Online Appendix
"The Price Impact of Canadian Retaliatory Tariffs"

Alberto Cavallo   Olena Kostyshyna   Oleksiy Kryvtsov   Matías Vieyra

June 28, 2026

Appendix Table of Contents

A Additional Tables and Figures **2**

B Canadian import tariffs: timeline and sources **7**

C AI methods for classifying affected products **10**
C.1 AI-assisted Country-of-Origin Identification at the Individual Product Level 10
C.2 AI-based HS-8 Classifications at the Individual Product Level 12

D The perceptions about the duration of the tariffs in the media **15**

E Pre-trends in the LP-DiD specification **16**

F Non-random assignment of tariffs **17**

G Impact on the values and quantities of the U.S. imports **21**

H Pass-through of temporary cost changes: a simple model **23**

I Decomposition of price effects of Canadian tariffs **24**

J U.S.-import exposure **27**

K Inventories and tariff effects **29**
K.1 Data and constructed variables 29
K.2 Cross-category evidence: pass-through and inventory cycles 30
K.3 Within-Food evidence: product-level shelf life from USDA FoodKeeper . . 33

A Additional Tables and Figures

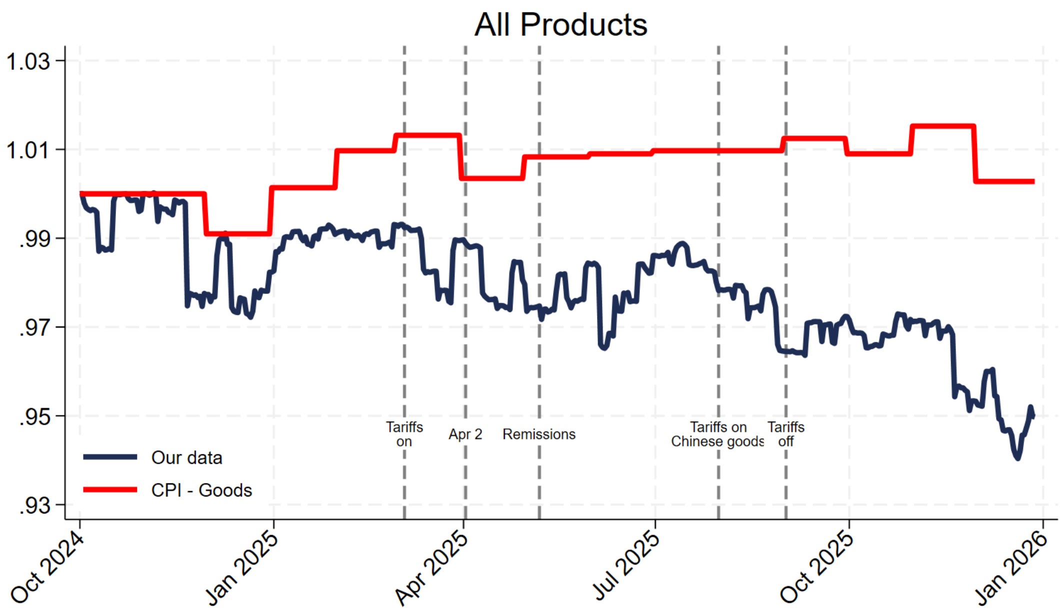
Table A1 provides inflation rates across different groups and categories of products. Overall, tariffed products reported an inflation rate of 1.8% over the period between December 1, 2024 and December 1, 2025, driven by the household goods (4.5%) and other goods, such as electronics and recreation equipment (3.0%). The prices of third-country substitutes and imported non-substitutes have declined by 1.7% and 3.3%, respectively, mostly because of the decline in the prices of other goods such as clothing and footwear.

Table A1. Inflation rates and the number of observations

	All goods	Food & bev.	Household	Other
Inflation rates by product groups, Dec 1, 2024–Dec 1, 2025				
Tariffed	1.8	0.8	4.5	3.0
Domestic non-subs	1.3	1.2	2.8	1.4
Domestic subs	2.4	2.5	3.3	2.0
Third-country subs	-1.7	1.0	1.4	-3.3
Imported non-subs	-3.3	2.0	2.7	-6.3
Number of observations				
Tariffed	1,193,291	370,570	362,707	460,014
Domestic non-subs	6,540,705	4,384,535	884,159	1,272,011
Domestic subs	1,003,184	517,561	214,185	271,438
Third-country subs	5,722,704	309,146	2,500,406	2,913,152
Imported non-subs	27,220,823	3,293,002	10,381,004	13,546,817
Total	41,680,707	8,874,814	14,342,461	18,463,432

Note: The number of observations is for the period between October 1, 2024 to December 28, 2025. "Other" goods include clothing and footwear, health and personal care, electronics, recreation, and transport.

Figure A1. Price movement in our data (with clothing) in comparison with CPI.



Note: The index with our data is constructed as a weighted geometric mean of observed product-level price changes, using CPI expenditure weights at the 1-digit COICOP level. This version includes COICOP 300 (Clothing and footwear). In the CPI, clothing prices are quality-adjusted (often using hedonic methods), whereas our matched-model index uses posted prices without quality adjustment. Because apparel items typically enter at higher prices and are discounted over their life cycle, and because we do not link discontinued items to replacement models, the apparel component mechanically drifts downward over time. As a result, including COICOP 300 induces a persistent downward trend in the index compared to the more stable quality-adjusted CPI.

Figure A2. Price movement in PS in comparison with CPI by COICOP.

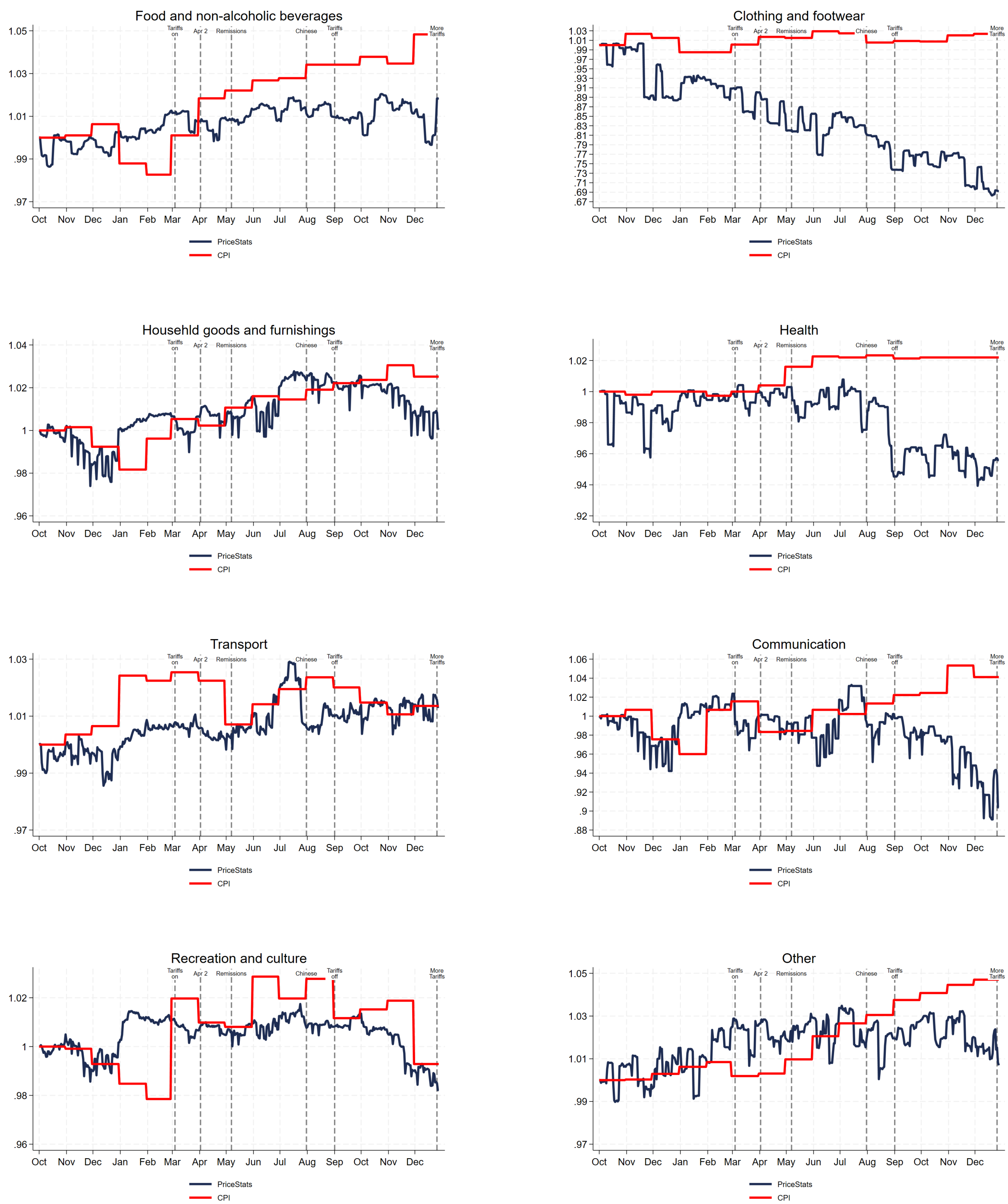
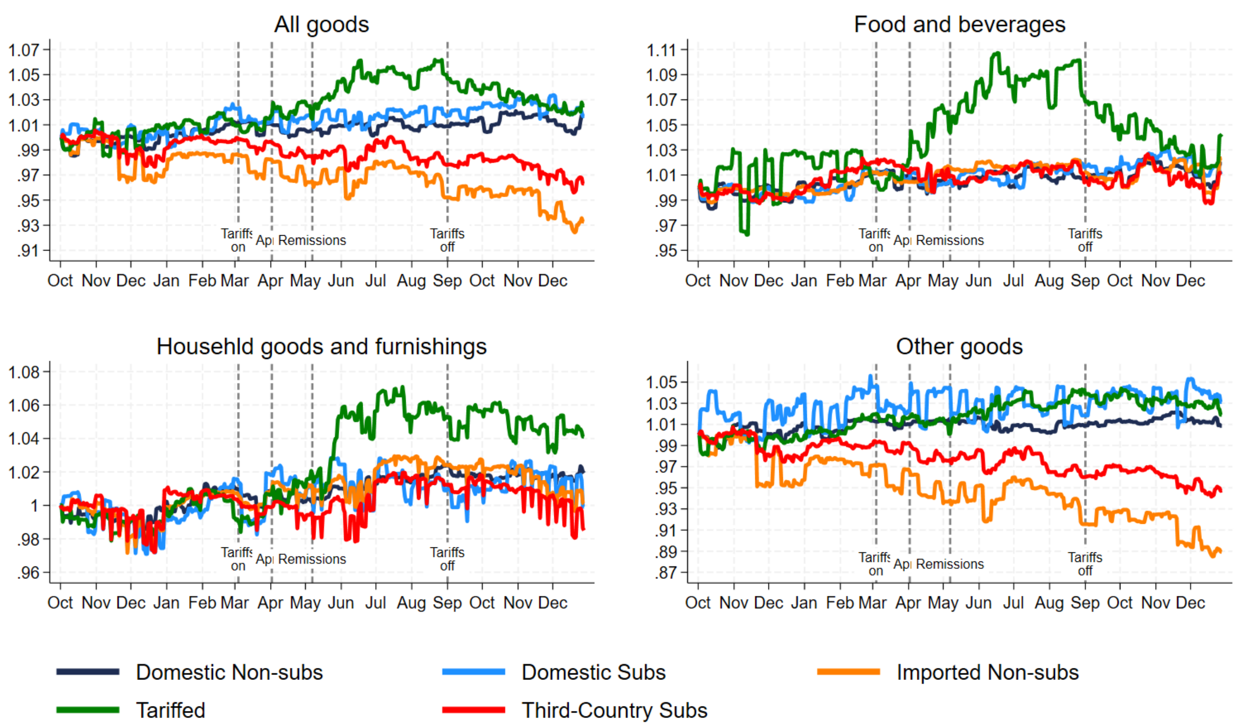
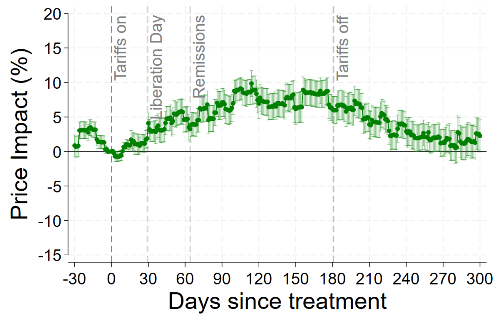


Figure A3. Price movements by product groups - Including Sales

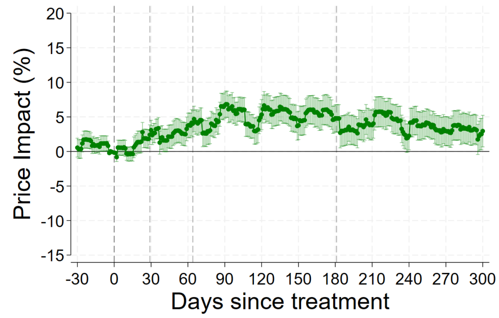


Note: Price indexes are weighted geometric means of price changes, with COICOP 1-digit weights. Tariffed are goods imported from the US subject to Canadian tariffs; Domestic substitutes are domestic goods in the tariffed HS8 categories; Third-Country substitutes are goods imported from third countries in tariffed HS8 categories; Imported Non-substitutes are goods imported from the US or third countries in non-tariffed HS8 categories; and Domestic Non-substitutes are domestic goods in non-tariffed HS8 categories. Canadian retaliatory tariffs are imposed at HS8 level.

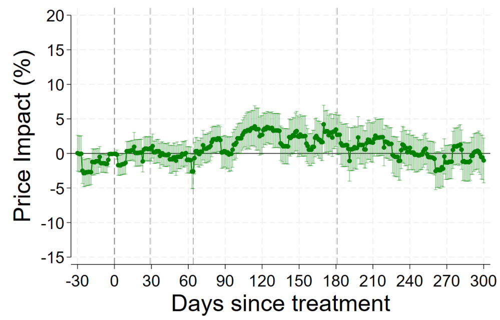
Figure A4. Price impact estimates across CPI categories



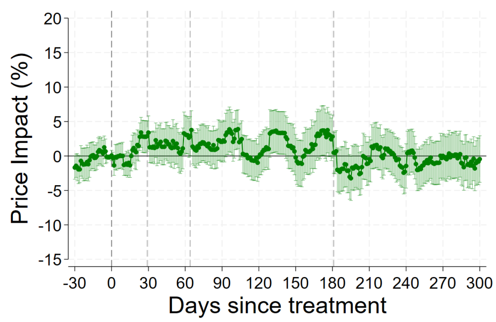
(a) Food and beverages



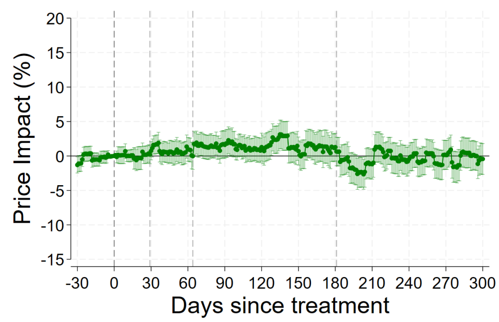
(b) Household operations, furniture, and equipment



(c) Health and personal care



(d) Transportation



(e) Recreation, culture, and reading

Note: The price impact of tariffs is estimated by the difference-in-differences linear projections of the March 4 effect using specification (1). Each plot provides the estimates for each of the CPI categories of the price impact on Tariffed goods relative to the control group (Domestic Non-substitutes). Vertical lines refer to March 4, April 2, May 7, and September 1, 2025, respectively. Coefficients are averaged across retailers using the weights of Footnote 13.

Figure A5. USD/CAD exchange rate

Note: Top line shows the evolution of the exchange rate from October 1, 2024 to January 31, 2026, expressed in USD per CAD. Bottom bars show the daily log change of the exchange rate. Vertical lines refer to March 4, April 2, and September 1, 2025, respectively.

B Canadian import tariffs: timeline and sources

Table B1 provides the timeline for Canadian tariffs in 2025.

List of U.S. products subject to Canadian tariffs effective March 4, 2025: https://www.canada.ca/en/department-finance/news/2025/03/list-of-products-from-the-united-states-subject-to-25-per-cent-tariffs-effective-march-4-2025.html. List of U.S. products subject to Canadian tariffs effective March 13, 2025: https://www.canada.ca/en/department-finance/news/2025/03/list-of-products-from-the-united-states-subject-to-25-per-cent-tariffs-effective-march-13-2025.html.

On May 7, a remission order was published to provide temporary tariff relief for goods used in manufacturing or processing, food and beverage packaging, agricultural production, public health, healthcare, public safety, and medical supplies and critical industrial inputs, reducing the effective tariff rate to zero for eligible imports through October 16, 2025 (later extended to December 16, 2025, and further into 2026): https://gazette.gc.ca/rp-pr/p2/2025/2025-05-07/html/sor-dors122-eng.html. Canadian government made an announcement about remissions on April 15, 2025, the publication of the remissions order on May 7, 2025, provided legal and regulatory implementation of the remissions. The remissions were for “the products imported for processing—not for direct retail sale” according to the Retail Council of Canada (www.retailcouncil.org/tariffs-and-trade), and the government guidelines stated that remissions will be considered on a “case-by-case basis, other exceptional circumstances that could have severe impacts on the Canadian economy" (https://www.canada.ca/en/department-finance/programs/international-trade-finance-policy/process-requesting-remission-tariffs-that-apply-on-certain-goods-us.html).

On September 1, 2025, Canada removed retaliatory tariffs on most products, while steel, aluminum, and automobiles remained subject to tariffs. List of the U.S. products subject to tariffs efffective September 1, 2025: https://www.canada.ca/en/department-finance/programs/international-trade-finance-policy/canadas-response-us-tariffs/complete-list-us-products-subject-to-counter-tariffs.html

As of October 2025, the effective Canadian tariff rate on U.S. goods was about 1% (2.6% in July), and the average U.S. tariff rate on Canadian goods was 5.9% (4.4% in July 2025). 2025 tariffs apply primarily to products that do not meet rules-of-origin requirements or fall under specific national security tariffs. See Bank of Canada (2025), Monetary Policy Report, October 29, Section 8: https://www.bankofcanada.ca/wp-content/uploads/2025/10/mpr-2025-10-29.pdf.

Table B1. Canadian Tariffs in 2025

Date	Measure	Tariff/Action	Product Scope	Policy Details
A. Tariffs and actions on U.S. imports				
March 4	Retaliatory Tariffs	25% surtax	Groceries, appliances, furniture, electronics, household goods	First wave of retaliatory tariffs targeting approximately C$30 billion in U.S. imports
March 13	Retaliatory Tariffs	25% surtax	Steel, aluminum, consumer durables	Expanded list worth about C$29.8 billion; intended to increase pressure on key U.S. exports
April 9	Auto Tariffs	25% surtax	U.S.-origin vehicles and auto parts (non-USMCA-compliant)	Strategic focus on autos; subject to exemptions and future quota arrangements (announced on April 3)
May 7	Remission Order: General Sectors	0% effective rate (relief)	Medical, public safety, packaging, manufacturing, and food processing inputs	Temporary surtax relief for eligible goods imported on or before October 16, 2025; must meet CBSA criteria (announced on April 15)
Sep 1	Canadian retaliatory tariffs are removed		Tariffs removed on most of the products	Tariffs on steel, aluminum and cars remain
B. Tariffs on non-U.S. imports				
July 31	Steel and Aluminum Goods Tariffs	25% surtax	Goods with steel melted/poured and aluminum smelted/cast in China	Addresses global overcapacity and non-market policies; exempts U.S.-origin goods (CUSMA), casual goods, and shipments under C$5,000
Dec 26	Steel Derivative Products Tariffs	25% tariff	Steel derivative products (structures, fasteners, chains, springs, furniture, prefab buildings)	Applies to full value from all countries; exemptions for motor vehicle/aircraft parts (until July 1, 2026), western wind towers, and goods in transit

C AI methods for classifying affected products

To determine which of the products in the scraped data are affected by tariffs, we employ AI methods to 1) identify each product's country of origin, and 2) assign each product to an 8-digit HS category. Since Canadian tariffs are imposed on products that fall within certain HS8 categories and are imported from the United States, this classification allows us to determine which products are tariffed. Among the products that are not tariffed we will also know which ones are close substitutes to the tariffed products, and which of the substitutes are supplied domestically versus imported from other countries.

C.1 AI-assisted Country-of-Origin Identification at the Individual Product Level

We develop an AI-assisted procedure to assign a *country of origin* (COO) to individual retail products using a large language model (LLM) with integrated web-search capabilities. The method takes as inputs (i) a product name and (ii) a URL to the product page on a Canadian retailer website. Rather than relying on a pre-labeled training set, the procedure uses targeted retrieval and a structured decision rule embedded in the prompt to produce a single COO label for each product.

For each product, we submit an API request consisting of a fixed system prompt and a short user query that references the product name and instructs the model to begin with the provided URL. The system prompt defines a step-by-step protocol:

1. **Inspect the retailer product page** (starting from the provided URL) and extract an explicit COO statement when available (e.g., "Made in X" or "Country of origin: X").

2. If the page indicates only that the item is **"Imported"** without naming a country, treat this as incomplete and **continue searching**.

3. **Search other trusted sources** (e.g., other retailers' listings and/or the manufacturer) using the product name to find an explicit COO.

4. If no explicit COO is found, **infer the most likely single country** using brand knowledge and typical production locations for the product category.

5. Return **"Imported"** only as a last resort when the item is clearly not produced in Canada but no specific country can be found or inferred; return **"Unknown"** if no usable information is available and no reasonable inference can be made.

The API call uses the following structured message template:

```
System: [Fixed instructions defining the COO protocol and strict output format]

User: Tell me the country of origin of this item: {product_name}.
      Begin your search with this URL: {product_url}.
```

We assess the accuracy of this approach using a validation sample of 8,941 products from three large retailers. For these products, COO was obtained either by scraping it directly from the product description on the retailer's website (Retailers 2 and 4) or by using the product's UPC to scrape COO from other retailers' websites (UPC codes were also scraped from Retailer 7's website). These latter products allow us to test not only the accuracy of AI predictions when COO information is available directly on the retailer's website, but also when the AI must rely on external sources to infer it. Table C1 summarizes performance along these two margins. First, the model correctly distinguishes domestic from imported items 85% of the time. Second, restricting attention to products for which a specific COO can be benchmarked against directly observed COO, it identifies the correct country in 88% of cases. Accuracy is broadly similar across the most common origin countries in our sample.

Table C1. AI-Based Validation of Country-of-Origin Classification

	Products	**Accuracy (%)**
Panel A: Overall Accuracy		
Domestic/Imported	8941	85.0
Imported	1194	99.8
Domestic	7747	82.8
Country of Origin	8211	87.9
Canada	7146	89.7
China	584	84.8
Mexico	72	61.1
United States	57	71.9
Italy	45	97.8
Taiwan	39	84.6
India	18	94.4
Other countries	250	52.8
Panel B: Accuracy by Retailer		
Retailer 2	1166	96.1
Retailer 4	6149	88.7
Retailer 7	896	71.5

Note: This table reports the number of products and prediction accuracy for AI-based country-of-origin classification. Accuracy rates are computed using three validation samples from three distinct retailers present in the dataset. Predictions were generated in July 2025 and January 2026 using an OpenAI retrieval-augmented large language model with web-search capabilities (gpt-4o-mini-search-preview).

Based on COO classifications, we define a product as **Domestic** if its country of origin is Canada, or if the price banner had "Prepared in Canada" on it in 2025. On the other hand, if a retailer had a "Tariff" banner on the product's price banner in 2025, we label its COO as the United States. We drop products for which COO was not classified and which did not have "Prepared in Canada" or "Tariff" banner in 2025. All remaining 98,644 products not tagged as **Domestic** are tagged as **Imported**.

Table C2 provides the country of origin for imported products in the data. For 41,011 of imported products (44.8%), we could not classify the country of origin—we will assume those are not U.S. imports. Among the remaining imported products, 15,945 (17.4%) are imported from the United States. The biggest number of imported non-U.S. products come from China (18,781), Mexico (2,791), Italy (2,039), Taiwan (1,674), Vietnam (1,321), Japan (984), and Korea (1,005). The remaining imports from 93 countries amount to 7,094 unique products.

Table C2. Country of origin for imported products

Country of origin	Products	%
Imported	41,011	44.8
China	18,781	20.5
United States	15,945	17.4
Mexico	2,791	3.0
Italy	2,039	2.2
Taiwan	1,674	1.8
Vietnam	1,321	1.4
Korea	1,005	1.1
Japan	984	1.1
Other (93 countries)	7,094	7.7
Total	91,615	100.0

C.2 AI-based HS-8 Classifications at the Individual Product Level

We develop an AI-based method to classify individual retail products directly into the HS hierarchy at the 8-digit level. This method has recently been used by Cavallo, Llamas, and Vazquez (2025) for classifying individual products in PriceStats micro data for retailers in the United States. Our approach uses large language models (LLMs) in a hierarchical and iterative manner: rather than assigning a product to an HS code in a single step, the algorithm moves sequentially through the HS tree, refining the classification one level at a time. This mirrors how a human expert would classify goods, starting from broad distinctions and progressively narrowing the choice set until reaching a unique HS8 code.

At each stage, the model is provided with (i) the product description and (ii) the list of valid HS subcategories at the current level of the hierarchy. The prompt, submitted via API, is simple and structured to minimize ambiguity. It takes the following form:

```
Classify the following item into one of these subcategories: {list}
Item: "{product description}"
Return exactly one code from the list.
```

Once a category is selected, we retrieve its immediate subcategories and repeat the procedure. This process continues recursively until the model reaches a terminal node of the HS tree at the 8-digit level. Each decision is therefore local, constrained, and conditioned on all previous choices.

Figure C1 illustrates this process using the example of *roasted, non-decaffeinated coffee*. At the top level, the model distinguishes between broad HS sections such as *Live animals and animal products* and *Vegetable products*, correctly selecting the latter. Within *Vegetable products*, it identifies *Chapter 09: Coffee, tea, maté and spices*. In the next iteration, it selects *Heading 0901: Coffee, whether or not roasted or decaffeinated*. It then chooses *Subheading 0901.21: Coffee, roasted, not decaffeinated*. Finally, it assigns the product to the relevant national subheading—*0901.21.10: Certified organic*—from the set of valid national subheadings under 0901.21.

A key advantage of this approach over traditional machine-learning classifiers is that it does not require a labeled training dataset. Instead, it leverages the ability of large language models to perform structured, coarse-to-fine reasoning over hierarchical taxonomies. These distinctions are made without task-specific training and rely instead on the model's general semantic reasoning. By limiting the choice set at each step, the method reduces classification errors that often arise when models are asked to choose among thousands of HS codes simultaneously.

In practice, many standard HS descriptions are ambiguous or too vague to support reliable classification, particularly for retail products. To address this, we augment the original HS hierarchy with enriched labels and clarifying annotations that make category boundaries more explicit. These refinements improve accuracy in cases where the official HS text lacks the specificity needed to classify consumer goods in our sample.

We apply this classification procedure uniformly to both imported and domestic products. This allows us not only to identify goods directly subject to tariffs, but also to map domestic products into the same HS categories, facilitating comparisons between imported goods and their domestic competitors. The resulting HS8 assignments provide a consistent and scalable bridge between high-frequency retail price data and tariff schedules, enabling precise measurement of tariff exposure at the product level.

Figure C1. Structure of the Harmonized System classification, illustrated for roasted, non-decaffeinated, certified organic coffee

```
HS System
|
+-- Section I: Live animals; animal products
|
+-- Section II: Vegetable products
|    |
|    +-- ...
|    |
|    +-- Chapter 07: Edible vegetables and certain roots and tubers
|    |
|    +-- Chapter 08: Edible fruit and nuts; peel of citrus fruit or melons
|    |
|    +-- Chapter 09: Coffee, tea, maté and spices
|    |    |
|    |    +-- Heading 0901: Coffee, whether or not roasted or decaffeinated;
|    |    |                 coffee husks and skins; coffee substitutes
|    |    |                 containing coffee in any proportion
|    |    |
|    |    +-- Coffee, not roasted:
|    |    |     |
|    |    |     +-- Subheading 0901.11: Not decaffeinated
|    |    |     |
|    |    |     +-- Subheading 0901.12: Decaffeinated
|    |    |
|    |    +-- Coffee, roasted:
|    |          |
|    |          +-- Subheading 0901.21: Not decaffeinated
|    |          |     |
|    |          |     +-- National subheadings:
|    |          |         +-- 0901.21.10: Certified organic
|    |          |         +-- 0901.21.90: Other
|    |          |
|    |          +-- Subheading 0901.22: Decaffeinated
|    |    |
|    |    +-- Heading 0902: Tea, whether or not flavoured
|...|...|...
```

D The perceptions about the duration of the tariffs in the media

This Section provides examples from the contemporaneous media coverage of counter-tariffs.

Canadian government introduces its tariffs on the US imports as retaliatory and conditional, with the goal to keep them in place until US tariffs were lifted. On March 4, 2025, Department of Finance published: “The tariffs imposed by the U.S. administration are unjustified, and detrimental to both Americans and Canadians. Working with provincial, territorial and industry partners, our singular focus is to get them removed as quickly as possible.”[1] And the Prime Minister's website state: ”Canada has responded to the U.S. imposition of tariffs on Canadian goods by introducing a suite of countermeasures designed to compel the U.S. to remove the tariffs as soon as possible.”[2] Royal Bank of Canada [commercial bank] wrote: ”Canada's retaliatory measures appear aimed at reducing the duration of U.S. tariffs.”[3] The Canadian government made an announcement about the remission process to mitigate the impact of tariffs at the same time as it announced its tariffs on March 4, 2025, also pointing to the expectations of tariffs being temporary.

The views about the trade environment changed after the announcements about the U.S. tariffs on April 2, 2025. The statements from Canadian officials convey the revision of their beliefs about the nature and structure of the economic environment. For example, on April 3, 2025, Canadian Prime Minister Mark Carney said: ”The global economy is fundamentally different today than yesterday.”[4] On April 4, 2025, Canada's Foreign Affairs Minister Mélanie Joly said: “The relationship between the United States and Canada will never be the same again after President Donald Trump announced a sweeping new tariff regime on Wednesday.”[5] Scotiabank wrote on May 8, 2025: ”Our last official forecast, published on April 16th, assumes that tariffs in effect as of that date are permanent.”[6] Bank of Canada Governor Macklem described U.S. protectionism as one of the structural changes that Canada undergoes in his speech in 2026 (Macklem, 2026).

Furthermore, when remissions were announced in May 2025, some economists interpreted them as almost entirely removing Canadian tariffs on U.S. goods. For example, a Financial Post, May 14, 2025 article said: “Canada's new tariffs on U.S. drop to ”nearly zero” with exemptions.” In an interview, Tony Stillo, Oxford's director of Canada eco-

[1] https://www.canada.ca/en/department-finance/news/2025/03/canada-announces-robust-tariff-package-in-response-to-unjustified-us-tariffs.html

[2] https://www.pm.gc.ca/en/news/news-releases/2025/04/03/canada-announces-new-countermeasures-response-tariffs-from-united-states.

[3] https://www.rbc.com/en/economics/canadian-analysis/featured-analysis/insights/a-us-canada-trade-shock-first-economic-takeaways/

[4] https://www.pm.gc.ca/en/news/news-releases/2025/04/03/canada-announces-new-countermeasures-response-tariffs-from-united-state

[5] https://globalnews.ca/video/11116615/canada-us-relationship-will-never-be-the-same-after-trump-tariffs-joly-warns.

[6] https://www.scotiabank.com/ca/en/about/economics/economics-publications/post.other-publications.insights-views.temporary-vs-permanent-tariffs--may-8--2025-.html

nomics, said: "It's a very strategic approach from a new prime minister to really say, 'We're not going to have a retaliation.'[...] It's a strategic play on the government's part to not damage the Canadian economy."[7] This reduction of the tariffs through remissions for a broad range of industries and inputs suggested to some that Canada might scale back the tariffs in the future. Indeed, while initially, remissions were announced to be a temporary 6-month measure (until October 16, 2025), they were extended to December 16, 2025 and then to February or July 2026 for different goods.

E Pre-trends in the LP-DiD specification

This appendix documents three robustness exercises on our main LP-DiD specification (1), with log price as the dependent variable. Each variant retains the main fixed-effects structure and the same interaction terms for retailers and product categories, but modifies the pre-treatment horizon, the lag-control set, or the construction of the pre-period reference price. We estimate each variant for all treatment groups; for brevity we report only the imported-tariffed (IT) group below, but the conclusions are unchanged for the other groups.

1. Extended pre-treatment horizons. We re-estimate the baseline specification using 150 pre-treatment lags (instead of the 30 lags used in the main text). This extends the pre-trend window by five months and provides a long-horizon test for parallel trends prior to the tariff announcement.

2. Adding lags as controls. We augment the regression with 30 lagged first differences of log price, $\Delta \ln p_{i,t-1}, \ldots, \Delta \ln p_{i,t-30}$, following the covariate-augmented LP-DiD specification of Dube et al. (2025). This absorbs short-run pre-treatment price dynamics under conditional parallel trends.

3. Pre-mean-differenced reference. We replace the one-day lag reference price with the average of available log prices over the 30 days preceding treatment, so the dependent variable becomes:

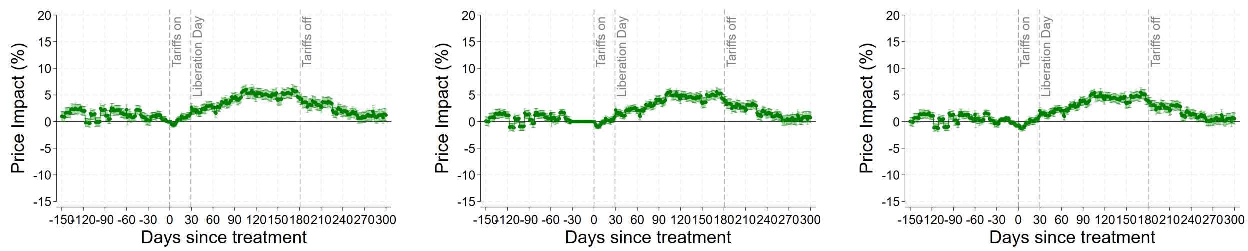
$$\ln p_{i,t+h} - \frac{1}{|\mathcal{L}_{i,t}|} \sum_{k \in \mathcal{L}_{i,t}} p_{i,t-k}, \qquad \mathcal{L}_{i,t} \subseteq \{1, \ldots, 30\},$$

where $\mathcal{L}_{i,t}$ collects the non-missing lags. This dampens day-specific noise in the reference price and tests whether results are sensitive to using a single pre-period day as the benchmark.

[7] https://financialpost.com/commodities/canadas-new-tariffs-on-us-drop-to-nearly-zero-with-exemptions-oxford-says.

Results. Figure E1 reports the average IT price impact for each variant. Across all three robustness checks the pre-trends show no systematic deviations from zero, and the dynamic post-treatment path closely tracks the estimates in our main specification, confirming that the headline result is not driven by the length of the pre-window, omitted short-run price dynamics, or the choice of a single-day pre-period reference.

Figure E1. LP-DiD robustness: average IT price impact



(a) Extended pre-trends (150 lags) **(b)** Adding 30 lags as controls **(c)** Pre-mean-differenced reference

Note: Each plot provides the estimated average pass-through for Tariffed products relative to the control group (Domestic Non-substitutes), from the robustness variant indicated in its subcaption. Bands denote 95% confidence intervals based on standard errors clustered at the product level. Vertical lines refer to March 4, April 2, May 7, and September 1, 2025, respectively. Results for the remaining treatment groups are available on request.

F Non-random assignment of tariffs

In this Section, we address the concern that tariffs may not be randomly assigned to countries or to HS codes.[8]

Notation. Indices:

- i: product-retailer observation (the panel unit).
- $H(i)$: HS8 code of product i.
- $c(i)$: COICOP category of product i.
- $r(i)$: retailer of product i.
- $o(i) \in \{\text{US}, \text{CAN}, \text{other}\}$: country of origin of product i.
- $t^* =$ March 4, 2025; $h \in \{0, 1, \ldots, 300\}$ is the horizon.

Outcomes and shocks:

- $\Delta p_{i,h} \equiv \log p_{i,t^*+h} - \log p_{i,t^*-1}$: log price change of product i from the pre-treatment day to horizon h.

[8] We thank our discussant, Kunal Sangani, for illuminating this point to us.

- $\Delta mc_{i,h}$: log marginal cost change for product i over the same window.
- $\delta_{H,h}$: HS-code-specific component of the marginal cost change at horizon h, common to all products in HS code H.
- $\alpha_{o,h}$: country-of-origin-specific component of the marginal cost change at horizon h.
- $\tau_{i,h}$: tariff component of $\Delta mc_{i,h}$, equal to the statutory tariff rate for products with $o(i) = \text{US}$ and $H(i) \in \mathcal{T}$, and zero otherwise.
- $\varepsilon_{i,h}$: idiosyncratic cost shock to product i, mean zero conditional on $(H(i), o(i))$.

Sets and indicators:

- $\mathcal{T}$: set of HS8 codes targeted by the March 4, 2025 Canadian retaliatory tariffs.
- $T_i \equiv \mathbf{1}\{H(i) \in \mathcal{T}\}$: indicator that product i's HS code is on the tariff list. Varies at the HS8 level.

Structural parameters:

- $\rho \in (0, 1]$: pass-through of own marginal cost to price (cost-side elasticity).
- $\Omega \in [0, 1)$: strategic complementarity in price-setting — the elasticity of firm i's price to the average price in its HS code, holding own cost fixed.

Cell averages:

- $\overline{\Delta p}_{H,h} \equiv \mathbb{E}[\Delta p_{j,h} \mid H(j) = H]$: equilibrium average log price change in HS code H at horizon h, taken across all countries of origin in the cell.

Fixed effects:

- $\gamma_{c,h}$: COICOP $\times$ horizon (or COICOP $\times$ day) fixed effect.
- $\zeta_{r,h}$: retailer $\times$ horizon fixed effect.

Pricing equation. The marginal cost change for product i decomposes as

$$\Delta mc_{i,h} = \delta_{H(i),h} + \alpha_{o(i),h} + \tau_{i,h} + \varepsilon_{i,h}, \tag{F.1}$$

and prices reflect own marginal cost and the equilibrium price in the firm's competitive set, which we take to be its HS code:

$$\Delta p_{i,h} = \rho \cdot \Delta mc_{i,h} + \Omega \cdot \overline{\Delta p}_{H(i),h}. \tag{F.2}$$

Substituting (F.1) into (F.2) gives

$$\Delta p_{i,h} = \rho\, \delta_{H(i),h} + \rho\, \alpha_{o(i),h} + \rho\, \tau_{i,h} + \Omega\, \overline{\Delta p}_{H(i),h} + \rho\, \varepsilon_{i,h}. \tag{F.3}$$

Identification strategy. We now show that ρ is identified by a double-difference-in-differences using all four cells of the product taxonomy.

Taking expectations within each cell at horizon h, (F.3) gives the structural equations for the four cells:

$$\mathbb{E}[\Delta p_{i,h} \mid o(i) = \text{US}, H(i) \in \mathcal{T}] = \rho\,(\bar{\delta}_{\mathcal{T},h} + \alpha_{\text{US},h} + \tau) + \Omega\,\overline{\Delta p}_{\mathcal{T},h}, \tag{F.4}$$

$$\mathbb{E}[\Delta p_{i,h} \mid o(i) = \text{US}, H(i) \notin \mathcal{T}] = \rho\,(\bar{\delta}_{\neg\mathcal{T},h} + \alpha_{\text{US},h}) + \Omega\,\overline{\Delta p}_{\neg\mathcal{T},h}, \tag{F.5}$$

$$\mathbb{E}[\Delta p_{i,h} \mid o(i) = \text{CAN}, H(i) \in \mathcal{T}] = \rho\,(\bar{\delta}_{\mathcal{T},h} + \alpha_{\text{CAN},h}) + \Omega\,\overline{\Delta p}_{\mathcal{T},h}, \tag{F.6}$$

$$\mathbb{E}[\Delta p_{i,h} \mid o(i) = \text{CAN}, H(i) \notin \mathcal{T}] = \rho\,(\bar{\delta}_{\neg\mathcal{T},h} + \alpha_{\text{CAN},h}) + \Omega\,\overline{\Delta p}_{\neg\mathcal{T},h}, \tag{F.7}$$

where $\bar{\delta}_{\mathcal{T},h} \equiv \mathbb{E}[\delta_{H,h} \mid H \in \mathcal{T}]$ and $\bar{\delta}_{\neg\mathcal{T},h}$ defined analogously. We refer to the four cells, in order, as Tariffed (T), US NonSubstitutes (USNS), Domestic Substitutes (DS), and Domestic NonSubstitutes (DNS).

The baseline LP-DiD comparison in our main specification uses Tariffed as treatment and Domestic NonSubstitutes as control. The cell-mean difference is

$$\begin{aligned}\mathbb{E}[\Delta p_{i,h} \mid \text{T}] - \mathbb{E}[\Delta p_{i,h} \mid \text{DNS}] = \rho\tau \;+\; &\underbrace{\rho\,(\alpha_{\text{US},h} - \alpha_{\text{CAN},h})}_{\text{country-of-origin gap}} \\ &+ \underbrace{\rho\,(\bar{\delta}_{\mathcal{T},h} - \bar{\delta}_{\neg\mathcal{T},h})}_{\text{HS-selection gap}} + \underbrace{\Omega\,(\overline{\Delta p}_{\mathcal{T},h} - \overline{\Delta p}_{\neg\mathcal{T},h})}_{\text{spillover}}.\end{aligned} \tag{F.8}$$

The single-DiD coefficient $\hat{\beta}_h^{\text{Tariffed}}$ recovers a sum of $\rho\tau$ and three additional terms, due to non-random assignment of country of origin, non-random assignment of HS category, and strategic pricing complementarities.

The four-cell structure allows construction of a difference-in-differences that nets out both nuisance terms simultaneously. Define

$$\Delta_{\mathcal{T},h} \equiv \mathbb{E}[\Delta p \mid \text{T}] - \mathbb{E}[\Delta p \mid \text{DS}], \qquad \Delta_{\neg\mathcal{T},h} \equiv \mathbb{E}[\Delta p \mid \text{USNS}] - \mathbb{E}[\Delta p \mid \text{DNS}].$$

From (F.4)–(F.7):

$$\Delta_{\mathcal{T},h} = \rho\tau + \rho\,(\alpha_{\text{US},h} - \alpha_{\text{CAN},h}), \tag{F.9}$$

$$\Delta_{\neg\mathcal{T},h} = \rho\,(\alpha_{\text{US},h} - \alpha_{\text{CAN},h}). \tag{F.10}$$

The within-HS differences $\bar{\delta}_{\mathcal{T},h}$ and $\bar{\delta}_{\neg\mathcal{T},h}$ cancel within each bracket because both terms share the same HS code. The spillover terms $\Omega\,\overline{\Delta p}_{\mathcal{T},h}$ and $\Omega\,\overline{\Delta p}_{\neg\mathcal{T},h}$ also cancel within each bracket, because the cell average depends only on $H(i) \in \mathcal{T}$, not on $o(i)$. The double-difference is then

$$\boxed{\Delta_{\mathcal{T},h} - \Delta_{\neg\mathcal{T},h} = \rho\tau.} \tag{F.11}$$

ρ is identified as $\hat{\rho}_h = (\Delta_{\mathcal{T},h} - \Delta_{\neg\mathcal{T},h})/\tau$, with τ taken as the known statutory tariff rate.

The identifying assumption. Equation (F.11) is exact under the framework's structural equations (F.4)–(F.7) together with one substantive assumption: the country-of-origin gap is common across HS codes,

$$(\alpha_{\text{US},h} - \alpha_{\text{CAN},h}) \mid (H \in \mathcal{T}) \;=\; (\alpha_{\text{US},h} - \alpha_{\text{CAN},h}) \mid (H \notin \mathcal{T}). \tag{PT$'$}$$

Assumption (PT′) permits arbitrary US-Canada gaps in price dynamics — FX pass-through, boycott effects, sourcing differentials — as long as they operate uniformly across tariffed and non-tariffed HS categories.

The LP-DiD specification. The double-DiD (F.11) maps directly into a triple-interaction LP-DiD regression on the four-cell sample. Define $T_i \equiv \mathbf{1}\{H(i) \in \mathcal{T}\}$ and $U_i \equiv \mathbf{1}\{o(i) = \text{US}\}$. The estimating equation is

$$\Delta p_{i,h} = \beta_h \cdot (T_i \times U_i) + \gamma_{c(i),h} + \zeta_{r(i),h} + \kappa_{o(i),h} + \eta_{H(i)} + \varepsilon_{i,h}, \tag{F.12}$$

estimated separately by horizon, with the sample restricted to $i \in \text{T} \cup \text{USNS} \cup \text{DS} \cup \text{DNS}$. The fixed effects play distinct roles:

- $\gamma_{c(i),h}$ (coicop$\times$horizon): absorbs coicop-level common shocks, as in the main specification.
- $\zeta_{r(i),h}$ (retailer$\times$horizon): absorbs retailer-level common shocks.
- $\kappa_{o(i),h}$ (country$\times$horizon): absorbs $\rho\, \alpha_{o(i),h}$, the country-of-origin gap.
- $\eta_{H(i)}$ (HS-code): absorbs time-invariant HS-code level effects.

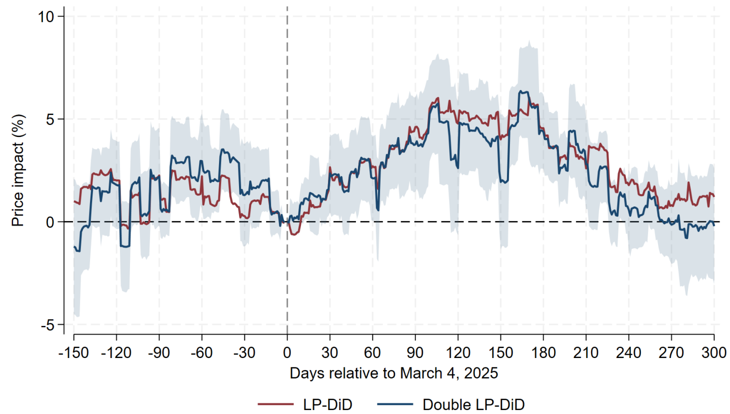
The coefficient $\hat{\beta}_h$ on the interaction $T_i \times U_i$ is the double-DiD estimate from (F.11), and the pass-through parameter is recovered as

$$\hat{\rho}_h = \frac{\hat{\beta}_h}{\tau}. \tag{F.13}$$

We cluster standard errors at the HS8 level.

Estimation results. Figure F1 compares the estimates of the price effects of tariffs using LP-DiD estimation in the paper (from Figure E1(b)) and using double LP-DiD specification (F.12). The differences in the estimates are small across all horizons, indicating that bias from the additional terms in equation (F.8) are small.

Figure F1. Estimated price effects of tariffs, double LP-DiD specification



Note: The price impact of tariffs is estimated by the double difference-in-differences linear projections of the March 4 effect using specification (F.12).

G Impact on the values and quantities of the U.S. imports

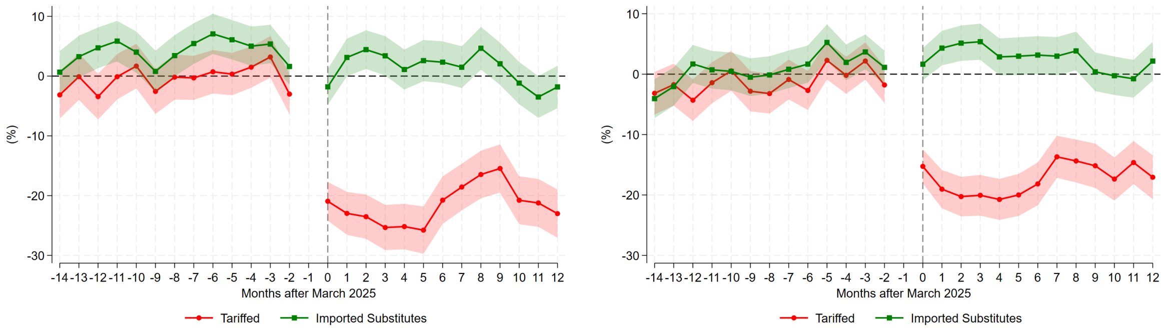
While we have provided evidence about the impact of tariffs on the prices, we would also like to shed some light on the impact of the Canadian countertariffs on the quantities of goods imported from the U.S. into Canada. We use monthly data on Canadian International Merchandise Trade at HS10 level on both the dollar value and quantity of goods by country of origin and by province of destination for the period from January 2024 to March 2026.[9] Using these data, we estimated the LP-DiD specification:

$$\Delta_h \text{ihs}(y_{it}) = \beta_{0,h} D_{it} + \delta_{ot}^{(h)} + \delta_{ct}^{(h)} + \varepsilon_{it}^{(h)}, \tag{G.1}$$

with tariffed and imported substitutes as treatment groups, and with imported non-substitutes as a control group. We perform estimations both for the values and the quantities of imports. We transform the dependent variable using the inverse of the hyperbolic sine ihs(y), as in Amiti, Redding, and Weinstein (2019), to keep zeros in the estimation, although dropping zeros and using log yields very similar results. In the regression, the observation is imports at HS10 category by country of origin and by province of destination, with standard errors clustered at this level. We control for fixed effects at HS2 level and country of origin. Regressions are unweighted. The results of the estimations are presented in Figure G1.

[9] The values of taxes, duties, and tariffs, including countervailing and anti-dumping duties, required on importation into Canada are not included in the value of imports: `https://www150.statcan.gc.ca/n1/pub/13-605-x/2024001/article/00001-eng.htm`.

Figure G1. Impact on the value and quantity of imports



(a) Values **(b)** Quantities

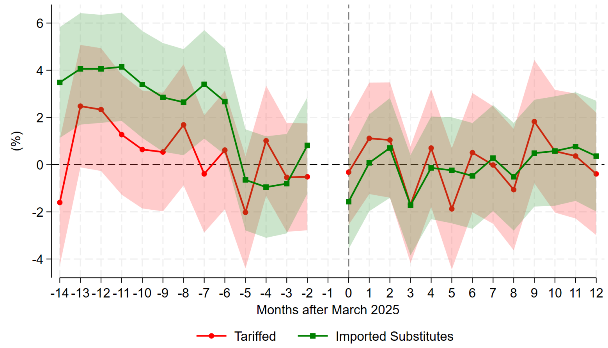
Note: The price impact of tariffs is estimated by the difference-in-differences linear projections of the March 4 effect using specification (G.1). Each plot provides the estimates of the impact on the value of the U.S. (left panel) and the quantity of the U.S. (right panel) for tariffed and imported substitutes relative to control group of imported non-substitutes. Vertical line refers to March 2025.

As expected, tariffs significantly reduce trade flows. There is a negative effect of 21% on value and 15% on quantity of tariffed goods in March 2025, indicating a rapid effect of the tariffs introduced on March 4. The effect reaches its peak impact of 26% for value and 21% for quantity in July 2025, five months after the imposition of the tariffs. A large immediate response to tariffs somewhat differs from the smoother adjustment in trade flows documented by Cavallo et al. (2021). One possible explanation is that the U.S.–Canada trade conflict effectively began before the official March 2025 tariff implementation, as trade tensions, announcements, and policy uncertainty were already elevated in preceding months. Firms may therefore have adjusted sourcing and purchasing decisions by the time of the formal tariff changes.

There is no significant impact of the tariffs on third-country substitutes (green line), i.e., for the goods in the tariffed categories but imported from countries other than the U.S. The negative impact starts to reverse after six months, in August 2025, when the removal of the tariffs on most consumer goods starting September 1 was announced. While the negative impact of tariffs has moderated, it has not reversed as of March 2026.

Average unit values—defined as the ratio between corresponding values and quantities at HS10 levels—respond little (Figure G2). Since unit values do not include tariffs, these results imply the prices received by exporters did not change significantly, and most of the adjustments of prices to the tariffs took place within Canada.

Figure G2. Impact on the unit prices



Note: The price impact of tariffs is estimated by the difference-in-differences linear projections of the March 4 effect using specification (G.1). Each plot provides the estimates of impact on unit price for tariffed and imported substitutes relative to control group of imported non-substitutes. Vertical line refers to March 2025.

These results are in line with findings elsewhere. For example, Amiti, Redding, and Weinstein (2019), using U.S. customs data at the ten-digit level of Harmonized Tariff Schedule by country-month, report import values falling 25% to 30% after the imposition of the U.S. tariffs on Chinese imports (with rates varying between 10% to 25%). Amiti, Redding, and Weinstein (2019) also find little effect on pre-tariff import prices.

H Pass-through of temporary cost changes: a simple model

In this Section, we provide a simple example of how a model with nominal price rigidities predicts a positive relationship between the expected duration of a temporary tariff and the pass-through to a firm's optimal reset price.[10]

In a Calvo (1983) model, a monopolistically competitive firm gets a random opportunity to adjust its price whenever it gets a signal, drawn independently from a Poisson stochastic process with parameter λ. This means that in any period with probability λ the firm will adjust its price and otherwise its price will remain the same as last period.

For the firm that resets its price in period t, let $mc_{\tau,t}$ denote the marginal cost expected at $\tau \geq t$. The first-order condition for this firm's optimal reset price p_t^* implies

$$d \ln p_t^* = \rho^* \sum_{\tau=t}^{\tau=\infty} \omega_{\tau,t} d \ln mc_{\tau,t}, \tag{H.1}$$

where ρ^* is a constant and weights $\omega_{\tau,t} = [1-\beta(1-\lambda)][\beta(1-\lambda)]^{\tau-t}$, with β denoting the discount factor.

Consider a tariff Δ introduced in $t=0$ and removed in period $t=T$, and assume the firm has perfect foresight. The tariff-induced change in the reset price (keeping all else equal) is

$$d \ln p_0^*(T) = \rho^* \Delta [1-\beta(1-\lambda)] \left(1 - [\beta(1-\lambda)]^T\right) \tag{H.2}$$

[10] We thank our discussant, Kunal Sangani, for proposing this example.

Taking the ratio of (H.2) for $T = T_1$ and $T = T_3$ gives

$$\frac{d \ln p_0^*(T_3)}{d \ln p_0^*(T_1)} = \frac{1 - [\beta(1-\lambda)]^{T_3}}{1 - [\beta(1-\lambda)]^{T_1}} \tag{H.3}$$

Given T_1 and $T_3 > T_1$, the right-hand side is an increasing function of T_3, i.e., the adjusting firm's response to a temporary tariff in period 0 increases with tariff duration.

In a monthly model with $\beta = 0.95^{1/12}$ for monthly discount factor and a monthly frequency of price changes $\lambda = 0.1$, the predicted reset price increase corresponding to increasing tariff duration from $T_1 = 12$ months to $T_3 = 36$ months goes up by 34%, in line with the survey findings documented in Section 5.1.

I Decomposition of price effects of Canadian tariffs

Following Klenow and Kryvtsov (2008), daily inflation can be decomposed as

$$\pi_s = fr_s^+ \cdot dp_s^+ - fr_s^- \cdot dp_s^-, \tag{I.1}$$

where fr_s^+ (fr_s^-) is the fraction of items with price increases (decreases) on day s, and dp_s^+ (dp_s^-) is the average absolute size of those increases (decreases). For simplicity, we will ignore cross-section heterogeneity here.

Cumulative inflation from day t to day $t+h$ is

$$\Pi_{t:t+h} = \sum_{s=t}^{t+h} \pi_s = \sum_{s=t}^{t+h} \left(fr_s^+ \cdot dp_s^+ - fr_s^- \cdot dp_s^- \right). \tag{I.2}$$

Let $\overline{fr^+}, \overline{fr^-}, \overline{dp^+}, \overline{dp^-}$ denote full-sample daily means. For each $j \in \{+, -\}$, write

$$fr_s^j = \overline{fr^j} + \widetilde{fr}_s^j, \qquad dp_s^j = \overline{dp^j} + \widetilde{dp}_s^j, \tag{I.3}$$

where tildes denote deviations from the mean. Expanding the product:

$$fr_s^j \cdot dp_s^j = \overline{fr^j}\,\overline{dp^j} + \overline{dp^j}\,\widetilde{fr}_s^j + \overline{fr^j}\,\widetilde{dp}_s^j + \widetilde{fr}_s^j\,\widetilde{dp}_s^j. \tag{I.4}$$

Summing from $s = t$ to $s = t+h$ and letting $H = h+1$ denote the number of days:

$$\begin{aligned} \Pi_{t:t+h} = {} & H\left(\overline{fr^+}\,\overline{dp^+} - \overline{fr^-}\,\overline{dp^-}\right) \\ & + \overline{dp^+} \sum_{s=t}^{t+h} \widetilde{fr}_s^+ - \overline{dp^-} \sum_{s=t}^{t+h} \widetilde{fr}_s^- \\ & + \overline{fr^+} \sum_{s=t}^{t+h} \widetilde{dp}_s^+ - \overline{fr^-} \sum_{s=t}^{t+h} \widetilde{dp}_s^- \\ & + \sum_{s=t}^{t+h} \widetilde{fr}_s^+\,\widetilde{dp}_s^+ - \sum_{s=t}^{t+h} \widetilde{fr}_s^-\,\widetilde{dp}_s^-. \end{aligned} \tag{I.5}$$

Define cumulative deviations:

$$\Delta FR^j \equiv \sum_{s=t}^{t+h} \widetilde{fr}_s^j, \qquad \Delta DP^j \equiv \sum_{s=t}^{t+h} \widetilde{dp}_s^j. \tag{I.6}$$

Then the decomposition can be written compactly as

$$\Pi_{t:t+h} = \underbrace{H\left(\overline{fr^+}\,\overline{dp^+} - \overline{fr^-}\,\overline{dp^-}\right)}_{\text{mean inflation}}$$
$$+ \underbrace{\overline{dp^+}\,\Delta FR^+}_{\text{extensive–up}} - \underbrace{\overline{dp^-}\,\Delta FR^-}_{\text{extensive–down}} + \underbrace{\overline{fr^+}\,\Delta DP^+}_{\text{intensive–up}} - \underbrace{\overline{fr^-}\,\Delta DP^-}_{\text{intensive–down}} + \text{interactions}. \tag{I.7}$$

The LP-DiD estimand at horizon h is the difference in cumulative post-tariff inflation:

$$\beta_h \equiv \Pi^T_{t^*:t^*+h} - \Pi^C_{t^*:t^*+h}, \tag{I.8}$$

where t^* is the treatment date, and $T(C)$ denote treatment (control) groups. Use the decomposition (I.7) to obtain decomposition of the estimand in (I.8).

In the data, the mean values of the frequency and size of price changes are very similar for tariff and control groups. We use the common mean across treated and control groups.

$$\overline{fr^{j,T}} = \overline{fr^{j,C}} \equiv \overline{fr^j}, \qquad \overline{dp^{j,T}} = \overline{dp^{j,C}} \equiv \overline{dp^j}, \qquad j \in \{+,-\}. \tag{I.9}$$

Since the mean values are common, the mean inflation terms cancel:

$$H\left(\overline{fr^+}\,\overline{dp^+} - \overline{fr^-}\,\overline{dp^-}\right) - H\left(\overline{fr^+}\,\overline{dp^+} - \overline{fr^-}\,\overline{dp^-}\right) = 0. \tag{I.10}$$

Define the differences of cumulative deviations:

$$\delta FR^j \equiv \Delta FR^{j,T} - \Delta FR^{j,C} = \sum_{s=t^*}^{t^*+h} \left(\widetilde{fr}_s^{j,T} - \widetilde{fr}_s^{j,C}\right), \qquad j \in \{+,-\}, \tag{I.11}$$

$$\delta DP^j \equiv \Delta DP^{j,T} - \Delta DP^{j,C} = \sum_{s=t^*}^{t^*+h} \left(\widetilde{dp}_s^{j,T} - \widetilde{dp}_s^{j,C}\right), \qquad j \in \{+,-\}. \tag{I.12}$$

Since the pre-tariff means are equal, the tildes for each group are deviations from the *same* mean value: $\widetilde{fr}_s^{j,g} = fr_s^{j,g} - \overline{fr^j}$, $g = \{T, C\}$. Therefore, δFR^j and δDP^j simplify to cumulative differences in levels (instead of deviations from the means):

$$\delta FR^j = \sum_{s=t^*}^{t^*+h} \left(fr_s^{j,T} - fr_s^{j,C}\right), \qquad \delta DP^j = \sum_{s=t^*}^{t^*+h} \left(dp_s^{j,T} - dp_s^{j,C}\right). \tag{I.13}$$

The decomposition of the treatment effect therefore is

$$\beta_h = \underbrace{\overline{dp^+}\,\delta FR^+}_{\text{extensive–up}} - \underbrace{\overline{dp^-}\,\delta FR^-}_{\text{extensive–down}} + \underbrace{\overline{fr^+}\,\delta DP^+}_{\text{intensive–up}} - \underbrace{\overline{fr^-}\,\delta DP^-}_{\text{intensive–down}} + \text{interactions}. \tag{I.14}$$

This decomposition is an identity that attributes the tariff's cumulative price effect β_h to four margins:

- **Extensive–up** ($\bar{dp}^+ \, \delta FR^+$): Did tariffed products experience more frequent price increases than control products? (Valued at the pre-tariff average increase size.)
- **Extensive–down** ($\bar{dp}^- \, \delta FR^-$): Did tariffed products experience less frequent price decreases? (Valued at the pre-tariff average decrease size.)
- **Intensive–up** ($\bar{fr}^+ \, \delta DP^+$): Were price increases on tariffed products larger? (Scaled by the pre-tariff average increase frequency.)
- **Intensive–down** ($\bar{fr}^- \, \delta DP^-$): Were price decreases on tariffed products smaller? (Scaled by the pre-tariff average decrease frequency.)

The margin components can be estimated using LP-DiD regressions at the product level as follows.

Define the following product-level dependent variables constructed over the post-tariff window from $s = t^*$ to $s = t^* + h$:

Extensive margins. For each product i, construct the cumulative count of daily price adjustments:

$$N_i^+(h) \equiv \sum_{s=t^*}^{t^*+h} \mathbf{1}\{p_{i,s} > p_{i,s-1}\}, \qquad N_i^-(h) \equiv \sum_{s=t^*}^{t^*+h} \mathbf{1}\{p_{i,s} < p_{i,s-1}\}. \tag{I.15}$$

Run the LP-DiD regression

$$N_i^j(h) = \alpha^j + \gamma^j \cdot \mathbf{1}\{i \in T\} + \varepsilon_i^j, \qquad j \in \{+, -\}. \tag{I.16}$$

The coefficient γ^j estimates δFR^j, the DiD in cumulative adjustment frequencies.

Combined extensive–intensive margins. For each product i, construct the cumulative positive and negative contributions to inflation:

$$C_i^+(h) \equiv \sum_{s=t^*}^{t^*+h} \max(p_{i,s} - p_{i,s-1},\ 0)\,, \qquad C_i^-(h) \equiv \sum_{s=t^*}^{t^*+h} \max(p_{i,s-1} - p_{i,s},\ 0)\,. \tag{I.17}$$

By construction, $p_{i,t^*+h} - p_{i,t^*-1} = C_i^+(h) - C_i^-(h)$.

Run the LP-DiD regression

$$C_i^j(h) = \alpha^j + \lambda^j \cdot \mathbf{1}\{i \in T\} + \varepsilon_i^j, \qquad j \in \{+, -\}. \tag{I.18}$$

The coefficient λ^j estimates the combined contribution of extensive and intensive margins for each j:

$$\lambda^j = \overline{dp^j}\, \delta FR^j + \overline{fr^j}\, \delta DP^j + \text{interaction}^j. \tag{I.19}$$

Backing out the intensive margins. Given γ^j and λ^j, recover the intensive margin residually:

$$\overline{fr^j}\,\delta DP^j = \lambda^j - \overline{dp^j}\,\gamma^j - \text{interaction}^j. \tag{I.20}$$

In practice, if the interaction terms are small, the approximation

$$\overline{fr^j}\,\delta DP^j \approx \lambda^j - \overline{dp^j}\,\gamma^j \tag{I.21}$$

is sufficient. The overall interaction residual can be computed as a diagnostic:

$$\text{interactions} = \beta_h - \overline{dp^+}\gamma^+ + \overline{dp^-}\gamma^- - \overline{fr^+}\,\delta DP^+ + \overline{fr^-}\,\delta DP^-. \tag{I.22}$$

In sum, estimation of contribution of extensive and intensive price adjustment margins to the price effects of import tariffs require five LP-DiD regressions for each horizon h:

1. $p_{i,t^*+h} - p_{i,t^*-1}$ on $\mathbf{1}\{i \in T\} \longrightarrow \beta_h$ (total pass-through),
2. $N_i^+(h)$ and $N_i^-(h)$ on $\mathbf{1}\{i \in T\} \longrightarrow \gamma^+, \gamma^-$ (extensive margins),
3. $C_i^+(h)$ and $C_i^-(h)$ on $\mathbf{1}\{i \in T\} \longrightarrow \lambda^+, \lambda^-$ (combined margins).

The intensive margins are then obtained residually using $\overline{dp^j}$ and $\overline{fr^j}$ computed from the pre-tariff period.

J U.S.-import exposure

When Canadian imports of a given product from the United States are tariffed, Canadian retailers may have less scope to substitute toward third-country suppliers. If that is the case, the tariff is expected to push retail prices up by more. Conversely, products with a low U.S. share of imports already have non-U.S. alternatives that can absorb the shock, so the tariff should translate into a smaller retail price response. In this Section, we analyze this channel by comparing the effects of the retaliatory tariffs on retail prices of products with high vs. low pre-tariff exposure to U.S. imports.

For each HS8 product code, we measure the U.S. share of total Canadian imports pre-tariff (variable `share_value_hs8` in the panel) based on Canadian International Merchandise Trade data.[11] We define U.S.-import exposure dummy as

$$d_i^{\text{US}} = \mathbb{1}\{\texttt{share\_value\_hs8}_i \geq \text{median}(\texttt{share\_value\_hs8})\},$$

with the median taken across the set of unique HS8 codes that appear in the panel (so each HS8 enters the cutoff once, regardless of how many products map to it). Products with $d_i^{\text{US}} = 1$ are the "high U.S. share" subgroup—those that, pre-tariff, sourced an above-median share of Canadian imports from the United States. The remaining treated products form the "low U.S. share" subgroup with $d_i^{\text{US}} = 0$. Observations with `share_value_hs8` missing are excluded.

[11] Data are available here: https://www150.statcan.gc.ca/n1/pub/71-607-x/2021004/imp-eng.htm.

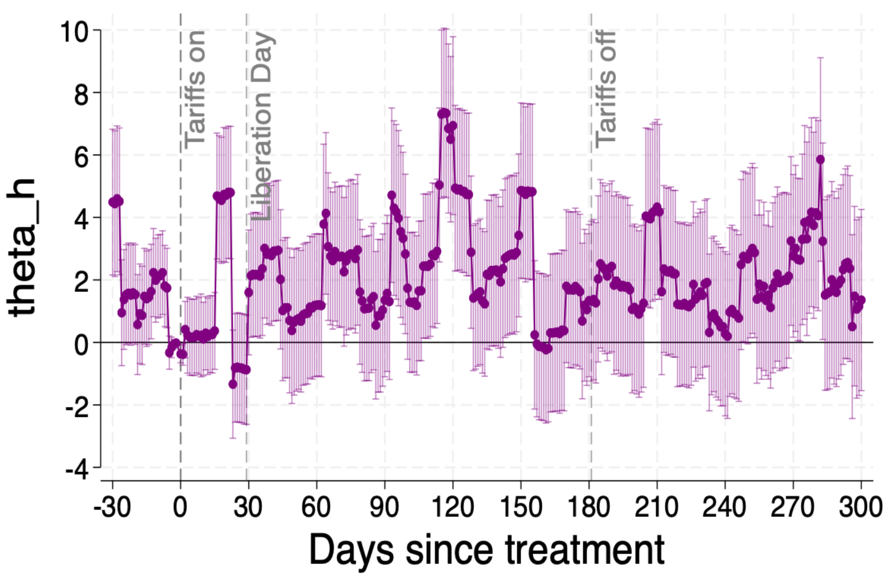
We estimate the main paper's specification (1) augmented with an interaction term for d_i^{US}:

$$100\left[\ln p_{i,t+h} - \ln p_{i,t-1}\right] = \beta_{0,h}\, D_{it} + \theta_h\, D_{it} \cdot d_i^{\text{US}} + \varphi_h d_i^{\text{US}} + \sum_{r \in \mathcal{R}} \beta_{r,h}\, D_{it} \cdot \mathbb{1}\{R_i = r\} + \sum_{c \in \mathcal{C}} \gamma_{c,h}\, D_{it} \cdot \mathbb{1}\{C_i = c\} + \delta_{rt}^{(h)} + \delta_{ct}^{(h)} + \varepsilon_{i,t}^{(h)}. \quad \text{(J.1)}$$

The only modification relative to (1) is the term $\theta_h\, D_{it} \cdot d_i^{\text{US}} + \varphi_h d_i^{\text{US}}$. The retailer- and CPI-category-specific coefficients $\beta_{r,h}$ and $\gamma_{c,h}$ are common to both subgroups, and the retailer×day and category×day fixed effects are also shared. The treatment indicator D_{it} identifies the Imported Tariffed group; the control group is Domestic Non-Substitutes, as in the main paper. Figure J1 plots the interaction coefficient $\hat{\theta}_h$ across horizons, and

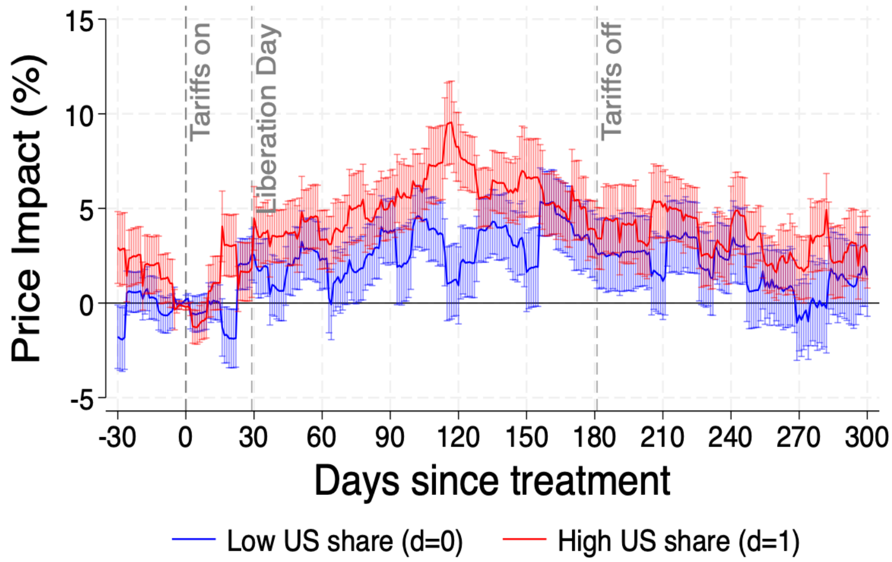
Figure J2 plots the two pass-through curves with their 95% confidence bands.

Figure J1. Additional price effect of tariffs on HS8 products with high exposure to U.S. imports



Note: Figure plots the estimated interaction coefficient $\hat{\theta}_h$ from equation (J.1): the difference in pass-through between high- and low-U.S.-share subgroups, holding the retailer and COICOP composition fixed at the regression averages. Horizontal solid line at zero: where the 95% CI band does not cross zero, the additional pass-through to the high-U.S.-share subgroup is statistically significant.

Figure J2. Pass-through by U.S.-import-share subgroup



Note: Figure plots estimated price effects $\hat{\beta}_h^{d=0}$ (low U.S. share, blue) vs. $\hat{\beta}_h^{d=1}$ (high U.S. share, red), with 95% confidence intervals. The high-share curve sits clearly above the low-share curve from $h \approx 30$ onwards. Vertical dashed lines: March 4 (tariff onset), April 2 (U.S. "Liberation Day"), and September 1 (tariff removal).

Quantitatively, the high-U.S.-share subgroup (red) shows markedly stronger pass-through: it peaks at about 9.5% around $h \approx 115$ (roughly four months after the tariff), against a much more muted response for the low-U.S.-share subgroup (blue), which peaks around 5% and somewhat later. The gap is largest near the high-share peak, where the interaction coefficient $\hat{\theta}_h$ in Figure J1 reaches about 7 percentage points ($t \approx 5.3$): the additional pass-through to products that were already heavily sourced from the U.S. pre-tariff is large and statistically significant. After the tariff is removed (September 1), both subgroup curves converge and $\hat{\theta}_h$ falls back toward zero, consistent with the heterogeneity being driven by the active retaliatory tariff rather than by a permanent compositional difference.

K Inventories and tariff effects

This section relates inventory statistics at the NAICS retail-trade level and at the product level (within Food) to the time-to-peak of pass-through.

K.1 Data and constructed variables

NAICS retail trade. Statistics Canada's Annual Retail Trade Survey, Table 20-10-0083-01 (https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2010008301), reports annual financial estimates for 2022–2024 by NAICS retail category. For each category c and year y, let $\text{open}_{c,y}$ denote the opening inventory, $\text{close}_{c,y}$ denotes the closing inventory, and $\text{cogs}_{c,y}$ denotes the cost of goods sold (COGS). We construct:

$$\text{avg\_inventory}_{c,y} = \tfrac{1}{2}\big(\text{open}_{c,y} + \text{close}_{c,y}\big), \tag{K.1}$$

$$\text{turnover}_{c,y} = \text{cogs}_{c,y} \;/\; \text{avg\_inventory}_{c,y}, \tag{K.2}$$

$$\text{days\_of\_inventory}_{c,y} = 365 \;/\; \text{turnover}_{c,y}, \tag{K.3}$$

where days of inventory measures the average number of days a unit of stock remains in the pipeline before being sold. Table K1 reports the raw and constructed series for 2024, the most recent year available.

K.2 Cross-category evidence: pass-through and inventory cycles

For each of NAICS retailer category (Table K1), we assign a 1-digit COICOP category. For each COICOP, we then compute the average (mean) days of inventory (each retailer's value averaged over 2022–2024). Table K2 reports the days of inventory and the corresponding time to the peak of the tariff effect (h_{peak}) in Figure 5 in the main text.

We exclude COICOP 600 (Health) as a strong outlier (low DOI but very late peak) and COICOP 800 (Communication) due to the lack of a clean NAICS retail match. Figure K1 plots the relationship for the six remaining categories, with Pearson correlation of $\rho = +0.354$, indicating that categories with larger inventory stocks had longer time to the peak of the tariff price effect.

Table K1. Retail trade statistics by NAICS category, 2024.

	Raw financial variables (B CAD)								Margins (%)		Constructed		
NAICS retail category	Sales	Revenue	Open. inv.	Purch.	Close. inv.	COGS	Labour	Op. exp.	Gross	Op. prof.	Avg inv. (B CAD)	Turn. (x)	Days inv.
Automotive parts, accessories and tire retailers	15.5	16.5	3.2	10.5	3.2	10.4	2.7	5.0	37.0	6.5	3.2	3.2	113
Beer, wine and liquor retailers	24.9	25.1	2.7	14.8	2.7	14.8	2.0	3.6	40.8	26.3	2.7	5.5	66
Building material and garden equipment and supplies dealers	47.5	49.0	9.9	32.6	9.6	32.9	7.1	13.2	32.8	5.9	9.8	3.4	108
Cannabis retailers	–	5.6	–	–	–	–	–	–	–	–	–	–	–
Clothing and clothing accessories retailers	36.7	37.4	6.5	19.3	6.5	19.3	6.2	14.8	48.4	8.7	6.5	3.0	124
Convenience retailers and vending machine operators	8.8	9.0	0.7	7.2	0.6	7.2	0.8	1.5	19.9	3.8	0.7	11.1	33
Electronics and appliances retailers	20.0	20.7	2.2	15.2	2.3	15.1	2.3	4.6	27.0	4.7	2.3	6.6	55
Floor covering, window treatment & home furnishing	9.0	9.4	1.4	5.2	1.4	5.2	1.7	3.6	44.8	6.6	1.4	3.6	102
Fuel dealers	6.8	6.9	0.2	5.4	0.2	5.4	0.5	1.2	21.5	4.8	0.2	25.8	14
Furniture retailers	14.6	15.0	2.5	8.7	2.4	8.8	2.0	5.2	41.4	6.6	2.5	3.6	102
Gasoline stations	76.2	77.8	3.5	66.3	4.1	65.7	2.5	7.0	15.5	6.5	3.8	17.2	21
General merchandise retailers	106.3	108.1	11.8	82.1	11.7	82.2	9.6	19.2	23.9	6.1	11.8	7.0	52
Health and personal care retailers	78.4	80.8	7.8	51.5	8.1	51.2	11.3	25.2	36.6	5.4	8.0	6.4	57
Jewellery, luggage and leather goods retailers	5.7	5.8	1.7	3.2	1.7	3.2	0.8	2.1	45.7	10.5	1.7	1.9	196
Miscellaneous retailers	31.5	32.7	3.9	19.5	3.9	19.5	5.2	10.8	–	–	3.9	5.0	72
New car dealers	178.0	186.7	28.8	160.4	29.7	159.5	11.7	20.9	14.6	3.4	29.2	5.5	67
Other motor vehicle dealers	13.9	14.8	6.4	11.3	6.6	11.2	1.6	2.9	24.5	4.9	6.5	1.7	213
Shoe retailers	4.6	5.1	1.3	2.7	1.4	2.5	0.9	2.0	50.7	10.7	1.4	1.8	197
Specialty food retailers	11.8	12.1	0.7	7.3	0.7	7.3	2.3	4.2	39.9	5.4	0.7	9.8	37
Sporting goods, hobby, musical instrument & book retailers	16.4	16.7	4.8	10.0	4.6	10.2	2.6	5.5	38.9	6.0	4.7	2.2	167
Supermarkets and other grocery retailers	108.6	113.3	5.5	81.8	3.7	83.5	12.4	26.3	26.3	3.0	4.6	18.2	20
Used car dealers	21.9	22.2	3.4	19.1	3.2	19.4	1.1	2.4	13.0	2.3	3.3	5.9	61

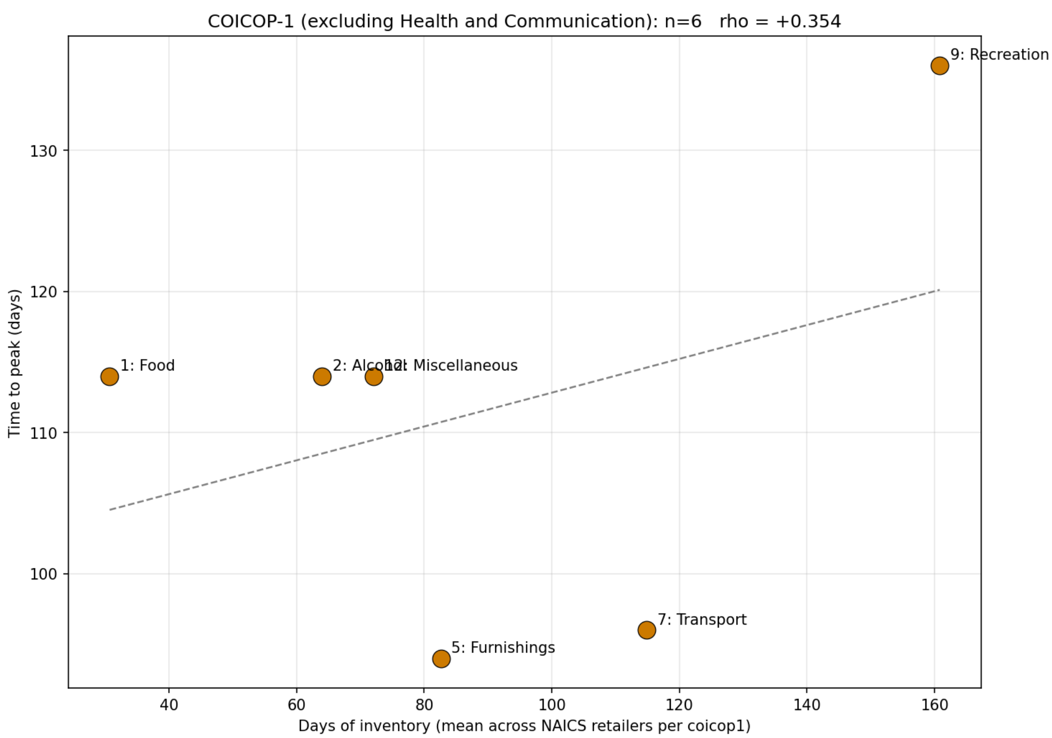
Note: 2024 values from Statistics Canada Table 20-10-0083-01 and are flagged as preliminary by the source. Dollar amounts converted from thousands to billions of CAD (divided by 10^6). Sales = Sales of goods for resale; Revenue = Total operating revenue; Open./Close. inv. = Opening/Closing inventory; Purch. = Purchases; COGS = Cost of goods sold; Labour = Total labour remuneration; Op. exp. = Total operating expenses (excluding COGS); Gross = Gross margin; Op. prof. = Operating profit margin. Avg inv., Turn., and Days inv. are constructed as defined in equations (K.1)–(K.3). "–" denotes values suppressed (x) or unreliable (F) in the source.

Table K2. Pass-through timing by COICOP category and matched retail trade inventory cycle.

COICOP	Category	NAICS retailers (days of inventory)	Mean DOI	h_{peak}
100	Food and non-alcoholic bev.	Convenience retailers & vending (30); Specialty food retailers (39); Supermarkets (23)	30.7	114
200	Alcoholic bev., tobacco, narcotics	Beer, wine and liquor retailers (64)	64.0	114
500	Furnishings and household equip.	Building material & garden (105); Electronics & appliances (55); Floor covering, window treatment & home furnishing (102); Furniture (96); General merchandise (54)	82.6	94
700	Transport	Automotive parts, accessories & tire retailers (115)	114.9	96
900	Recreation and culture	Sporting goods, hobby, musical instrument, book retailers & news dealers (161)	160.8	136
1200	Miscellaneous goods and services	Miscellaneous retailers (72)	72.1	114
Categories excluded from the cross-section analysis (see notes):				
600	Health	Health & personal care retailers (57)	57.3	180
800	Communication	— (no clean NAICS retail match)	—	157

Note: h_{peak} is the horizon (in days from March 4, 2025) at which the LP-DiD coefficient reaches its maximum in Figure 5. "Mean DOI" is the simple mean of days of inventory across the assigned NAICS retailers in the third column.

Figure K1. Time-to-peak pass-through versus days of inventory: COICOP categories.



Note: Horizontal axis: mean days of inventory across the NAICS retailers assigned to each COICOP (Table K2). Vertical axis: h_{peak} (horizon at which the LP-DiD coefficient reaches its maximum in Figure 5). Sample excludes COICOP 600 (Health) and 800 (Communication). Pearson correlation $\rho = +0.354$ ($n = 6$).

K.3 Within-Food evidence: product-level shelf life from USDA FoodKeeper

So far, we used variation in average inventory stocks for retailers selling goods in different 1-digit COICOP categories. In this Section, we exploit variation of perishability of food products, i.e., we use variation across products within a 1-digit COICOP category for Food. We use a product-level proxy of perishability from the USDA FoodKeeper dataset (https://www.foodsafety.gov/keep-food-safe/foodkeeper-app), which reports recommended shelf life for 661 individual food products in three storage modes (pantry, refrigerate, freeze). We classified each product to one of the eleven food 3-digit COICOP categories using its name, sub-category, and keywords.

For each 3-digit food COICOP we compute the mean refrigerate shelf life across its products. COICOP 121 (Coffee, tea and cocoa) is excluded throughout because no FoodKeeper product has refrigerate data for this category; we report the cross-section both with and without COICOP 118 (Sugar/preserves), whose mean rests on a single product.

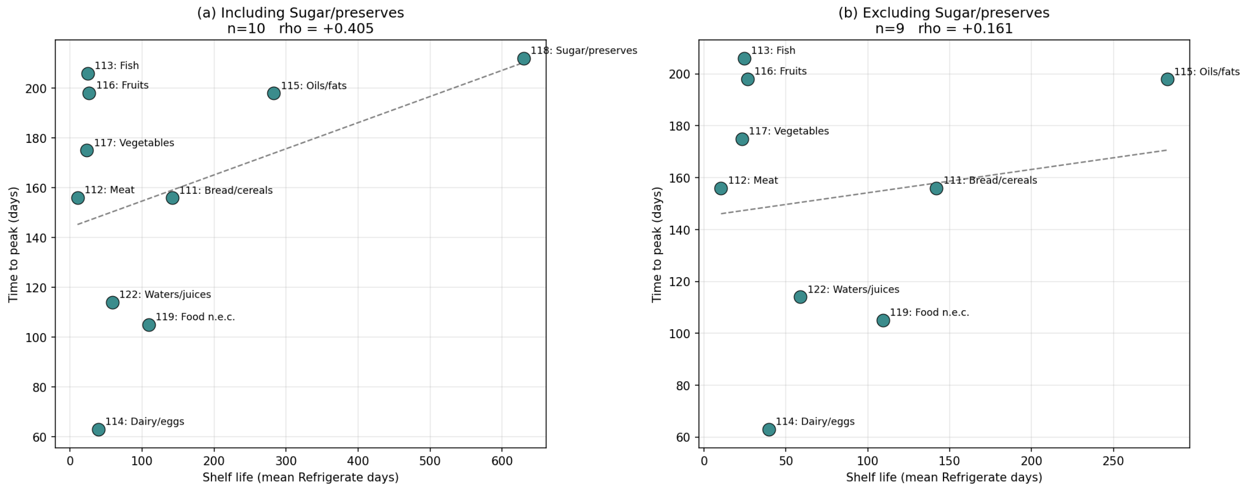
Table K3. Within-Food (COICOP=100): product-level refrigerate shelf life and time-to-peak.

COICOP	Sub-category	# products	Mean refrig. shelf (days)	h_{peak}
112	Meat	117	10.4	156
117	Vegetables	60	23.2	175
113	Fish and seafood	27	24.5	206
116	Fruits	35	26.5	198
114	Milk, cheese and eggs	34	39.5	63
122	Mineral waters, soft drinks and juices	6	58.8	114
119	Food products n.e.c.	65	109.3	105
111	Bread and cereals	11	141.9	156
115	Oils and fats	6	282.9	198
118†	Sugar, jam, honey, chocolate and confectionery	1	630.0	212
Excluded throughout (no FoodKeeper products with refrigerate shelf life):				
121	Coffee, tea and cocoa	0	—	104

Note: Shelf life by 3-digit COICOP for Food, computed from USDA FoodKeeper as the mean refrigerate-storage shelf life across products in each category. Categories are sorted by ascending shelf life. The # products column reports the number of FoodKeeper products in that category that have a non-missing refrigerate shelf-life value. COICOP 121 (Coffee, tea and cocoa) is excluded throughout because FoodKeeper provides no refrigerate shelf life for these products. The dagger (†) on COICOP 118 marks that the category-level mean rests on a single product; we present the cross-section both with COICOP 118 and without it (Figure K2). h_{peak} is the days to peak response computed for each 3-digit COICOP using specification 1 in the main text.

Figure K2 plots h_{peak} against the mean refrigerate shelf life: $\rho = +0.405$ with all ten categories (panel (a)) and $\rho = +0.161$ when Sugar/preserves is dropped (panel (b)).

Figure K2. Time-to-peak versus FoodKeeper refrigerate shelf life for food.



Note: Panel (a) all ten 3-digit food COICOP categories with refrigerate data (excludes only 121 Coffee/tea), Pearson correlation $\rho = +0.405$ ($n = 10$). Panel (b) restricts the sample to the nine categories with at least six FoodKeeper products with refrigerate data (also drops 118 Sugar/preserves), Pearson correlation $\rho = +0.161$ ($n = 9$). COICOP 118 (Sugar/preserves) is the rightmost point in panel (a) and contributes substantially to the slope.

The relationship is positive in both samples: price effects for short-shelf products (Dairy, shelf-life $\sim$ 40 days, peak at 63 days) peak earlier than for long-shelf products (Sugar, shelf-life $\sim$ 630 days, peak at 212 days; Oils/fats, shelf-life $\sim$ 283 days, peak at 198 days).

References

Amiti, Mary, Stephen J. Redding, and David E. Weinstein. 2019. "The Impact of the 2018 Tariffs on Prices and Welfare." *Journal of Economic Perspectives* 33 (4):187–210.

Calvo, Guillermo A. 1983. "Staggered Prices in a Utility-Maximizing Framework." *Journal of Monetary Economics* 12 (3):383–398.

Cavallo, Alberto, Gita Gopinath, Brent Neiman, and Jenny Tang. 2021. "Tariff Pass-Through at the Border and at the Store: Evidence from US Trade Policy." *American Economic Review: Insights* 3 (1):19–34.

Cavallo, Alberto, Paola Llamas, and Franco M. Vazquez. 2025. "Tracking the Short-Run Price Impact of U.S. Tariffs." NBER Working Paper 34496, National Bureau of Economic Research.

Dube, Arindrajit, Daniele Girardi, Òscar Jordà, and Alan M. Taylor. 2025. "A Local Projections Approach to Difference-in-Differences." *Journal of Applied Econometrics* 40 (7):741–758.

Klenow, Peter J. and Oleksiy Kryvtsov. 2008. "State-Dependent or Time-Dependent Pricing: Does It Matter for Recent U.S. Inflation?" *The Quarterly Journal of Economics* 123 (3):863–904.

Macklem, Tiff. 2026. "Structural change—Canada at a crossroads." Speech presented at the Empire Club of Canada. Toronto, Ontario.