economics*, page 103769.

Cavallo, A., Lippi, F., and Miyahara, K. (2024). Large shocks travel fast. *American Economic Review: Insights*.

Cavallo, A. and Rigobon, R. (2016). The billion prices project: Using online prices for measurement and research. *Journal of Economic Perspectives*, 30(2):151–178.

De Loecker, J. and Eeckhout, J. (2018). Global market power. Technical report, National Bureau of Economic Research.

De Loecker, J., Eeckhout, J., and Unger, G. (2020). The rise of market power and the macroeconomic implications. *The Quarterly Journal of Economics*, 135(2):561–644.

De Loecker, J. and Scott, P. (2022). Markup estimation using production and demand data. an application to the us brewing industry. Technical report, Working paper.

de Roos, N. (2011). Markup uniformity under the multi-nomial logit. *Available at SSRN 1804735*.

Díez, F. J., Fan, J., and Villegas-Sánchez, C. (2021). Global declining competition? *Journal of International Economics*, 132:103492.

Döpper, H., MacKay, A., Miller, N., and Stiebale, J. (2025). Rising markups and the role of consumer preferences. *Journal of Political Economy*.

Eichenbaum, M., Jaimovich, N., and Rebelo, S. (2011). Reference prices, costs, and nominal rigidities. *American Economic Review*, 101(1):234–262.

Galeotti, M. and Schiantarelli, F. (1998). The cyclicality of markups in a model with adjustment costs: econometric evidence for us industry. *Oxford Bulletin of Economics and Statistics*, 60(2):121–142.

Gopinath, G., Gourinchas, P.-O., Hsieh, C.-T., and Li, N. (2011). International prices, costs, and markup differences. *American Economic Review*, 101(6):2450–2486.

Koujianou Goldberg, P. and Hellerstein, R. (2013). A structural approach to identifying the sources of local currency price stability. *Review of Economic Studies*, 80(1):175–210.

Kryvtsov, O. and Midrigan, V. (2013). Inventories, markups, and real rigidities in menu cost models. *Review of Economic Studies*, 80(1):249–276.

Leduc, S., Li, H., and Liu, Z. (2024). Are markups driving the ups and downs of inflation? *FRBSF Economic Letter*, 2024(12):1–5.

MacKay, A. and Remer, M. (2024). Consumer inertia and market power. *Available at SSRN 3380390*.

Meyer, B. and Sheng, X. S. (2024). Unit cost expectations and uncertainty: Firms' perspectives on inflation. *FRB Atlanta Working Paper*.

Minton, R. and Wheaton, B. (2023). Delayed inflation in supply chains: Theory and evidence. *Available at SSRN 4470302*.

Nakamura, E. (2008). Pass-through in retail and wholesale. *American Economic Review*, 98(2):430–437.

Nakamura, E. and Zerom, D. (2010). Accounting for incomplete pass-through. *The Review of Economic Studies*, 77(3):1192–1230.

Nekarda, C. J. and Ramey, V. A. (2020). The cyclical behavior of the price-cost markup. *Journal of Money, Credit and Banking*, 52(S2):319–353.

Rotemberg, J. J. and Woodford, M. (1999). The cyclical behavior of prices and costs. *Handbook of macroeconomics*, 1:1051–1135.

Sangani, K. (2022). Markups across the income distribution: Measurement and implications. *Available at SSRN 4092068*.

Spengler, J. J. (1950). Vertical integration and antitrust policy. *Journal of Political Economy*, 58(4):347–352.

Stroebel, J. and Vavra, J. (2019). House prices, local demand, and retail prices. *Journal of Political Economy*, 127(3):1391–1436.

Vaona, A. (2016). A nonparametric panel data approach to the cyclical dynamics of price-cost margins in the fourth kondratieff wave. *Eurasian Business Review*, 6:155–170.

A Alternative Bargaining Assumptions

We propose an alternative version of the theoretical framework introduced in Section 4, which differs from the baseline in one key respect: it assumes fixed bargaining weights for both parties and introduces a time-varying outside option $\bar{\pi}_i^M \geq 0$ for the manufacturer and $\bar{\pi}_i^R \geq 0$ for the retailer. Product pricing remains unchanged: it follows a two-stage process in which the manufacturer first sets retail prices to maximize joint supply chain profits, and then the manufacturer and retailer negotiate the division of product-level margins.

Product margins are split via a Nash bargaining protocol with fixed weights $\tau_i \in [0, 1]$ for the manufacturer:

$$\max_{p_i^M} \left(p_i^M - c_i - \bar{\pi}_i^M\right)^{\tau_i} \left(p_i^R - p_i^M - \bar{\pi}_i^R\right)^{1-\tau_i}, \ \forall i \in \mathcal{I}. \tag{A.1}$$

Taking the first-order condition yields:

$$\tau_i = \frac{p_i^M - c_i - \bar{\pi}_i^M}{p_i^R - c_i - \bar{\pi}_i^R - \bar{\pi}_i^M}, \tag{A.2}$$

where the bargaining weight corresponds to the share of surplus the manufacturer captures in the negotiation. Unlike Equation (6) in the baseline model, this expression cannot be directly mapped to the data, as it depends on two unobserved outside options.

We proceed in two complementary ways to bring Equation (A.2) to the data. First, we impose a parametric restriction by assuming that the expected value of each party's outside option is a constant fraction $A \in [0, 1)$ of their *average* margin:

$$\mathbb{E}[\bar{\pi}_i^M] = A\ \mathbb{E}[p_i^M - c_i], \qquad \mathbb{E}[\bar{\pi}_i^R] = A\,\mathbb{E}[p_i^R - p_i^M].$$

Taking expectations of Equation (A.2) and substituting these moment conditions yields:

$$\tau = \frac{\mathbb{E}[p_i^M - c_i]}{\mathbb{E}[p_i^R - c_i]}. \tag{A.3}$$

Since A cancels out, the ratio of sample means identifies τ for any assumed value of A.

Second, we provide a more flexible alternative by estimating the manufacturer's bargaining weight directly. Rearranging Equation (A.2) yields the following linear regression specification:

$$p_i^M - c_i = \tau_i(p_i^R - c_i) + (1 - \tau_i)\bar{\pi}_i^M - \tau_i\bar{\pi}_i^R\ , \tag{A.4}$$

which we estimate via OLS using period sales weights. The estimate of τ_i is unbiased under the assumption that outside options are mean-independent of the total margin and, crucially, does not rely on any parametric assumption on their values.

Table A.1: Bargaining Weight with Time-Varying Outside Options

(a) Calibration Exercise

	(1) US	(2) UK	(3) CA	(4) MX
Bargaining Weight	0.60	0.34	0.42	0.31

(b) Estimation Exercise

	(1) US	(2) UK	(3) CA	(4) MX
Bargaining Weight	0.406***	0.289***	0.383***	0.297***
	(0.007)	(0.005)	(0.007)	(0.021)
Constant	0.023***	0.006***	0.011***	0.028
	(0.001)	(0.000)	(0.001)	(0.037)
R^2	0.62	0.48	0.67	0.43
N	23,820	7,597	6,411	3,911

Notes: This table reports estimates for bargaining weights with time-varying outside option. Panel a) shows weighted averages from Equation (A.3), and Panel b) shows OLS coefficients and (robust) standard errors of Equation (A.4) using per period sales as weights.

Table A.1 reports the results. Table A.1a shows bargaining weights derived from the calibration exercise with parametric restrictions, while Table A.1b reports country-level OLS estimates.[33] Both approaches yield the same picture: the manufacturer has the strongest bargaining power, meaning it retains the largest share of surplus, in the United States, while its bargaining power is weaker in the UK, Canada, and Mexico.

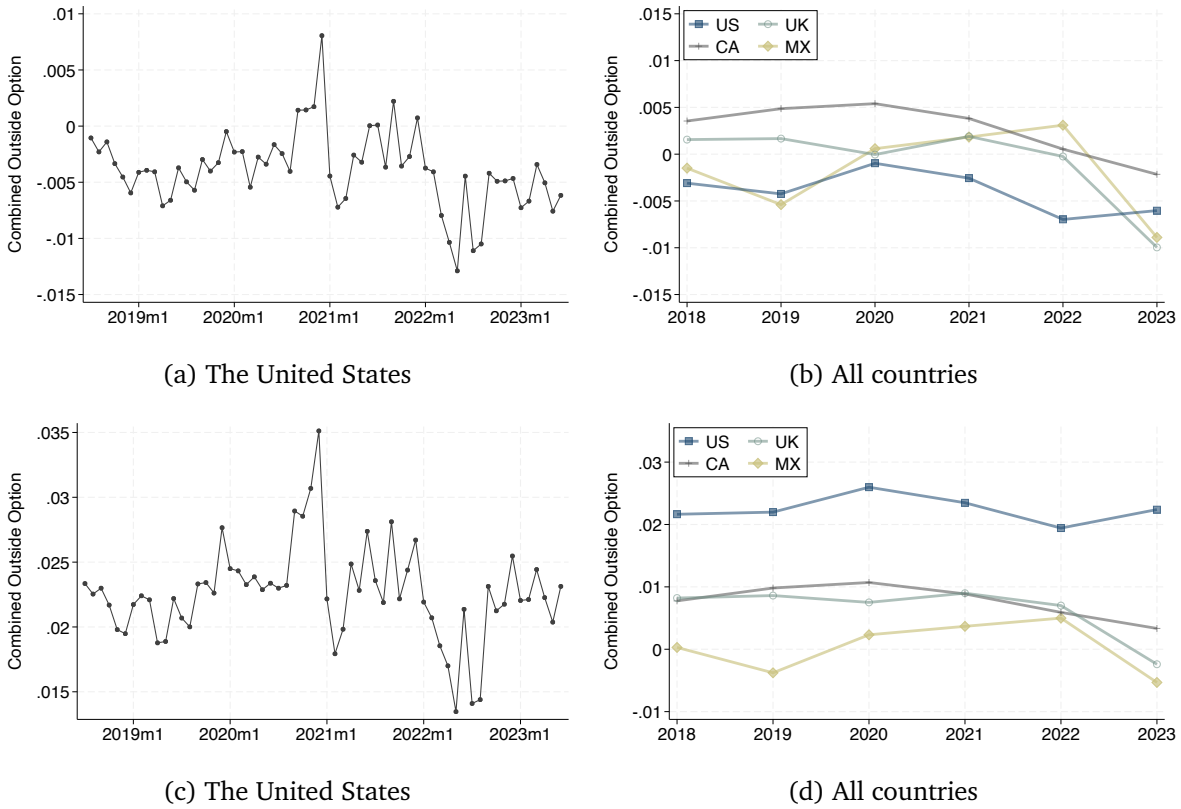
The calibrated weights (Table A.1a), closely match the average of the time-varying bargaining weights recovered in Section 4. In contrast, the OLS estimates (Table A.1b) are lower. This possibly reflects the measurement error in the total surplus, as our data do not include retailing costs.

Next, we turn to the analysis of the outside options. While we cannot separately identify $\bar{\pi}^M$ and $\bar{\pi}^R$ for each product without further assumptions, we can recover the combined term $\widehat{\left[(1-\tau_i)\bar{\pi}_i^M - \tau_i\bar{\pi}_i^R\right]}$, which reflects a weighted difference between the manufacturer's and retailer's outside options. We use the estimated bargaining weights from from the calibration exercise recover the combined outside option term as $(w_i - c_i) - \hat{\pi}(p_i - c_i)$. An advantage of using the OLS specification is that the regression constant identifies the (sales-weighted) average of the combined term, $\left[(1-\tau_i)\bar{\pi}_i^M - \tau_i\bar{\pi}_i^R\right]$. Estimated constants are reported in Table A.1b, and are positive and significant in the US, UK, and Canada, but not significantly different from zero in Mexico.[34] In this case, we recover the combined term for each product by summing the regression residuals to the constant.

[33] All moments are computed using period sales weights, consistency with Section 4.

[34] A regression without a constant—effectively assuming this term equals zero on average—yields higher τ estimates in all countries: 0.53 in the US, 0.33 in the UK, 0.43 in Canada, and 0.31 in Mexico. Median coefficients from quantile regressions with a constant are also close to those from the OLS without constant.

Figure A.1: Combined Outside Option Over Time



(a) The United States

(b) All countries

(c) The United States

(d) All countries

Notes: This figure shows the time series of the estimates of the combined outside options term $\left[(1-\tau_i)\bar{\pi}_i^M - \tau_i\bar{\pi}_i^R\right]$. Panel (a) and (b) show estimates from the calibration exercise, while Panel (c) and (d) estimates from the estimation exercise.

We explore the time-series dynamics of the combined outside option term in Figure A.1. The top panels show results from the calibration exercise, and the bottom panels from the estimation exercise.

Figure A.1a displays monthly variation in the US under the calibration approach. The combined term fluctuates around zero by construction, with notable volatility: it spikes at the end of 2020 and falls sharply in early 2022, before returning to trend. Figure A.1c shows similar high-frequency variation under the estimation approach, though the series now centers around a positive mean of approximately 0.02.

Figure A.1b plots annual averages across countries from the calibration exercise. The series remains relatively stable for the US and Canada, while Mexico and the UK exhibit a pronounced decline in 2023. A comparable pattern emerges from the estimation-based series in Figure A.1d, with the US, UK, and Canada consistently showing positive averages.

Finally, we examine the correlation between estimated combined term and a set of economic variables to shed light on the potential determinants of outside options in favor of one or the other party involved in the negotiation. This exercise mirrors the analysis presented in the main

Table A.2: Bargaining Weight Predictors

	(1)	(2)	(3)	(4)	(5)
Production Cost	-0.741***	-0.757***	-0.615***	-0.903***	-0.946***
	(0.006)	(0.006)	(0.009)	(0.010)	(0.012)
Margins	0.883***	0.815***	0.798***	0.895***	0.807***
	(0.005)	(0.005)	(0.006)	(0.009)	(0.012)
Sales per capita	0.128***	0.133***	0.099***	0.146***	0.136***
	(0.002)	(0.002)	(0.004)	(0.003)	(0.003)
GDP	1.175***	-0.314***	0.936***	0.924***	1.093***
	(0.015)	(0.092)	(0.028)	(0.211)	(0.256)
CPI	-0.873***	-0.275***	-0.608***	-0.837***	-0.717***
	(0.054)	(0.062)	(0.076)	(0.129)	(0.155)
Quality					8.610***
					(0.286)
Country FEs		X			
Non US			X		
US Only				X	X
Observations	41,739	41,739	17,919	23,820	16,114
R^2	0.553	0.570	0.494	0.395	0.424

Notes: This table shows the outcome of regressing standardized manufacturer bargaining weights on (log) production costs, (log) total margins, (log) product sales, (log) GDP per capita, and (log) CPI. Variables are standardized across countries in column (1) and (2), in non-US countries in column (3) and in the US in column (4) and (5). Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

text, where we explored how bargaining power covaries with market structure and supply chain characteristics.

Since a non-negligible share of the combined outside option terms are negative, we cannot apply a log transformation. Instead, we standardize it and regress it on the same set of predictors. For completeness, we also replicate Table 3 using the standardized level of bargaining power (recovered from Equation (6)) as the dependent variable. The results, presented in Table A.2, remain consistent with the baseline specification: all coefficients preserve their sign and statistical significance.[35]

We now examine how the combined outside option term correlates with product and market characteristics, noting that an increase in the combined term $\left[(1-\tau_i)\bar{\pi}_i^M - \tau_i\bar{\pi}_i^R\right]$ implies an increase in the manufacturer's outside option relative to retailer's one. Table A.3 reports the estimated coefficients for the calibration exercise.

Production costs are negatively and significantly associated with the combined outside option in most specifications for the UK, Canada, and Mexico. This may reflect that it is harder to replace the retailing structure for high-cost products. In the US, however, the sign flips: higher production costs are associated with higher manufacturer's outside option. This pattern is con-

[35]The coefficient on quality appears larger than in the baseline because the dependent variable is standardized, while quality is still in logs and fixed over time, thus presenting very little variation.

Table A.3: Combined Outside Option Predictors

	(1)	(2)	(3)	(4)	(5)
Production Cost	-0.227***	-0.023*	-0.120***	0.223***	0.142***
	(0.008)	(0.013)	(0.013)	(0.021)	(0.027)
Margins	-0.306***	-0.484***	-0.121***	-0.843***	-0.982***
	(0.009)	(0.014)	(0.014)	(0.022)	(0.028)
Sales per capita	0.167***	0.160***	0.094***	0.205***	0.164***
	(0.003)	(0.003)	(0.005)	(0.004)	(0.005)
GDP	-0.564***	-0.484***	-0.115**	0.857***	1.078***
	(0.023)	(0.115)	(0.047)	(0.283)	(0.342)
CPI	-0.224***	-0.413***	-0.547***	-1.288***	-1.310***
	(0.072)	(0.081)	(0.097)	(0.176)	(0.209)
Quality					16.342***
					(0.403)
Country FEs		X			
Non US			X		
US Only				X	X
Observations	40,907	40,907	17,563	23,344	15,739
R^2	0.204	0.224	0.055	0.288	0.370

Notes: This table shows the outcome of regressing the combined outside options term $\left[(1-\tau_i)\bar{\pi}_i^M - \tau_i\bar{\pi}_i^R\right]$ on (log) production costs, (log) total margins, (log) product sales, (log) GDP per capita, and (log) CPI. Standard errors in parentheses. Variables are standardized across countries in column (1) and (2), in non-US countries in column (3) and in the US in column (4) and (5). Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

sistent with the positive coefficient on product quality and may indicate high-quality products are easier to reallocate across retail firms in the US market.

Total margins are consistently negatively associated with the combined term across all specifications. This pattern contrasts with earlier estimation results and suggests that, while higher margin are associated with higher manufacturer's bargaining power, products with higher margins may strengthen the fallback position of the retailer more than that of the manufacturer.

Product sales per capita remain a strong and stable predictor, with large positive coefficients throughout. This suggests that products with broader market penetration are associated with stronger fallback positions for the manufacturer, possibly due to demand scale or distribution leverage. GDP per capita is negatively correlated with the combined term in the pooled and non-US regressions, but turns positive in the US-only sample, pointing to cross-country heterogeneity in how macroeconomic conditions shape fallback values.

Finally, inflation measured as the consumer price index (CPI) is negatively and significantly associated with the combined term across all specifications. This implies that inflationary environments may reduce fallback profits, particularly for retailers.

Table A.4 reports the same analysis using the combined outside option terms resulting from the estimation exercise. While some discrepancies arise—especially in the role of production costs outside the US and total margins overall—the qualitative patterns remain stable, and most

Table A.4: Combined Outside Option Predictors

	(1)	(2)	(3)	(4)	(5)
Production Cost	0.167***	0.004	-0.154***	0.157***	0.137***
	(0.009)	(0.013)	(0.014)	(0.020)	(0.025)
Margins	0.094***	0.236***	0.108***	0.207***	0.011
	(0.010)	(0.014)	(0.015)	(0.020)	(0.026)
Sales per capita	0.165***	0.173***	0.102***	0.197***	0.154***
	(0.003)	(0.003)	(0.005)	(0.004)	(0.005)
GDP	1.524***	-0.419***	0.003	0.649**	0.716**
	(0.026)	(0.121)	(0.050)	(0.284)	(0.335)
CPI	-1.289***	-0.442***	-0.629***	-0.860***	-0.909***
	(0.075)	(0.085)	(0.104)	(0.178)	(0.207)
Quality					17.171***
					(0.403)
Country FEs		X			
Non US			X		
US Only				X	X
Observations	40,902	40,902	17,560	23,342	15,774
R^2	0.159	0.177	0.041	0.166	0.275

Notes: This table shows the outcome of regressing the combined outside options term $\left[(1-\tau_i)\bar{\pi}_i^M - \tau_i\bar{\pi}_i^R\right]$ on (log) production costs, (log) total margins, (log) product sales, (log) GDP per capita, and (log) CPI. Standard errors in parentheses. Variables are standardized across countries in column (1) and (2), in non-US countries in column (3) and in the US in column (4) and (5). Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

coefficients retain statistical significance.

B Additional Tables and Figures

Table B.1: The Matched Manufacturer-Retailer Dataset

		Obs.	N_i	N_{ir}	% of firm sales	N of brands
US	*Manufacturer*	40,283	1,518	-	100	9
	Retailers	58,202	1,004	3,418	93.88	8
UK	*Manufacturer*	11,546	696	-	100	6
	Retailers	18,914	421	1,223	92.06	5
CA	*Manufacturer*	19,606	916	-	100	6
	Retailers	10,153	316	621	75.91	6
MX	*Manufacturer*	7,818	497	-	100	9
	Retailers	5,096	251	400	82.99	9
ALL	*Manufacturer*	79,253	3,627	-	100	17
	Retailers	92,365	1,992	5,662	87.40	16

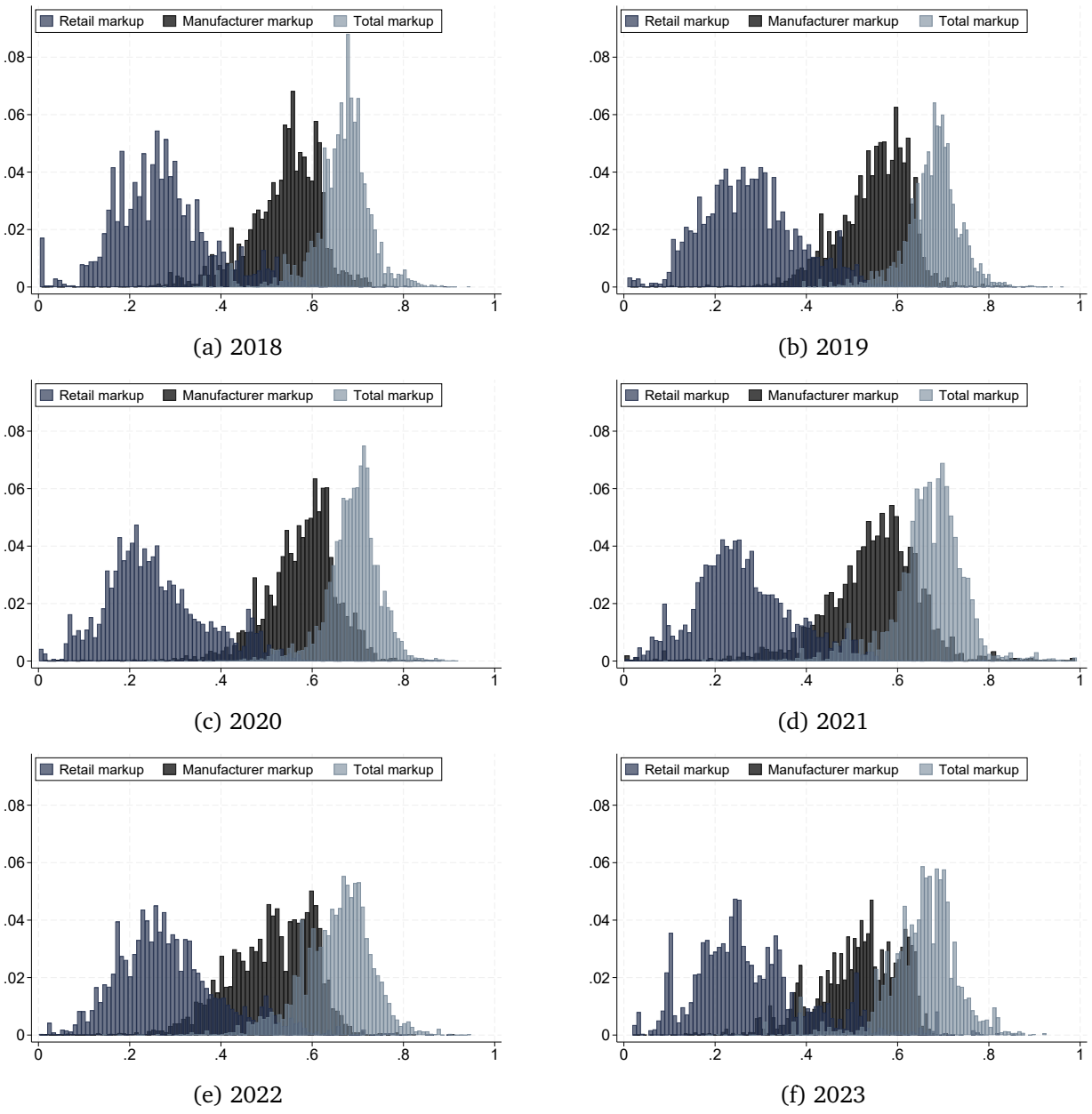
Notes: This table shows the summary statistics of the manufacturer data and of the matched retailers dataset including only observations with a matched manufacturer observation. Reported are the matched number of observations and shares of sales for all countries pooled and for each country separately. Observations reports the number of observed product-month and product-retailer-month combinations, in the manufacturer and retail datasets, respectively. The % of firm sales reports, weighting using the firm sales, the share of products for which a retail match was found.

Table B.2: Summary Statistics of Costs, Prices and Quality

	Mean	p25	p75	SD	CV_i	N
Retail price	0.214	0.115	0.295	0.11	0.08	41,739
Manufacturer price	0.133	0.068	0.183	0.07	0.09	41,739
Cost	0.068	0.038	0.093	0.04	0.13	41,739
Cost breakdown						
Expected	0.066	0.036	0.089	0.03	0.10	38,448
Unexpected	0.002	-0.001	0.005	0.01	0.10	38,448
Quality indicators						
Differentiation	68.24	65.84	71.23	3.12	-	669
Perceived Quality	86.14	85.20	87.44	1.93	-	669

Notes: This table shows the summary statistics of costs, prices and quality statistics in the matched sample from July 2018 to June 2023 (with the cost breakdown starting in January 2019). N reports the number of product-month observed prices or the number of products with quality information. All prices and costs are translated first in 2019m1 US Dollars. SD reports the standard deviation across all observations. As a measure of time-series variation, we calculate the coefficient of variation for each product across time and report the average coefficient of variation across products in CV_i. Since unexpected costs have a mean close to zero, in order to help with the interpretation, for expected and unexpected costs the coefficient of variation is computed relative to the total costs. Expected and unexpected costs statistics are based on less observations because this data starts in January 2019. Data are winsorized at the 1% level. Quality information is only available for a subset of products in the US.

Figure B.1: Markups Along the Supply Chain by Year (United States)



(a) 2018

(b) 2019

(c) 2020

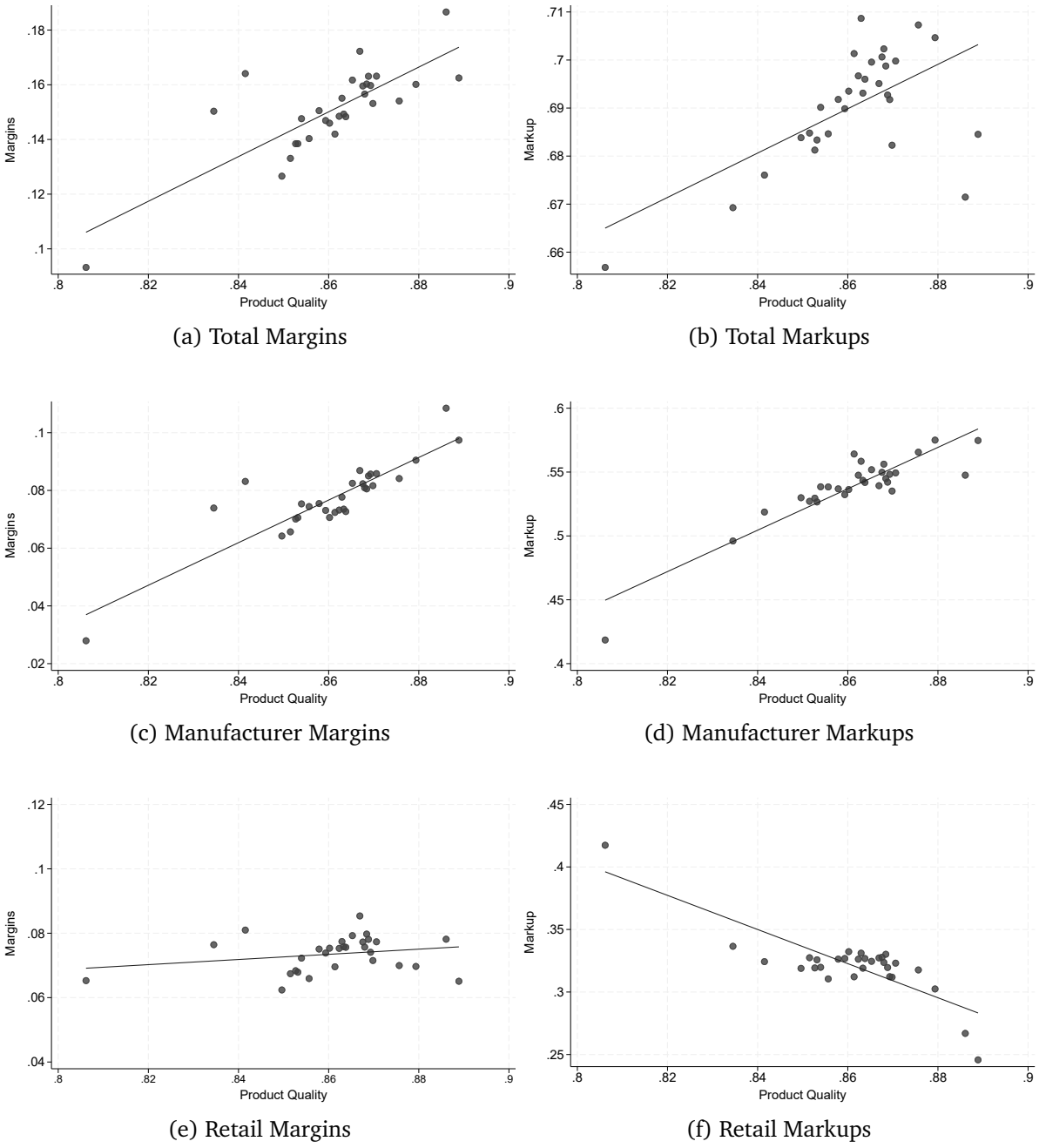
(d) 2021

(e) 2022

(f) 2023

Notes: This figure shows the sales-weighted frequency distribution of markups along the supply chain in the United States by year. Retail markups ($\frac{p^R - p^M}{p^R}$) are shown in dark blue, manufacturer markups ($\frac{p^M - c}{p^M}$) in dark grey, and total markups ($\frac{p^R - c}{p^R}$) in light blue.

Figure B.2: Quality Differentiation Along the Supply Chain (Perceived Quality)



(a) Total Margins

(b) Total Markups

(c) Manufacturer Margins

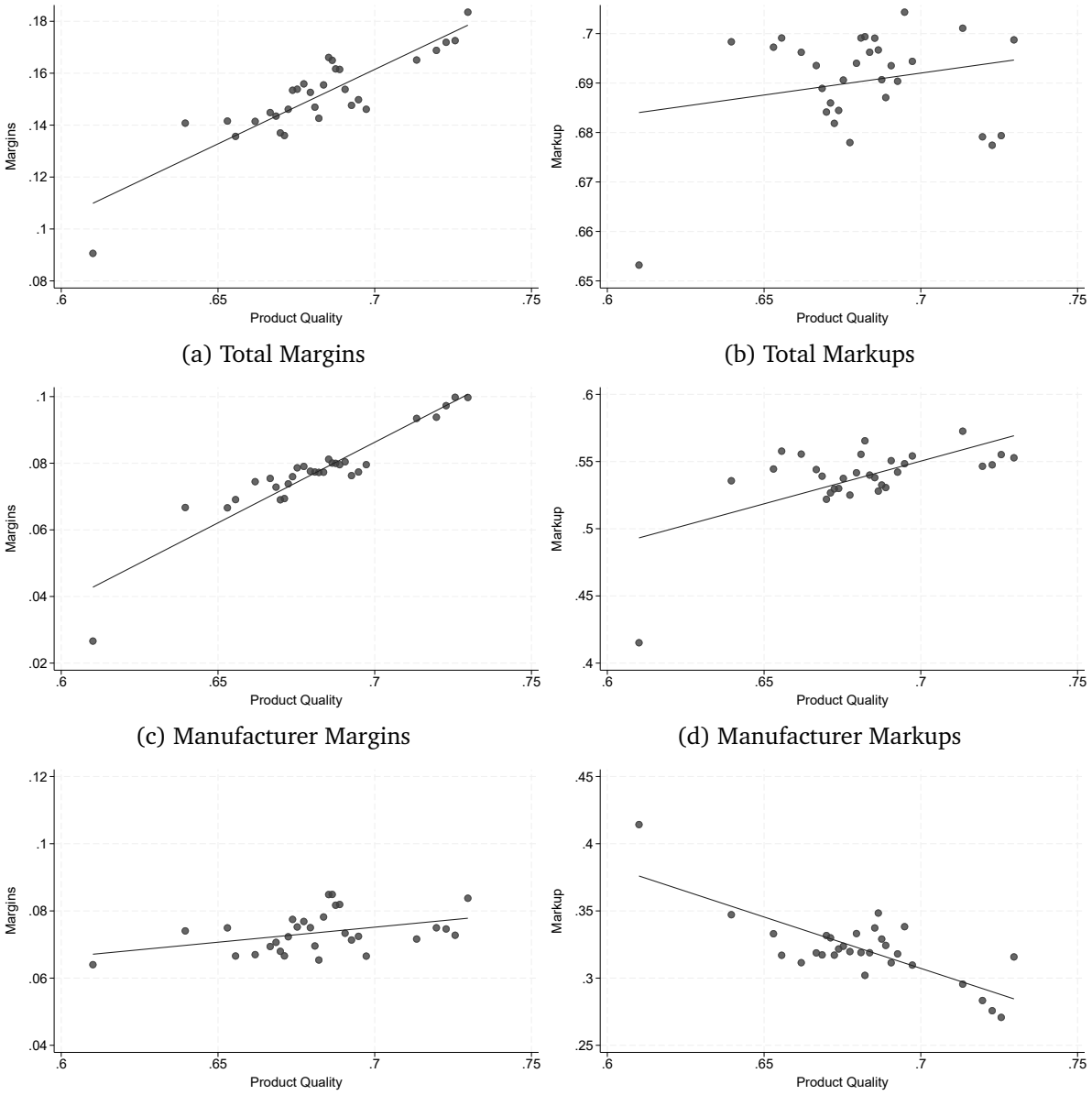
(d) Manufacturer Markups

(e) Retail Margins

(f) Retail Markups

Notes: This figure shows the relation of product (a) total margins, (b) total markups, (c) manufacturer margins, (d) manufacturer markups, (e) retail margins, and (f) retail markups to an indicator of perceived quality. Values are residualized on linear and quadratic package size, to account for quantity discount, and on a set of fixed effects including product category interacted with periods

Figure B.3: Quality Differentiation Along the Supply Chain (Product Differentiation)



(a) Total Margins

(b) Total Markups

(c) Manufacturer Margins

(d) Manufacturer Markups

(e) Retail Margins

(f) Retail Markups

Notes: This figure shows the relation of product (a) total margins, (b) total markups, (c) manufacturer margins, (d) manufacturer markups, (e) retail margins, and (f) retail markups to an indicator of product differentiation. Values are residualized on linear and quadratic product size, to account for quantity discount, and product category interacted with periods.

Table B.3: Summary Statistics For Markup and Margin Share

Variable	Mean	SD	p10	p25	p50	p75	p90
Country: United States							
Total Markup	0.67	0.07	0.58	0.64	0.68	0.71	0.75
Manufacturer Markup	0.54	0.09	0.42	0.49	0.55	0.60	0.64
Retail Markup	0.27	0.11	0.15	0.20	0.26	0.33	0.43
Product Markup	0.41	0.06	0.34	0.37	0.41	0.44	0.48
Manufacturer Margin Share	0.60	0.15	0.38	0.51	0.61	0.70	0.78
Retail Margin Share	0.40	0.15	0.22	0.30	0.39	0.49	0.62
Country: Canada							
Total Markup	0.65	0.11	0.51	0.59	0.65	0.72	0.77
Manufacturer Markup	0.46	0.14	0.29	0.37	0.47	0.54	0.61
Retail Markup	0.35	0.11	0.20	0.28	0.35	0.42	0.49
Product Markup	0.40	0.09	0.30	0.35	0.40	0.46	0.51
Manufacturer Margin Share	0.46	0.16	0.26	0.36	0.46	0.56	0.66
Retail Margin Share	0.54	0.16	0.34	0.44	0.54	0.64	0.74
Country: Mexico							
Total Markup	0.60	0.12	0.46	0.53	0.60	0.67	0.75
Manufacturer Markup	0.33	0.17	0.15	0.23	0.30	0.41	0.53
Retail Markup	0.41	0.11	0.26	0.35	0.43	0.49	0.53
Product Markup	0.37	0.10	0.26	0.30	0.36	0.42	0.49
Manufacturer Margin Share	0.32	0.15	0.15	0.22	0.30	0.40	0.51
Retail Margin Share	0.68	0.15	0.49	0.60	0.70	0.78	0.85
Country: United Kingdom							
Total Markup	0.64	0.07	0.55	0.60	0.64	0.69	0.73
Manufacturer Markup	0.38	0.12	0.21	0.30	0.39	0.46	0.51
Retail Markup	0.42	0.10	0.30	0.36	0.42	0.48	0.53
Product Markup	0.40	0.06	0.32	0.36	0.40	0.43	0.47
Manufacturer Margin Share	0.35	0.14	0.18	0.26	0.35	0.43	0.51
Retail Margin Share	0.65	0.14	0.49	0.57	0.65	0.74	0.82

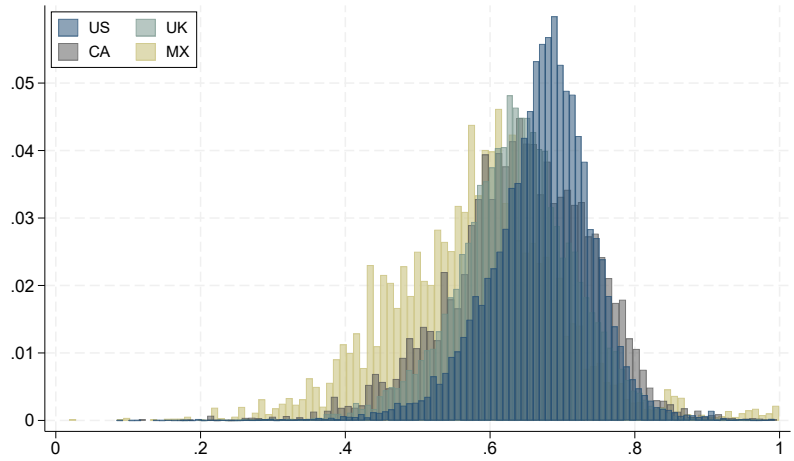
Notes: This table shows summary statistics of the sales-weighted markup and margin share distributions in each country. Markups are computed as the Lerner index using retail prices and production costs for the total indicator ($\frac{p^R-c}{p^R}$), wholesale prices and production costs for the manufacturer indicator ($\frac{p^M-c}{p^M}$), and retail prices and wholesale prices for the retail indicators ($\frac{p^R-p^M}{p^R}$). Product markup is computed as the average between the manufacturer markup and the retail markup. Margin shares indicate the percentage of the total $ margin available per product that the manufacturer ($\frac{p^M-c}{p^R-c}$) and the retailer ($\frac{p^R-p^M}{p^R-c}$) retain.

Table B.4: Margins and Alternative Quality Measure (Product Differentiation)

	Margins			Markup		
	Total	Manu.	Retail	Total	Manuf.	Retail
Differentiation	0.57***	0.48***	0.09***	0.08***	0.62***	-0.74***
	(0.01)	(0.01)	(0.01)	(0.02)	(0.03)	(0.03)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.79	0.80	0.55	0.37	0.31	0.27
N	16,114	16,114	16,114	16,114	16,114	16,114

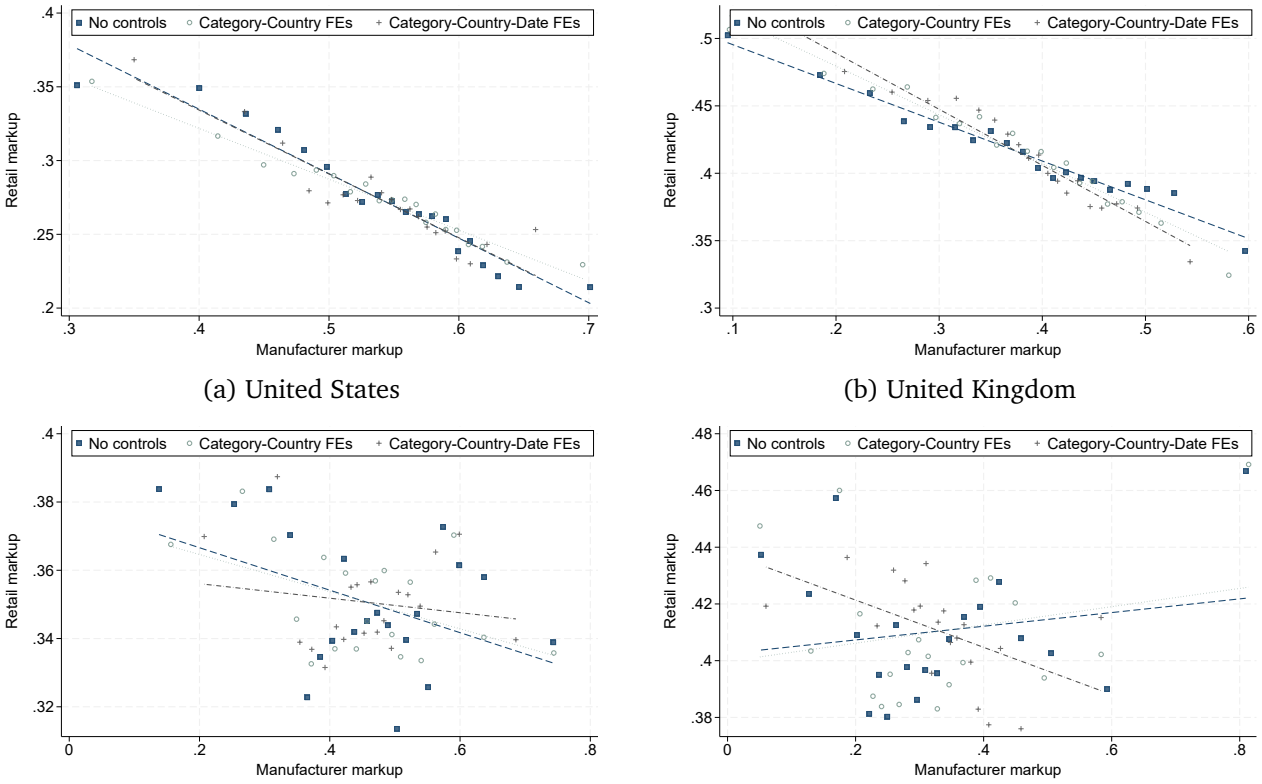
Notes: This table shows the linear relation between margins or markups and product quality estimated from the following linear model: $y_{it} = a + \alpha q_i + \beta X_{it} + \phi_{it} + \varepsilon_{it}$, with y_{it} being the variable of interest, margins or markups, for product i at time t, q_i product quality, X_{it} controls including linear and quadratic package size to account for quantity discounts, ϕ_{it} fixed effects including product category interacted with time, and ε_{it} a mean zero error. Robust standard errors are reported in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure B.4: Total Markups Without Retail Price Adjustment



Notes: This figure shows the sales-weighted frequency distribution of total markups ($\frac{p^R - c}{p^R}$) along the supply chain for each country.

Figure B.5: Manufacturer and Retailer Markup Relation



(a) United States

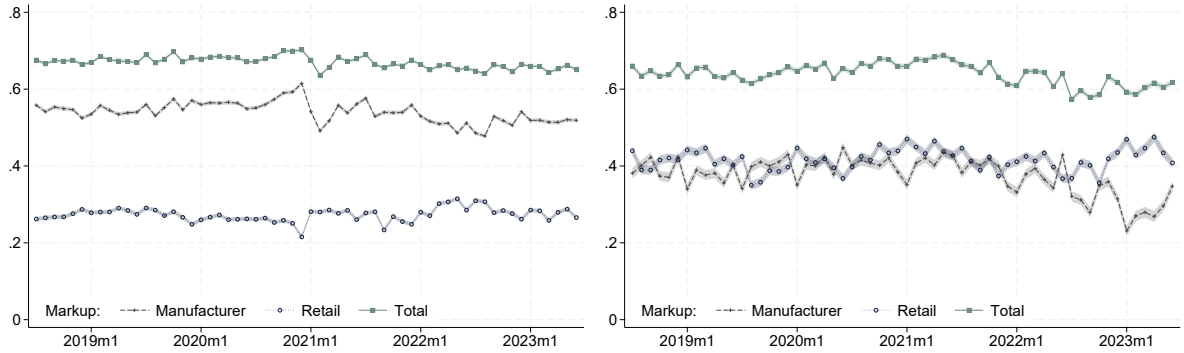
(b) United Kingdom

(c) Canada

(d) Mexico

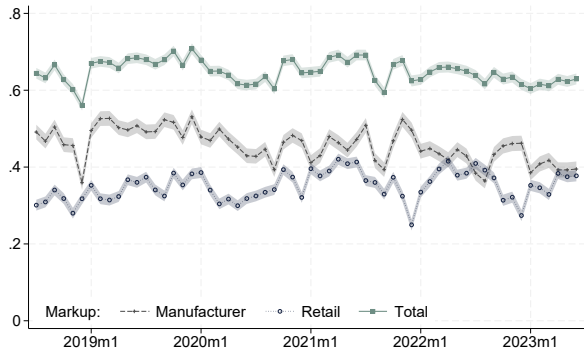
Notes: This figure shows the correlation of markups along the supply chain in every country. Bins include sales-weighted values residualized on product and category times period fixed effects.

Figure B.6: Markup Dynamics

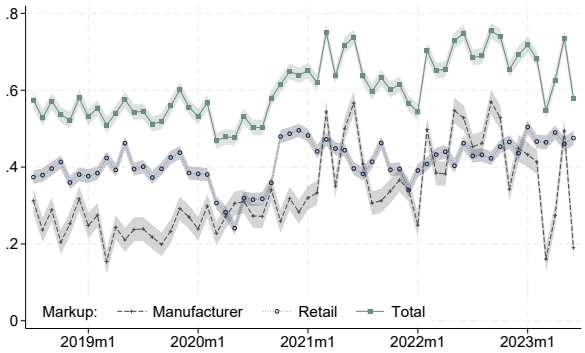


(a) United States

(b) United Kingdom



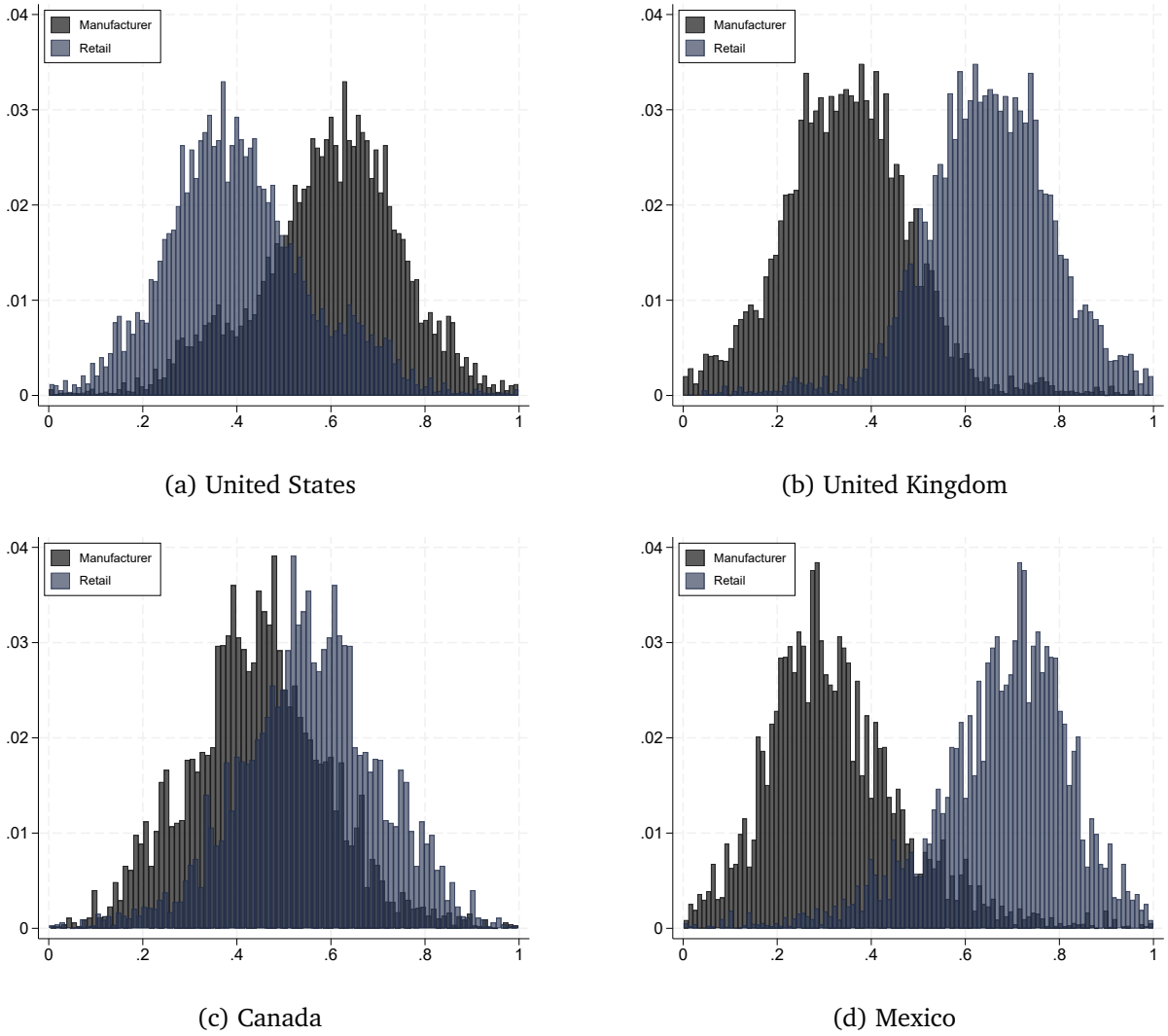
(c) Canada



(d) Mexico

Notes: This figure shows markup averages and 95% (robust) confidence intervals in the United States, United Kingdom, Canada, and Mexico, resulting from a regression on period and product fixed effects using sales weights. The total markup is defined as the Lerner index of retail prices and production costs, $\frac{p^R - c}{p^R}$, the manufacturer markup as the Lerner index of wholesale prices and production costs, $\frac{p^M - c}{p^M}$, while the retail markup as the Lerner index of retail prices and wholesale costs, $\frac{p^R - p^M}{p^R}$.

Figure B.7: Manufacturer and Retailer Margin Share



(a) United States

(b) United Kingdom

(c) Canada

(d) Mexico

Notes: This figure shows the sales-weighted frequency distribution of margin shares along the supply chain for all years separately by country. Manufacturer margin share defined as the ratio of the manufacturer margin to the total margin $\frac{p^M - c}{p^R - c}$. Retailer margin share defined as the ratio of the retail margin to the total margin $\frac{p^R - p^M}{p^R - c}$.

Table B.5: Manufacturer Pass-through

	Idiosyncratic					Aggregate			
	(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)
$\hat{c}$	1.043***	0.979***	1.042***	1.051***	C_t	0.465***	0.305***	0.297***	0.293***
	(0.055)	(0.066)	(0.072)	(0.090)		(0.022)	(0.022)	(0.023)	(0.028)
$\hat{c}_{t-1}$		0.001	-0.014	0.026	C_{t-1}		0.321***	0.303***	0.315***
		(0.037)	(0.044)	(0.047)			(0.024)	(0.026)	(0.033)
$\hat{c}_{t-2}$		-0.077**	-0.071*	0.019	C_{t-2}		0.292***	0.318***	0.275***
		(0.030)	(0.034)	(0.040)			(0.033)	(0.032)	(0.041)
$\hat{c}_{t-3}$		-0.039	-0.082*	-0.046	C_{t-3}		0.176***	0.143***	0.115*
		(0.027)	(0.032)	(0.037)			(0.038)	(0.043)	(0.053)
$\hat{c}_{t-4}$			-0.003	0.052	C_{t-4}			0.165***	0.113*
			(0.036)	(0.037)				(0.045)	(0.058)
$\hat{c}_{t-5}$			-0.036	-0.039	C_{t-5}			0.007	0.007
			(0.025)	(0.032)				(0.041)	(0.049)
$\hat{c}_{t-6}$			-0.044	-0.055	C_{t-6}			-0.039	-0.005
			(0.024)	(0.031)				(0.038)	(0.049)
$\hat{c}_{t-7}$				0.018	C_{t-7}				-0.083*
				(0.032)					(0.034)
$\hat{c}_{t-8}$				-0.047	C_{t-8}				-0.026
				(0.043)					(0.038)
$\hat{c}_{t-9}$				-0.039	C_{t-9}				-0.006
				(0.048)					(0.034)
$\hat{c}_{t-10}$				-0.051	C_{t-10}				0.049
				(0.054)					(0.029)
$\hat{c}_{t-11}$				0.066	C_{t-11}				0.192**
				(0.061)					(0.070)
$\hat{c}_{t-12}$				-0.092	C_{t-12}				0.016
				(0.056)					(0.038)
Long-term PT	1.043	0.865	0.792	0.863		0.465	1.094	1.194	1.256
s.e.	0.055	0.067	0.077	0.109		0.022	0.039	0.049	0.084
Product FE	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Date FE	No	No	No	No		No	No	No	No
N	40,246	31,518	25,657	17,257		40,246	31,518	25,657	17,257

Notes: This table show pass-through of costs to wholesale prices estimated using Equation (7). Coefficients for idiosyncratic and aggregate shocks are estimated jointly. Robust standard errors are shown in parentheses. Long-term pass-through estimates are constructed using the Delta method.

Table B.6: Manufacturer Pass-through with Fixed Effects

	Idiosyncratic					Aggregate			
	(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)
$\hat{c}$	1.051***	0.990***	1.055***	1.062***	C_t	0.253***	0.182***	0.188***	0.203***
	(0.054)	(0.065)	(0.071)	(0.088)		(0.021)	(0.020)	(0.022)	(0.027)
$\hat{c}_{t-1}$		0.002	-0.018	0.017	C_{t-1}		0.215***	0.219***	0.249***
		(0.037)	(0.043)	(0.047)			(0.023)	(0.025)	(0.032)
$\hat{c}_{t-2}$		-0.076**	-0.072*	0.009	C_{t-2}		0.222***	0.247***	0.222***
		(0.030)	(0.034)	(0.039)			(0.035)	(0.031)	(0.041)
$\hat{c}_{t-3}$		-0.027	-0.066*	-0.028	C_{t-3}		0.072	0.059	0.052
		(0.027)	(0.032)	(0.036)			(0.040)	(0.043)	(0.053)
$\hat{c}_{t-4}$			-0.020	0.038	C_{t-4}			0.098*	0.057
			(0.036)	(0.037)				(0.045)	(0.058)
$\hat{c}_{t-5}$			-0.041	-0.036	C_{t-5}			-0.040	-0.049
			(0.024)	(0.031)				(0.042)	(0.050)
$\hat{c}_{t-6}$			-0.047*	-0.055	C_{t-6}			-0.080*	-0.059
			(0.024)	(0.031)				(0.039)	(0.051)
$\hat{c}_{t-7}$				0.006	C_{t-7}				-0.145***
				(0.031)					(0.037)
$\hat{c}_{t-8}$				-0.056	C_{t-8}				-0.058
				(0.042)					(0.038)
$\hat{c}_{t-9}$				-0.040	C_{t-9}				-0.016
				(0.048)					(0.034)
$\hat{c}_{t-10}$				-0.048	C_{t-10}				0.017
				(0.053)					(0.029)
$\hat{c}_{t-11}$				0.065	C_{t-11}				0.187**
				(0.061)					(0.072)
$\hat{c}_{t-12}$				-0.077	C_{t-12}				-0.044
				(0.055)					(0.038)
Long-term PT	1.051	0.888	0.791	0.858		0.253	0.692	0.691	0.616
s.e.	0.054	0.066	0.076	0.104		0.021	0.053	0.066	0.127
Product FE	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
N	40,246	31,518	25,657	17,257		40,246	31,518	25,657	17,257

Notes: This table show pass-through of costs to wholesale prices estimated using Equation (7). Coefficients for idiosyncratic and aggregate shocks are estimated jointly. The specification includes date fixed effects and robust standard errors are shown in parentheses. Long-term pass-through estimates are constructed using the Delta method.

Table B.7: Retailer Pass-through

	Idiosyncratic					Aggregate			
	(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)
$\hat{c}$	0.317***	0.288***	0.275***	0.316***	C_t	0.916***	0.465***	0.473***	0.571***
	(0.034)	(0.046)	(0.048)	(0.065)		(0.041)	(0.045)	(0.050)	(0.070)
$\hat{c}_{t-1}$		0.134***	0.095**	0.119**	C_{t-1}		0.346***	0.329***	0.426***
		(0.031)	(0.032)	(0.036)			(0.040)	(0.043)	(0.060)
$\hat{c}_{t-2}$		0.100**	0.055	0.064	C_{t-2}		0.298***	0.195***	0.239***
		(0.032)	(0.034)	(0.037)			(0.040)	(0.044)	(0.058)
$\hat{c}_{t-3}$		0.098***	0.052	0.047	C_{t-3}		0.191***	-0.019	0.001
		(0.028)	(0.029)	(0.031)			(0.042)	(0.046)	(0.058)
$\hat{c}_{t-4}$			0.081*	0.033	C_{t-4}			0.113*	0.072
			(0.032)	(0.038)				(0.048)	(0.061)
$\hat{c}_{t-5}$			0.027	0.010	C_{t-5}			0.237***	0.192**
			(0.026)	(0.031)				(0.047)	(0.062)
$\hat{c}_{t-6}$			-0.022	0.007	C_{t-6}			0.207***	0.156**
			(0.024)	(0.033)				(0.041)	(0.058)
$\hat{c}_{t-7}$				0.014	C_{t-7}				0.105
				(0.031)					(0.055)
$\hat{c}_{t-8}$				0.017	C_{t-8}				0.138*
				(0.034)					(0.061)
$\hat{c}_{t-9}$				-0.005	C_{t-9}				0.008
				(0.030)					(0.060)
$\hat{c}_{t-10}$				0.005	C_{t-10}				0.095
				(0.030)					(0.061)
$\hat{c}_{t-11}$				0.006	C_{t-11}				-0.008
				(0.032)					(0.056)
$\hat{c}_{t-12}$				-0.023	C_{t-12}				-0.084
				(0.028)					(0.061)
Long-term PT	0.317	0.620	0.563	0.611		0.916	1.300	1.535	1.914
s.e.	0.034	0.057	0.063	0.113		0.041	0.052	0.061	0.107
Product FE	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Retailer FE	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Date FE	No	No	No	No		No	No	No	No
N	23,815	18,707	15,039	9,906		23,815	18,707	15,039	9,906

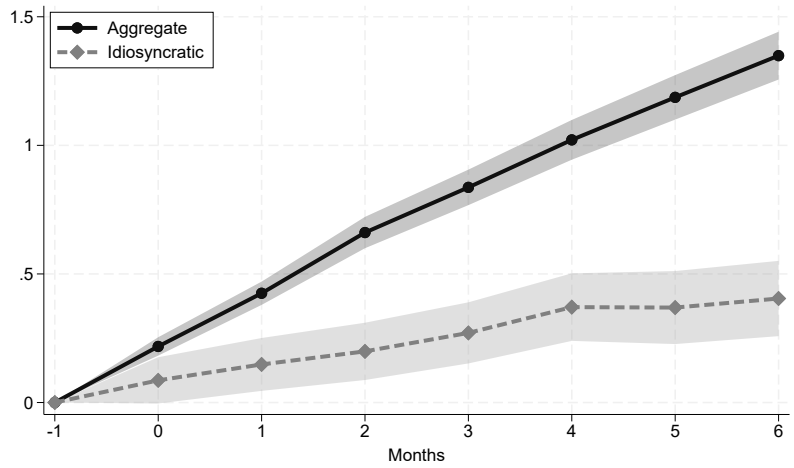
Notes: This table show pass-through of wholesale prices to retail prices estimated using Equation (8). Coefficients for idiosyncratic and aggregate shocks are estimated jointly. Robust standard errors are shown in parentheses. Long-term pass-through estimates are constructed using the Delta method.

Table B.8: Retailer Pass-through with Fixed Effects

	Idiosyncratic					Aggregate			
	(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)
$\hat{c}$	0.290***	0.251***	0.225***	0.267***	C_t	0.646***	0.366***	0.342***	0.481***
	(0.035)	(0.047)	(0.048)	(0.064)		(0.054)	(0.062)	(0.071)	(0.100)
$\hat{c}_{t-1}$		0.111***	0.053	0.079*	C_{t-1}		0.268***	0.177**	0.321***
		(0.032)	(0.032)	(0.035)			(0.057)	(0.062)	(0.084)
$\hat{c}_{t-2}$		0.081*	0.023	0.028	C_{t-2}		0.243***	0.158*	0.185*
		(0.033)	(0.035)	(0.037)			(0.056)	(0.062)	(0.080)
$\hat{c}_{t-3}$		0.096***	0.039	0.028	C_{t-3}		0.151**	0.026	-0.025
		(0.028)	(0.030)	(0.030)			(0.057)	(0.065)	(0.083)
$\hat{c}_{t-4}$			0.080*	0.021	C_{t-4}			0.089	-0.021
			(0.032)	(0.037)				(0.067)	(0.089)
$\hat{c}_{t-5}$			0.021	-0.009	C_{t-5}			0.164**	0.082
			(0.025)	(0.028)				(0.063)	(0.085)
$\hat{c}_{t-6}$			-0.023	-0.018	C_{t-6}			0.085	0.084
			(0.023)	(0.031)				(0.054)	(0.082)
$\hat{c}_{t-7}$				-0.002	C_{t-7}				0.064
				(0.029)					(0.074)
$\hat{c}_{t-8}$				0.013	C_{t-8}				0.139
				(0.032)					(0.081)
$\hat{c}_{t-9}$				-0.002	C_{t-9}				-0.050
				(0.029)					(0.078)
$\hat{c}_{t-10}$				0.015	C_{t-10}				0.024
				(0.029)					(0.076)
$\hat{c}_{t-11}$				0.014	C_{t-11}				-0.065
				(0.030)					(0.069)
$\hat{c}_{t-12}$				-0.006	C_{t-12}				-0.085
				(0.027)					(0.070)
Long-term PT	0.290	0.539	0.418	0.428		0.646	1.028	1.041	1.133
s.e.	0.035	0.064	0.066	0.115		0.054	0.073	0.078	0.124
Product FE	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
N	23,815	18,707	15,039	9,906		23,815	18,707	15,039	9,906

Notes: This table show pass-through of wholesale prices to retail prices estimated using Equation (8). Coefficients for idiosyncratic and aggregate shocks are estimated jointly. The specification includes date fixed effects and robust standard errors are shown in parentheses. Long-term pass-through estimates are constructed using the Delta method.

Figure B.8: Pass-through from Production Cost to Retail Price Using Direct Estimation



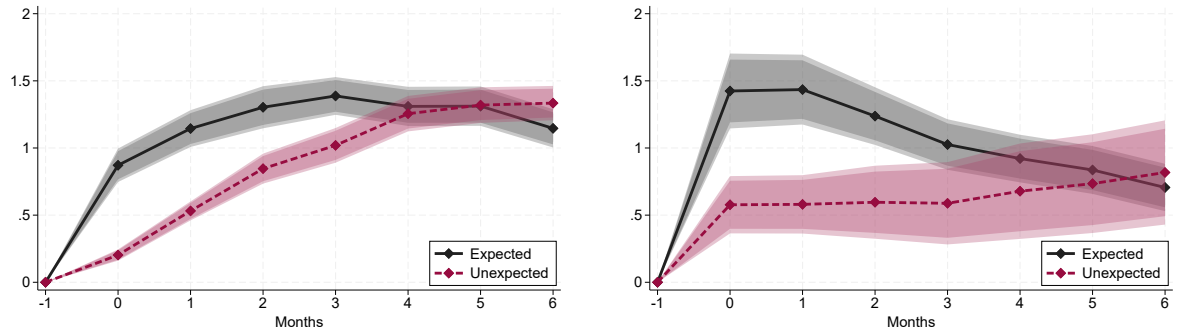
Notes: This figure shows the cumulative response estimated by regressing retail prices directly on production costs using the following specification: $p^R_{ist} = b + \sum_{z=0}^{T} \alpha^R_z \hat{c}^M_{ist-z} + \sum_{z=0}^{T} \beta^C_z C^M_{st-z} + \gamma_i + \nu_{ist}$. Lines are the point estimates, and shaded areas are the 95 and 90 percent confidence bands computed using the Delta method.

Table B.9: Cost Pass-through to Retail Price Using Direct Estimation

	Idiosyncratic					Aggregate			
	(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)
$\hat{c}$	0.235***	0.110*	0.086	0.117	C_t	0.339***	0.244***	0.218***	0.204***
	(0.051)	(0.053)	(0.055)	(0.069)		(0.023)	(0.022)	(0.022)	(0.028)
$\hat{c}_{t-1}$		0.098*	0.062	0.095	C_{t-1}		0.263***	0.207***	0.220***
		(0.043)	(0.041)	(0.051)			(0.021)	(0.020)	(0.024)
$\hat{c}_{t-2}$		0.079	0.051	0.073	C_{t-2}		0.244***	0.236***	0.232***
		(0.046)	(0.043)	(0.054)			(0.022)	(0.022)	(0.029)
$\hat{c}_{t-3}$		0.111**	0.072	0.063	C_{t-3}		0.224***	0.176***	0.185***
		(0.041)	(0.042)	(0.049)			(0.023)	(0.023)	(0.028)
$\hat{c}_{t-4}$			0.100*	0.067	C_{t-4}			0.185***	0.169***
			(0.045)	(0.054)				(0.024)	(0.029)
$\hat{c}_{t-5}$			-0.002	0.034	C_{t-5}			0.165***	0.178***
			(0.044)	(0.056)				(0.027)	(0.032)
$\hat{c}_{t-6}$			0.035	0.064	C_{t-6}			0.162***	0.165***
			(0.038)	(0.057)				(0.026)	(0.032)
$\hat{c}_{t-7}$				0.089	C_{t-7}				0.147***
				(0.067)					(0.036)
$\hat{c}_{t-8}$				0.080	C_{t-8}				0.115**
				(0.066)					(0.044)
$\hat{c}_{t-9}$				0.072	C_{t-9}				-0.001
				(0.074)					(0.044)
$\hat{c}_{t-10}$				0.149	C_{t-10}				-0.005
				(0.080)					(0.052)
$\hat{c}_{t-11}$				-0.084	C_{t-11}				-0.018
				(0.067)					(0.043)
$\hat{c}_{t-12}$				-0.041	C_{t-12}				0.003
				(0.063)					(0.044)
Long-term PT	0.235	0.399	0.404	0.778		0.339	0.976	1.349	1.592
s.e.	0.051	0.097	0.089	0.151		0.023	0.042	0.056	0.099
Product FE	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Date FE	No	No	No	No		No	No	No	No
N	23,815	18,707	15,039	9,906		23,815	18,707	15,039	9,906

Notes: These tables show pass-through of costs to retail prices estimated using Equation (8) on the retail dataset – only observations with matched retail data kept. Coefficients for idiosyncratic and aggregate shocks are estimated jointly. Robust standard errors are shown in parentheses. Long-term pass-through estimates are constructed using the Delta method.

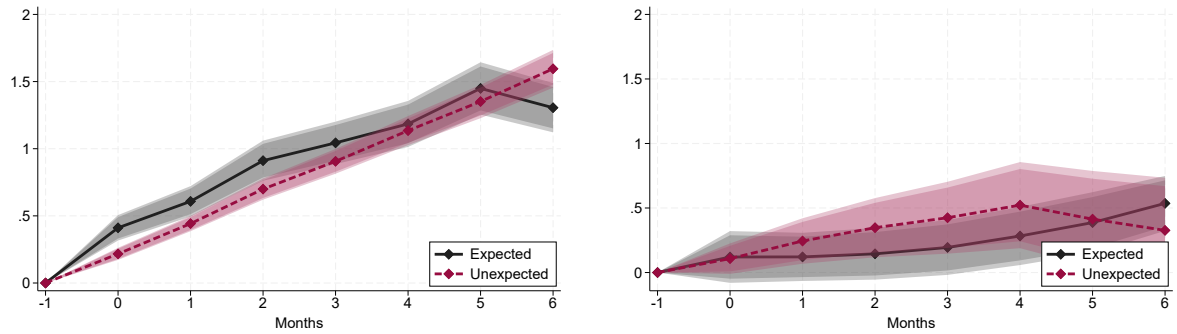
Figure B.9: Manufacturer's Cost Transmission by Cost Type



(a) Aggregate Cost (b) Idiosyncratic Cost

Notes: This figure show the cumulative pass-through of aggregate costs (a) and of idiosyncratic costs (b) to wholesale prices, differentiating by expected and unexpected costs, and estimated using Equation (9). Solid lines are the point estimates, and shaded areas are the 95 and 90 percent confidence bands computed using the Delta method.

Figure B.10: Retailers' Cost Transmission by Cost Type

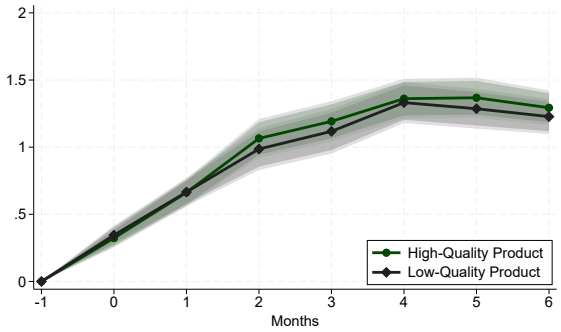


(a) Aggregate Cost (b) Idiosyncratic Cost

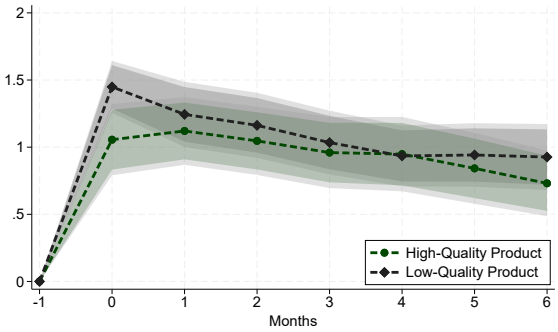
Notes: This figure show the cumulative pass-through of aggregate costs (a) and of idiosyncratic costs (b) to retail prices, differentiating by expected and unexpected costs, and estimated using a direct estimation of costs to retail prices. Solid lines are the point estimates, and shaded areas are the 95 and 90 percent confidence bands computed using the Delta method.

Figure B.11: Cost Transmission Along the Supply Chain by Product Quality

Manufacturer

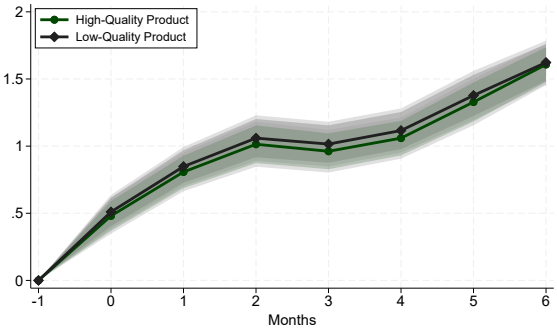


(a) Aggregate Cost

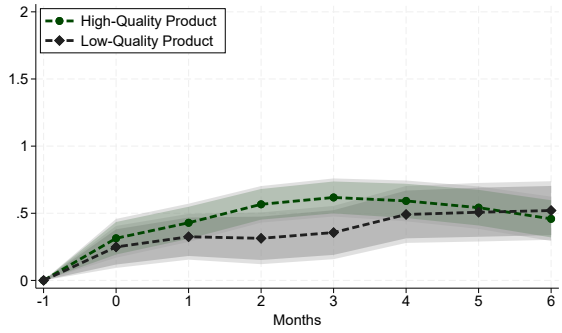


(b) Idiosyncratic Cost

Retailers



(c) Aggregate Cost



(d) Idiosyncratic Cost

Notes: This figure show the cumulative pass-through of costs to wholesale prices (a-c) and of wholesale prices to retail prices (b-d), estimated using Equation (10) and Equation (11). Blue represents high-quality products, and orange represents low-quality ones. Solid lines are the point estimates, and shaded areas are the 95 and 90 percent confidence bands computed using the Delta method.

Table B.10: Imputed Data

	Manufacturer Data				Retail Data			
	Observations		Regression Obs. (6M)		Observations		Regression Obs. (6M)	
	No fill	Fill	No fill	Fill	No fill	Fill	No fill	Fill
UK	11,546	12,423	6,326	8,545	7,597	7,972	4,300	5,174
CA	19,606	22,058	9,013	16,029	6,411	6,818	3,044	4,308
MX	7,818	9,207	3,115	5,720	3,911	4,314	1,747	2,519
ALL	79,253	86,667	44,111	63,804	41,739	43,690	24,130	29,073

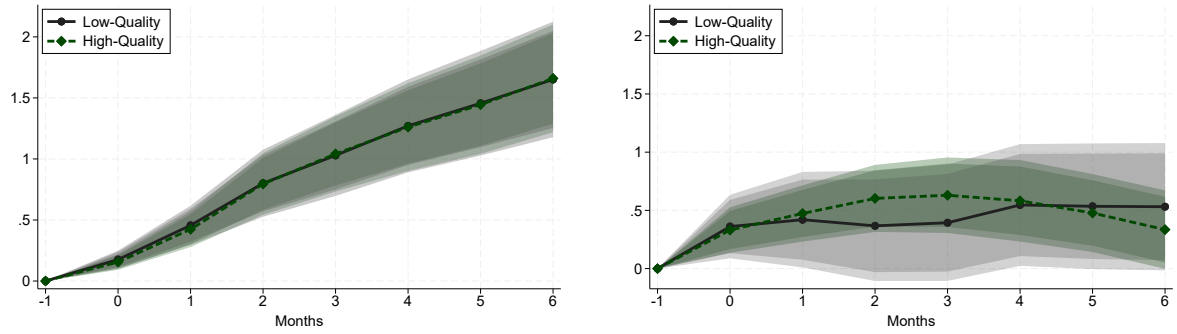
Notes: This table shows the number of observations for all products ("Observations") and only for products continuously observed during a 6-month period ("6M-Observations"). The latter represents the sample used in the cost transmission analysis. For each set of products, we show the observations in the data, and the total after imputing missing values bringing forward costs and prices for gaps in a product's time series up to 90 days.

Table B.11: Bargaining Weight Predictors with Dynamics

	(1)	(2)	(3)	(4)
ProductionCost$_t$	-0.488***			
	(0.003)			
TotalMargin	0.563***	0.599***	0.617***	0.626***
	(0.002)	(0.003)	(0.003)	(0.004)
SalesperCapita	0.050***	0.049***	0.047***	0.051***
	(0.001)	(0.001)	(0.001)	(0.001)
GDPperCapita	0.424***	0.360***	0.292***	0.233***
	(0.007)	(0.007)	(0.007)	(0.008)
CPI	-0.213***	-0.402***	-0.427***	-0.641***
	(0.024)	(0.026)	(0.027)	(0.034)
ExpectedCost$_t$		-0.539***	-0.150***	-0.007
		(0.003)	(0.010)	(0.015)
ExpectedCost$_{t-1}$			-0.168***	-0.079***
			(0.012)	(0.017)
ExpectedCost$_{t-2}$			-0.254***	-0.140***
			(0.010)	(0.016)
ExpectedCost$_{t-3}$				-0.105***
				(0.016)
ExpectedCost$_{t-4}$				-0.054***
				(0.014)
ExpectedCost$_{t-5}$				-0.062***
				(0.014)
ExpectedCost$_{t-6}$				-0.146***
				(0.013)
UnexpectedCost$_t$		-0.118***	0.017*	0.072***
		(0.009)	(0.010)	(0.011)
UnexpectedCost$_{t-1}$			-0.023**	0.006
			(0.011)	(0.012)
UnexpectedCost$_{t-2}$			-0.070***	-0.019
			(0.011)	(0.012)
UnexpectedCost$_{t-3}$				-0.008
				(0.012)
UnexpectedCost$_{t-4}$				-0.008
				(0.013)
UnexpectedCost$_{t-5}$				-0.004
				(0.013)
UnexpectedCost$_{t-6}$				-0.036***
				(0.013)
Observations	41739	38396	31304	21622
R^2	0.661	0.677	0.684	0.681

Notes: This table shows the outcome of regressing the (log) manufacturer bargaining weight on (log) total margins, (log) product sales, (log) GDP per capital, (log) CPI, present and lagged (log) production costs. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure B.12: Pass-through from Production Cost to Retail Price by Product Quality

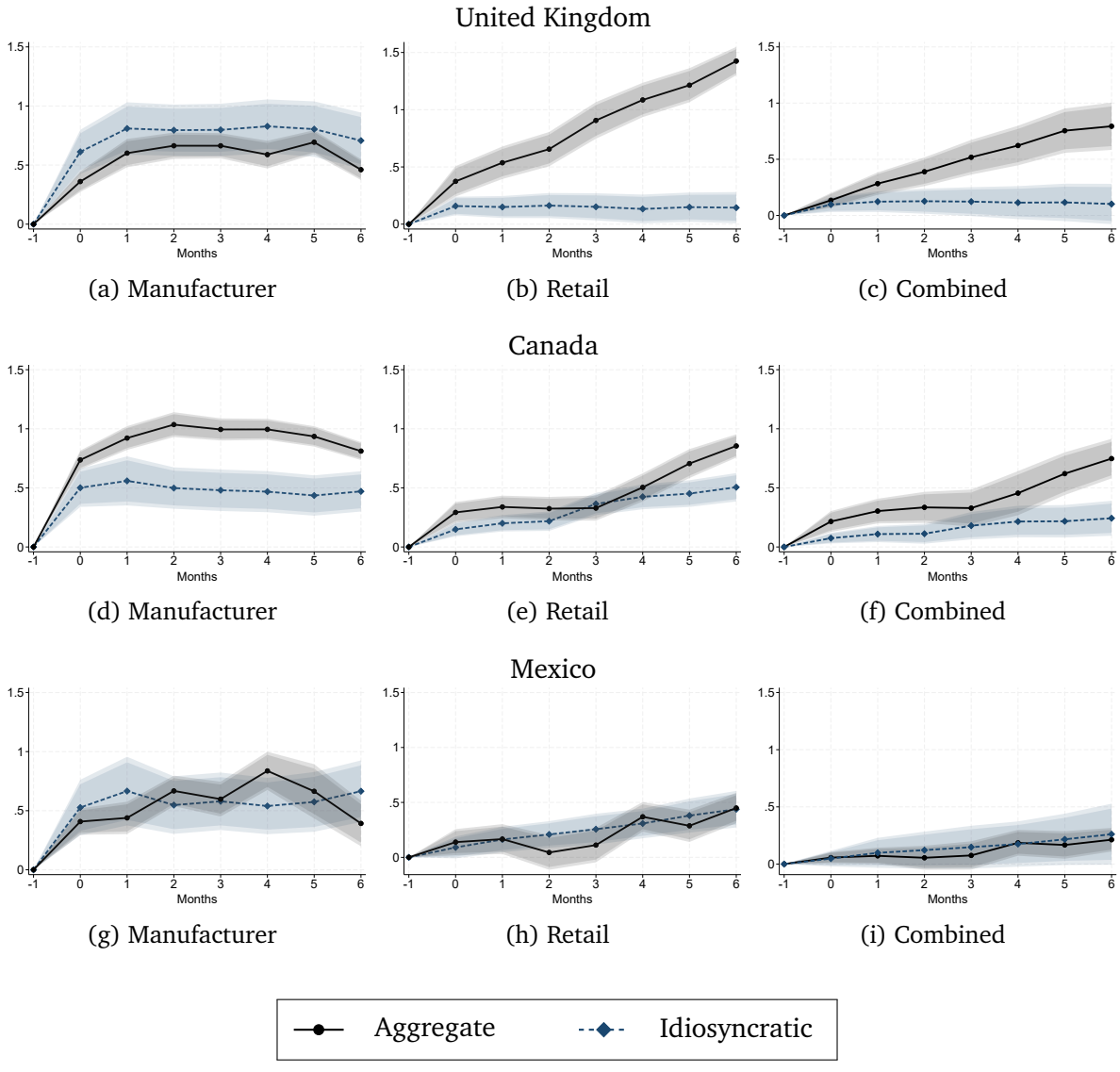


(a) Aggregate Cost

(b) Idiosyncratic Cost

Notes: These figure show the cumulative pass-through of production costs to retail prices by product quality. The cumulative responses are calculated as $\theta^{\text{AGG}}_{q,t} = \sum_{i=0}^{t} \tilde{\beta}^{R}_{q,i} (\sum_{j=0}^{t-i} \tilde{\beta}^{M}_{q,j})$ and $\theta^{\text{IDIO}}_{q,t} = \sum_{i=0}^{t} \tilde{\alpha}^{R}_{q,i} (\sum_{j=0}^{t-i} \tilde{\alpha}^{M}_{q,j})$ with $\theta^{\text{AGG}}_{q,t}$ and $\theta^{\text{IDIO}}_{q,t}$ being the cumulative adjustment of the retail price at time t to aggregate or idiosyncratic costs and q = 1 for high-quality products, else 0. The coefficients are recovered from Equation (10) and Equation (11) with $\tilde{\alpha}^{X}_{q,t} = \alpha^{X}_{t} + \text{I}_{q,t} \times \left(\alpha^{X}_{q,t}\right)$ and $\tilde{\beta}^{X}_{q,t} = \beta^{X}_{t} + \text{I}_{q,i} \times \left(\beta^{X}_{q,t}\right)$ with $\text{I}_{q,i} = 1$ if product i has above average quality, else 0, and $X = \{M, R\}$. Standard errors are constructed by bootstrapping 100 times with replacement.

Figure B.13: Cost Pass-through Along the Supply Chain



(a) Manufacturer (b) Retail (c) Combined

(d) Manufacturer (e) Retail (f) Combined

(g) Manufacturer (h) Retail (i) Combined

Notes: This figure show the cumulative pass-through of costs to wholesale prices on the left, of wholesale prices to retail prices in the center, and of production costs to retail prices on the right. Coefficients are estimated using Equation (7) and Equation (8), jointly for all countries, using country dummies. The top panel includes results for the United Kingdom, the second for Canada, and the third for Mexico. Solid lines are the point estimates, and shaded areas are the 95 and 90 percent confidence bands computed using the Delta method.