

The Production Network Amplification of Retaliatory Tariffs

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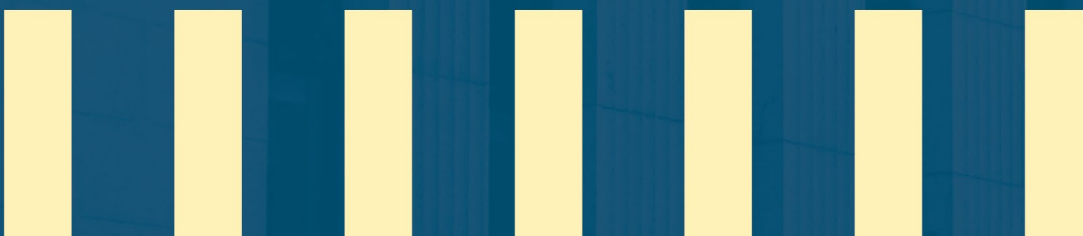
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The Production Network Amplification of Retaliatory Tariffs*

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Abstract

We develop a framework to quantify how tariff changes on imported goods affect sectoral and aggregate consumption prices through direct and production-network channels. Using Canada's input-output matrix and administrative firm-good import data for the universe of Canadian firms, we estimate price elasticities for tariffs on U.S.-imported goods. Tariffs on machinery and equipment and transport equipment generate the largest effects on final prices, reflecting their widespread use as intermediate inputs. On average, two-thirds of the total price response stems from higher intermediate input costs passing through domestic supply chains. Applying the framework to Canada's 2025 counter-tariffs, we estimate consumption price increases of 1.56 and 0.72 percentage points for the pre- and post-September 2025 phases, respectively; alternative packages of equal import value could reduce aggregate price effects by three to seven times. A hypothetical CUSMA breakdown reverting to MFN tariffs would raise final-good prices by 0.64 percentage points.

JEL: F13, F14, D57, E31

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1 Introduction

Recent trade tensions have spurred new analysis of the effect of increased tariffs on prices and economic activity. In March and April 2025, the U.S. announced increased tariffs for a significant fraction of its imports. Countries subject to these tariffs have responded with counter-tariffs on U.S.-imported goods. For example, Canada announced a series of retaliatory measures imposing a 25 percent tariff on a number of goods imported from the U.S. In September 2025, some of these tariffs were lifted, but an important fraction of tariffs on steel, aluminium, and motor vehicles remained. In parallel, the Canada-U.S.-Mexico trade agreement (CUSMA/USMCA) is due to be reviewed in 2026, in a context where tariffs could undergo further substantial changes.

We propose a framework to quantify the impact of tariff changes on sectoral and aggregate final consumption prices. Tariffs are levied on goods, which can affect consumer prices through two channels. First, goods consumed directly by households experience immediate price changes following a tariff shock. Second, goods used as intermediate inputs in production transmit cost increases downstream, ultimately accumulating into the prices of final goods. We exploit the production network structure embedded in the economy's input-output matrix to capture both the direct and indirect effects of tariffs on final consumption prices. To identify which goods are affected and measure these effects precisely, we use detailed administrative data at the firm-good level covering the universe of Canadian importers.

We compute final price elasticities for tariffs at the level of U.S.-imported goods. To isolate the impact of tariff shocks, we assume that markups and non-intermediate input costs remain unaffected by tariffs. The linearity of the framework allows us to evaluate any trade scenario by aggregating good-level elasticities and to decompose total price effects into their direct and indirect components. These assumptions allow us to isolate the impact of tariff shocks, while recognizing that our measure provides an upper bound on these effects and that general equilibrium effects may mitigate the final impact.

Our findings show that tariffs on machinery and equipment and on transport equipment have the largest impact on final consumption prices. These are goods that have a large import share across different Canadian production sectors. Our results also show that, on average across different good categories, indirect effects account for about two-thirds of the total effect following tariff changes. The share explained by indirect effects depends on the centrality of sectors that import that particular good, as well as on how much of that sector's production flows back into the economy's supply chain rather than being used for final consumption. These results underscore the need to account for production network effects when quantifying the effects of tariff shocks.

The pre- and post-September 2025 phases of Canadian counter-tariffs would have increased the price of final consumption by 1.56 and 0.72 percentage points, respectively. This response reflects the direct-indirect composition of tariff elasticities: about two-thirds of the total effect is explained by production network effects. However, we also find that these tariff packages do not minimize the impact on aggregate prices. To show this, we compute the responses to alternative packages that levy tariffs affecting the same value of imports, but that would minimize the impact on aggregate prices. These alternative packages cut the aggregate impact by a margin between three and seven times.

In the context of the ongoing CUSMA review process, we estimate the effects of a potential collapse of the agreement, under which Canadian tariffs on U.S. goods would revert to most-favored-nation rates. In this scenario, all U.S. imports would face tariffs, but for most goods, these rates would remain well below the 25 percent counter-tariffs announced in 2025. As a result, the total effect on final-good prices would be 0.64 percentage points.

Finally, and in addition to our quantitative analysis, we construct import-level data that may be of independent interest. Given that our raw data contains good-level import data for the universe of Canadian firms, we compute the shares of U.S.-imported goods

used as intermediate inputs aggregated at the 2-digit NAICS level. This information could be exploited by researchers when conducting further analysis.

Related Literature This paper speaks to three related strands of the literature. The first studies the incidence and welfare effects of recent tariff increases. [Amiti, Redding and Weinstein \(2019\)](#) and [Fajgelbaum, Goldberg, Kennedy and Khandelwal \(2020\)](#) show that the 2018–19 U.S. tariffs on Chinese goods were passed through almost one-for-one to import prices, implying that domestic consumers and firms bore most of the burden. [Fajgelbaum, Goldberg, Kennedy, Khandelwal and Taglioni \(2024\)](#) summarize this evidence and conclude that the trade war reduced real income in both the United States and China. More recently, focusing on Canada’s 2025 retaliatory tariffs on U.S. goods, [Cavallo, Kostyshyna, Kryvtsov and Vieyra \(2026\)](#) document substantial retail-price pass-through for tariffed products, with limited spillovers to untariffed goods, providing new evidence on the transmission of retaliatory tariffs to consumer prices in a non-U.S. setting.

The second literature emphasizes the role of supply chains and production networks in transmitting tariff shocks, and how that transmission goes beyond the direct effects on affected goods. Focusing again on the 2018–19 U.S.-China trade war, [Cavallo, Gopinath, Neiman and Tang \(2021\)](#) find that downstream retail-price adjustments were more muted than border-price adjustments, suggesting that margins and distribution sectors partly absorb tariff shocks. [Handley, Monarch and Kamal \(2024\)](#) show that tariffs disrupted buyer-supplier relationships and affected exports through imported-input linkages. More broadly, [Antràs and Chor \(2022\)](#), [Baqae and Rubbo \(2023\)](#), and [Luo and Villar \(2023\)](#) highlight that input-output linkages are central to the propagation of cost shocks across sectors and to their aggregate consequences. Our paper is closely related to this strand because it quantifies how tariff shocks propagate through Canada’s production network, rather than only through directly affected consumer goods.

The third, more recent literature quantifies the inflationary effects of tariffs using input-output methods. [Barbiero and Stein \(2025\)](#) show that tariff effects on prices depend not only on households’ direct purchases of imported goods but also on the imported content of domestically produced final goods. [Antonova, Huxel, Matvieiev and Müller \(2025\)](#) study the propagation of tariff shocks on U.S. output and inflation using a New Keynesian model with a production network and find stagflationary effects associated with the 2025 tariffs.

Our paper contributes to this literature in two ways. First, we develop a framework to quantify the effect of tariff changes on sectoral and aggregate final consumption prices by combining detailed good-level import data with an input-output structure that captures both direct and indirect exposure to tariffs. Relative to reduced-form studies of retail pass-through, our approach is designed to measure economy-wide price exposure, including the role of intermediates in transmitting tariff shocks downstream. Second, we focus on the recent U.S.-Canada tariff episode and the Canadian retaliatory measures.

Paper Outline The remainder of the paper is organized as follows. [Section 2](#) outlines the our framework and [Section 3](#) describes the data. Later, [Section 4.1](#) presents measures of tariff elasticities at the good level and discusses how to decompose these elasticities into direct and indirect effects. [Section 4.2](#) examines different counterfactual tariff scenarios. Finally, [Section 5](#) concludes.

2 Framework

2.1 Setup

We model the Canadian economy as a static small open economy in which final consumption goods are produced by bundling intermediate inputs from S sectors. A competitive final goods sector operates with the technology

$$Y = \prod_{s=1}^S y_s^{\gamma_s}, \quad (1)$$

where γ_s is the share of sector s goods in the final consumption basket and $\sum_{s=1}^S \gamma_s = 1$.

Representative producers in each intermediate goods sector source inputs from domestic intermediate sectors, from the U.S., or from the rest of the world (ROW) to produce using a Cobb-Douglas technology:

$$y_s = \left(\prod_{s'} x_{CA, s, s'}^{\omega_{s, s'}^{CA}} \right)^{\alpha_s^{CA}} \times \left(\prod_g x_{US, s, g}^{\omega_{s, g}^{US}} \right)^{\alpha_s^{US}} \times \left(\prod_g x_{ROW, s, g}^{\omega_{s, g}^{ROW}} \right)^{\alpha_s^{ROW}} \times x_{Others, s}^{1 - \alpha_s^{CA} - \alpha_s^{US} - \alpha_s^{ROW}} \quad (2)$$

where $x_{CA, s, s'}$ denotes the quantity of intermediate inputs purchased by sector s from domestic sector s' , $\omega_{s, s'}^{CA}$ is the corresponding share within domestic input purchases, and $\sum_{s'=1}^S \omega_{s, s'}^{CA} = 1$ for each s . Likewise, $x_{US, s, g}$ denotes the quantity of imported intermediate good g from the U.S. used by sector s , with within-U.S.-imports shares $\omega_{s, g}^{US}$ satisfying $\sum_{g=1}^G \omega_{s, g}^{US} = 1$ for each s ; $x_{ROW, s, g}$ denotes the quantity of imported intermediate good g from the rest of the world, with $\sum_{g=1}^G \omega_{s, g}^{ROW} = 1$; and $x_{Others, s}$ denotes all the other inputs (e.g., labor and other operating costs) used by sector s . The parameters α_s^{CA} , α_s^{US} , and α_s^{ROW} are the sector- s expenditure (cost) shares on domestic, U.S.-imported, and ROW-imported intermediate input bundles, respectively. Indices $s, s' \in \{1, \dots, S\}$ refer to sectors and $g \in \{1, \dots, G\}$ refers to the types of imported goods.

2.2 Implied Price Effects

Under the Cobb-Douglas aggregation technology, the cost minimization would imply that the changes in the price of a sector s , denoted by Δp_s , can be decomposed as the sum of changes in the sector's markup over costs, $\Delta \mu_s$, and changes in the sector's

costs, which can be further decomposed into changes in non-intermediate input costs, $\Delta p_{Others, s}$, changes in the price of imported inputs from the rest of the world $\Delta p_{ROW, g}$ and from the U.S. $\Delta p_{US, g}$, and changes in the cost of intermediate inputs from other domestic sectors s' , $\Delta p_{s'}$.

We assume that (i) markups remain constant, and the tariffs are fully passed through to input costs ($\Delta \mu_s = 0$); that (ii) non-intermediate input and the imported goods from the rest of world costs are not affected by tariffs ($\Delta p_{Others, s} = 0$); that (iii) there is no change in the cost of importing goods from countries other than the U.S. $\Delta p_{ROW, g} = 0$; and that (iv) firms do not substitute the mix of intermediate goods, or the sourcing of their U.S. imported inputs. In this way, we can isolate the cost pass-through to sectoral prices from Canadian tariffs on U.S.-imported goods. General equilibrium effects could attenuate this response, e.g., as firms adjust their input demand or households rebalance their consumption basket. Therefore, the measure we provide below offers an upper bound on the effects of tariffs on sectoral prices and inflation.

Sector-Level Price Changes Changes in tariffs of U.S. imported good g , $\Delta \tau_g^{US}$, have a direct impact on the prices of sector s . In addition, there will be a series of indirect effects as changes in the prices of sector s are further passed through to other sectors that utilize sector s 's output as intermediate inputs in their production. Therefore, the effect of increased tariffs on sector-level prices will depend on the extent to which a sector imports intermediate goods (direct effect) and the extent to which a sector supplies intermediate goods to other sectors (indirect effect). More explicitly, the change in price of domestically produced goods in sector s , Δp_s , can be decomposed as

$$\Delta p_s = \underbrace{\alpha_s^{US} \times \sum_{g=1}^G \omega_{s,g}^{US} \Delta \tau_g^{US}}_{\text{Direct effect from U.S. imports}} + \underbrace{\alpha_s^{CA} \times \sum_{s'=1}^S \omega_{s,s'}^{CA} \Delta p_{s'}}_{\text{Indirect effect from domestic production network}}. \quad (3)$$

Impacts of Changes in Tariffs $\Delta\tau_g$ on Aggregate prices With the above equations, we can solve the equilibrium sector-level price changes $\Delta\vec{p} \equiv [\Delta p_1, \Delta p_2, \dots, \Delta p_S]$ as

$$\Delta\vec{p} = \left[\mathbf{I} - A^{CA} \cdot \Omega_{\text{by sector}}^{CA} \right]^{-1} \cdot \left[A^{US} \cdot \Omega_{\text{by good}}^{US} \right] \cdot \Delta\vec{\tau}^{US} \quad (4)$$

where $\mathbf{I}$ is an identity matrix, A^{CA} and A^{US} are diagonal matrices with the shares of domestically produced products and U.S. imports in total intermediate inputs for each sector, respectively. Likewise, $\Omega_{\text{by sector}}^{CA}$ and $\Omega_{\text{by good}}^{US}$ are the matrix counterparts of the shares of domestic and imported products used as intermediate inputs ($\omega_{s,s'}^{CA}$ and $\omega_{s,g}^{US}$), and $\Delta\vec{\tau}^{US}$ is a vector with tariff changes at the good-level.

Furthermore, we can decompose sectoral price changes into direct and indirect effects. Direct effects account for the direct impact on each sector's prices arising from the increased cost of intermediate inputs imported into that sector. This is $A^{US} \cdot \Omega_{\text{by good}}^{US} \cdot \Delta\vec{\tau}$. Indirect effects, on the other hand, measure how changes in each sector's prices are passed through to other sectors that use its goods as intermediate inputs in production. These effects are captured by the Leontief inverse in Eq. (4) and can be simplified to $\Delta\vec{p} - A^{US} \cdot \Omega_{\text{by good}}^{US} \cdot \Delta\vec{\tau}$

Having computed the sectoral price changes above, we can then solve for the aggregate price change ΔP as

$$\Delta P = \vec{\gamma} \cdot \Delta\vec{p} \quad (5)$$

where $\vec{\gamma}$ is the vector with the final consumption shares of domestically produced products from each sector.

3 Data

To measure the impact of Canadian tariffs on sectoral and aggregate price changes, we draw on two primary data sources: (i) the Symmetric Input-Output tables produced

by Statistics Canada, and (ii) firm-level administrative data from Statistics Canada's National Accounts Longitudinal Microdata File (NALMF) merged with goods-level import data from Trade by Importer Characteristics - Goods (TIC).¹ The first allows us to map the production network structure of the Canadian economy comprehensively. The second allows us to identify which goods within each industry are subject to tariffs. This distinction matters because while the production network is defined at the industry level, tariffs are levied at the goods level –requiring a more granular data source to determine tariff exposure across industries.

First, the Symmetric Input-Output tables link final and intermediate uses of goods and services across sectors, as well as total intermediate imports by these sectors and the final consumption of domestically produced goods. In particular, we focus on the Input-Output table for 2022, as it is the most recent year with available data. We use these data at basic prices and aggregate industries at the 2-digit NAICS level. Using these data, we can compute the input shares of domestically produced inputs for each sector. Table A1 in Appendix A, summarizes these shares.

Second, we merge firm-level administrative data from Statistics Canada's National Accounts Longitudinal Microdata File (NALMF) and goods-level import data from Trade by Importer Characteristics - Goods (TIC). TIC is compiled by Statistics Canada using administrative records from the Canadian Border Services Agency (CBSA). Using these two data sources for 2022, we compile information on the universe of firms operating in Canada, as well as their imports at the good level. Goods imports are classified under the Harmonized System (HS) at the 8-digit level (tariff line level), allowing us to map specific tariff policies to our framework in detail.

In addition to the results we present in the following section, we also provide data that may be of independent interest. We compile the shares of U.S.-imported goods used as intermediate inputs for each industry. Industries are presented at the 2-digit NAICS level, and goods are summarized using the sections of the Canadian Export

¹Statistics Canada. Table 36-10-0001-01 Symmetric input-output tables, detail level. Available at: <https://doi.org/10.25318/3610000101-eng>

Classification. Using this level of aggregation, [Table 1](#) provides import data for 20 sectors and 21 goods categories.

4 Quantifying the Aggregate Price Effects of Tariffs on Canada’s Imports from the U.S.

4.1 Heterogeneous Impacts Across Imported Goods

There is substantial variation in imported goods across sectors, implying heterogeneity in their exposure to changes in costs or tariffs. Furthermore, sectors vary widely in their linkages to other sectors. In this context, it is useful to understand how sensitive final consumption prices are to changes in good-specific tariffs, and how those tariffs are passed through via the domestic production network. For each type of good, we construct a measure of the elasticity of the price of final consumption with respect to a 1 percent change in tariffs on U.S. imports in that good. [Figure 1](#) reports these elasticities for each corresponding good category and its decomposition between direct and indirect effects.

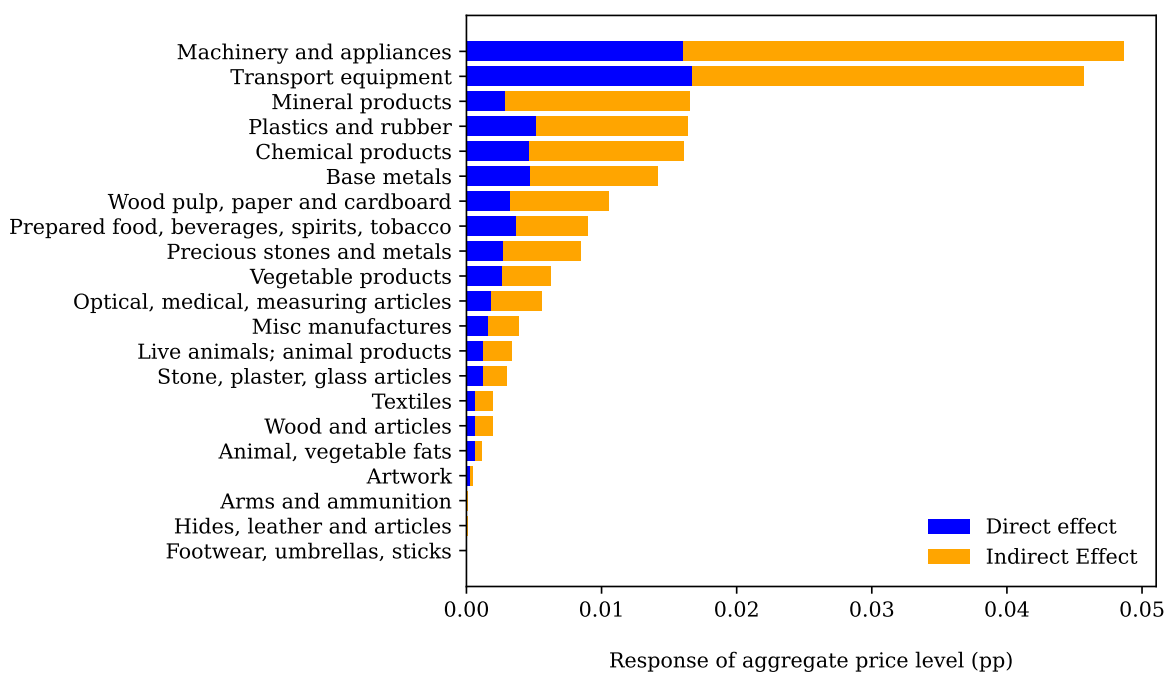
Tariffs on machinery and appliances, and transport equipment have the greatest impact. A 1 percentage point increase in tariffs on these goods roughly leads to a 0.05 percentage point increase in the price of final consumption in both cases. Consequently, a 25 percent tariff on these goods generates a 1.2 percentage points ($25\% \times 0.05$) increase in the prices of final consumption. The higher elasticity to tariffs on U.S. machinery and appliances, and transport equipment arises from significant reliance on U.S. imports (with average import shares of 24 percent and 14 percent across Canadian industries, respectively). However, these import shares do not fully explain the outsized effects of tariffs on machinery and transport goods. Supply chain linkages determine a significant portion of the total effects. Mineral products have an average import share very similar

Table 1: U.S. Goods Import Shares by NAICS 2-Digit Level

Good category (section) →	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Agriculture (11)	0.17	0.17	0.00	0.03	0.00	0.23	0.20	0.00	0.06	0.02	0.00	0.00	0.00	0.00	0.01	0.06	0.04	0.00	0.00	0.00	0.00
Mining (21)	0.00	0.00	0.00	0.00	0.81	0.07	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.05	0.01	0.00	0.00	0.00	0.00
Utilities (22)	0.00	0.00	0.00	0.00	0.88	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.06	0.02	0.01	0.00	0.00	0.00
Construction (23)	0.00	0.00	0.00	0.02	0.01	0.03	0.07	0.00	0.02	0.00	0.02	0.00	0.02	0.00	0.13	0.51	0.08	0.03	0.00	0.05	0.00
Manufacturing (31-33)	0.01	0.02	0.00	0.05	0.03	0.09	0.09	0.00	0.01	0.03	0.01	0.00	0.01	0.04	0.09	0.18	0.30	0.02	0.00	0.01	0.00
Retail trade (40)	0.00	0.04	0.00	0.12	0.04	0.08	0.02	0.00	0.01	0.01	0.01	0.00	0.01	0.03	0.01	0.04	0.50	0.02	0.00	0.05	0.00
Wholesale trade (41)	0.01	0.04	0.00	0.08	0.03	0.18	0.06	0.00	0.01	0.03	0.01	0.00	0.01	0.00	0.08	0.23	0.15	0.04	0.00	0.02	0.00
Transportation and warehousing (48)	0.01	0.01	0.00	0.01	0.09	0.02	0.02	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.04	0.22	0.50	0.03	0.00	0.02	0.00
Information industries (51)	0.00	0.01	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.35	0.01	0.00	0.00	0.01	0.01	0.52	0.00	0.03	0.00	0.03	0.00
Finance and insurance (52)	0.02	0.04	0.00	0.01	0.30	0.01	0.02	0.00	0.01	0.03	0.00	0.00	0.01	0.32	0.03	0.14	0.05	0.01	0.00	0.00	0.00
Real estate (53)	0.02	0.00	0.04	0.04	0.00	0.01	0.04	0.00	0.01	0.00	0.00	0.00	0.05	0.00	0.07	0.38	0.26	0.04	0.00	0.02	0.01
Professional services (54)	0.01	0.00	0.00	0.02	0.00	0.10	0.03	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.04	0.59	0.02	0.15	0.00	0.01	0.01
Management of companies (55)	0.01	0.05	0.00	0.04	0.62	0.05	0.02	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.05	0.07	0.03	0.00	0.00	0.00	0.00
Admin. and support (56)	0.00	0.04	0.00	0.03	0.06	0.09	0.13	0.00	0.01	0.11	0.03	0.00	0.01	0.02	0.06	0.27	0.08	0.02	0.00	0.04	0.00
Educational services (61)	0.01	0.00	0.00	0.00	0.00	0.10	0.01	0.00	0.00	0.09	0.02	0.00	0.00	0.00	0.02	0.24	0.14	0.33	0.00	0.03	0.00
Health care and social assistance (62)	0.00	0.00	0.00	0.00	0.00	0.35	0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.07	0.01	0.36	0.00	0.15	0.00
Arts, entertainment and recreation (71)	0.01	0.00	0.00	0.06	0.00	0.01	0.01	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.01	0.08	0.19	0.01	0.01	0.43	0.15
Accommodation and food services (72)	0.03	0.30	0.00	0.24	0.00	0.01	0.07	0.00	0.00	0.05	0.01	0.00	0.01	0.00	0.01	0.09	0.11	0.00	0.00	0.05	0.00
Other services (81)	0.00	0.01	0.00	0.01	0.00	0.05	0.04	0.00	0.00	0.02	0.04	0.01	0.01	0.00	0.05	0.57	0.11	0.08	0.00	0.01	0.00
Public administration (91)	0.00	0.00	0.00	0.00	0.00	0.20	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.44	0.10	0.13	0.06	0.02	0.00

Note: This table shows how much each sector imports from each good category (section) as a share of its total U.S. imports. Shares are computed by aggregating firm-level data imports for each sector and each group category. NAICS codes for each sector are in parentheses in each row, and the columns denote each goods category section code. See [Table A4](#) for a list of section codes and names.

Figure 1: Good-Specific Elasticity of the Price of Final Consumption: Total Effect and Decomposition



Note: Each bar represents the elasticity of the price of final consumption to a 1 percent tariff on U.S. imports for the corresponding good.

to that of transport equipment, but their imports are mostly concentrated in the mining sector.

Importantly, indirect effects account for nearly two-thirds of the total elasticity on average, underscoring the importance of incorporating supply chain linkages into tariff pass-through analysis. [Table A2](#) reports two sectoral centrality measures. Out-degree centrality measures the upstream importance of a sector by identifying sectors that are important suppliers to other sectors. We compute this measure by adding cost shares across sectors. Eigenvector centrality extends the out-degree centrality measure by considering the recursive upstream importance, i.e., by quantifying how important a sector is as a supplier to other supplier-important sectors.

Sectors with higher centrality measures, such as manufacturing, are key drivers of the transmission of tariff (and other) shocks, and tariff changes affecting the goods they import the most generate stronger spillovers on other sectors and on the price of final consumption. Consequently, when certain types of goods are imported by sectors with high centrality, indirect effects account for a larger share of the total effect. On top of this, sectors with a lower share in the final consumption basket have smaller direct effects. For example, when tariffs are levied on mineral products, indirect effects account for 83 percent of the total impact, as these goods are primarily imported by firms in the mining sector – a sector with relatively high centrality and a low share in the final consumption basket.

4.2 Aggregate Price Effects in Alternative Scenarios

We can also exploit our framework to quantify the effects of detailed trade scenarios at the specific tariff-line level (8-digit HS codes) on aggregate prices. We study the price impact of three sets of scenarios summarized in [Table 2](#). First, we examine the impact of the two phases of Canadian counter-tariffs. These tariffs were announced in response to U.S. tariffs effective as of March 2025. Second, we solve for the counter-tariffs that minimize the impact on the aggregate price while affecting the same dollar value of U.S.

imports targeted in the two phases of announced counter-tariffs. Finally, we explore the effects of a scenario in which CUSMA is not renewed, and that would bring tariffs to the most-favored-nation (MFN) level.

Canadian counter-tariffs were announced in two phases. The first phase was effective from March to April and remained in effect until August 2025 (pre-September 2025). This phase of tariffs imposed a flat 25 percent tariff on some specific goods in the categories of live animals, vegetable products, animal and vegetable fats, prepared foods, beverages and spirits, chemical products, plastics, hides and leather articles, wood, base metals, and transport equipment, totaling imports for more than C\$95 billion. Most of these tariffs were lifted in the second phase in September 2025 (post-September 2025), with those on base metals and transport equipment remaining.

Our results indicate that the pre-September 2025 phase of Canadian counter-tariffs increases the aggregate price by 1.56 percentage points. Supply chain effects, measured by the indirect effects column, account for almost two-thirds of the total effect, as the total effect comes from a linear combination of the sector-level impacts shown earlier. Post-September 2025, which reduced the targeted imports by about C\$45 billion, reduces the price impact by about half to 0.72 percentage points. To show that targeting the same value of imports does not necessarily generate the same impact on prices, we compute two alternative scenarios with 25 percent flat tariffs that affect the same C\$95 and C\$50 billion imports from phase 1 and 2, but that would generate the minimum effect on prices. The alternative phase 1 scenario reduced the aggregate price impact by more than two-thirds to 0.46 percentage points, while the alternative phase 2 scenario lowers it to just 0.1 percentage points.

Finally, we consider the case in which CUSMA is not renewed, and Canadian tariffs on U.S. goods revert to MFN tariffs. MFN tariffs are normal, non-discriminatory tariffs charged on goods excluded by preferential tariffs under free trade agreements. Under this scenario, most goods are charged tariffs significantly below the 25 percent tariffs imposed in 2025. Therefore, although all goods would be subject to tariffs, the impact

Table 2: Effects on Aggregate Prices under Different Tariff Policies

Scenario	Aggregate price impacts		
	Total	Direct	Indirect
Pre-September retaliatory tariffs ($\approx$ C\$96 billion)			
As announced	1.56	0.55	1.01
Minimum price impact	0.46	0.14	0.31
Post-September retaliatory tariffs ($\approx$ C\$50 billion)			
As announced	0.72	0.24	0.48
Minimum price impact	0.10	0.03	0.08
CUSMA risk ($\approx$ C\$334 billion)			
	0.64	0.23	0.41

Note: Total, direct, and indirect effects on aggregate prices under each scenario are measured in percentage points. The last column reports total imports affected by each scenario in billions of Canadian dollars.

on the aggregate price is 0.64 percentage points, with indirect effects being even larger, and accounting for about three-fourths of the total impact.

5 Concluding Remarks

In this paper, we develop a framework to quantify the effects of tariff changes on sectoral and aggregate final consumption prices. We show that price effects of tariffs cannot be inferred from directly imported consumer goods alone. As imported goods also enter production as intermediate inputs, tariff shocks propagate through input-output linkages and raise the cost of a much broader set of final goods. In the context of the recent Canadian retaliatory measures responding to the U.S. tariff increases, these indirect channels are quantitatively important, accounting for two-thirds of the total price effects.

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Appendix A

Additional Figures and Tables

Table A1: Input-Output Table, NAICS 2-Digit Level

NAICS (code)	11	21	22	23	30	40	41	48	51	52	53	54	55	56	61	62	71	72	81	91
Agriculture (11)	0.29	0.01	0.03	0.02	0.42	0.02	0.04	0.06	0.00	0.03	0.01	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mining (21)	0.00	0.23	0.04	0.04	0.29	0.02	0.07	0.05	0.01	0.05	0.02	0.11	0.01	0.05	0.00	0.00	0.00	0.01	0.01	0.01
Utilities (22)	0.00	0.23	0.04	0.17	0.17	0.02	0.04	0.03	0.03	0.06	0.02	0.13	0.00	0.04	0.00	0.00	0.00	0.01	0.00	0.01
Construction (23)	0.01	0.05	0.00	0.00	0.54	0.03	0.08	0.04	0.00	0.03	0.02	0.14	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.01
Manufacturing (31-33)	0.10	0.18	0.02	0.01	0.50	0.01	0.05	0.06	0.01	0.02	0.01	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Retail trade (40)	0.00	0.02	0.03	0.03	0.10	0.02	0.03	0.09	0.07	0.15	0.17	0.15	0.00	0.09	0.01	0.00	0.01	0.03	0.00	0.02
Wholesale trade (41)	0.00	0.02	0.02	0.01	0.15	0.02	0.03	0.16	0.09	0.10	0.07	0.18	0.00	0.10	0.00	0.00	0.00	0.02	0.00	0.02
Transportation and warehousing (48)	0.00	0.01	0.01	0.05	0.31	0.01	0.03	0.34	0.02	0.05	0.04	0.03	0.00	0.04	0.00	0.00	0.00	0.02	0.02	0.01
Information industries (51)	0.00	0.00	0.01	0.01	0.21	0.02	0.03	0.03	0.35	0.03	0.05	0.12	0.00	0.06	0.01	0.00	0.03	0.02	0.02	0.01
Finance and insurance (52)	0.00	0.00	0.01	0.01	0.03	0.00	0.01	0.02	0.05	0.59	0.02	0.14	0.00	0.06	0.00	0.00	0.00	0.01	0.02	0.02
Real estate (53)	0.00	0.01	0.03	0.26	0.07	0.01	0.02	0.03	0.03	0.17	0.09	0.07	0.00	0.14	0.00	0.00	0.01	0.02	0.02	0.02
Professional services (54)	0.00	0.00	0.01	0.01	0.13	0.02	0.04	0.04	0.10	0.04	0.08	0.31	0.00	0.12	0.01	0.00	0.01	0.04	0.03	0.01
Management of companies (55)	0.00	0.00	0.01	0.01	0.06	0.01	0.02	0.04	0.06	0.12	0.08	0.28	0.00	0.22	0.00	0.00	0.01	0.01	0.03	0.02
Admin. and support (56)	0.00	0.00	0.01	0.02	0.21	0.03	0.05	0.06	0.06	0.05	0.09	0.16	0.00	0.12	0.01	0.00	0.01	0.04	0.06	0.01
Educational services (61)	0.00	0.02	0.04	0.08	0.19	0.02	0.04	0.14	0.07	0.01	0.05	0.10	0.00	0.11	0.02	0.00	0.01	0.04	0.04	0.03
Health care and social assistance (62)	0.00	0.00	0.02	0.02	0.32	0.04	0.07	0.02	0.03	0.02	0.05	0.05	0.00	0.06	0.01	0.18	0.00	0.03	0.04	0.03
Arts, entertainment and recreation (71)	0.00	0.00	0.02	0.03	0.19	0.10	0.04	0.04	0.06	0.04	0.07	0.05	0.00	0.12	0.00	0.00	0.11	0.05	0.04	0.02
Accommodation and food services (72)	0.05	0.00	0.02	0.02	0.48	0.04	0.05	0.04	0.03	0.05	0.08	0.03	0.00	0.05	0.00	0.00	0.01	0.01	0.01	0.01
Other services (81)	0.00	0.01	0.03	0.01	0.32	0.04	0.05	0.06	0.04	0.07	0.10	0.08	0.00	0.10	0.01	0.00	0.01	0.04	0.03	0.02
Public administration (91)	0.00	0.01	0.02	0.04	0.17	0.02	0.04	0.03	0.03	0.04	0.03	0.11	0.00	0.08	0.02	0.29	0.01	0.01	0.01	0.04

Source: Statistics Canada. Table 36-10-0001-01 Symmetric input-output tables at basic prices at the detail level.

Note: Each row represents what fraction of the total intermediate inputs used by a sector is purchased from the sectors in the columns. Industry-level data is aggregated at the 2-digit NAICS level.

Table A2: Sector Centrality Measures, NAICS 2-Digit Level

Sector (NAICS)	Out-degree	Eigenvector
Manufacturing (31-33)	4.86	0.82
Professional services (54)	2.30	0.28
Finance and insurance (52)	1.72	0.27
Mining (21)	0.82	0.22
Transportation and warehousing (48)	1.38	0.21
Admin. and support (56)	1.57	0.15
Information industries (51)	1.13	0.13
Agriculture (11)	0.46	0.12
Wholesale trade (41)	0.84	0.11
Real estate (53)	1.17	0.11
Construction (23)	0.85	0.08
Utilities (22)	0.40	0.05
Retail trade (40)	0.50	0.05
Accommodation and food services (72)	0.40	0.04
Other services (81)	0.38	0.04
Public administration (91)	0.32	0.03
Health care and social assistance (62)	0.50	0.01
Arts, entertainment and recreation (71)	0.23	0.01
Educational services (61)	0.11	0.01
Management of companies (55)	0.04	0.01

Note: Centrality measures computed using the shares of intermediate consumption from the input-output table. Out-degree centrality for sector s is computed as $C_s^{\text{out}} = \sum_{s'} \omega_{s,s'}^{CA}$, and measures how much sector s supplies other sectors (upstream). Eigenvector centrality is computed as the dominant right eigenvector of Ω^{CA} and measures the recursive upstream importance of a sector.

Table A3: Total Share Across Sectors of US Imported Goods

Goods category (section)	Total share
Machinery and appliances (16)	4.81
Mineral products (5)	2.90
Transport equipment (17)	2.70
Chemical products (6)	1.70
Optical, medical, measuring articles (18)	1.31
Misc manufactures (20)	0.95
Plastics and rubber (7)	0.93
Wood pulp, paper and cardboard (10)	0.83
Base metals (15)	0.76
Prepared food, beverages, spirits, tobacco (4)	0.76
Vegetable products (2)	0.73
Precious stones and metals (14)	0.45
Live animals; animal products (1)	0.33
Artwork (21)	0.18
Textiles (11)	0.17
Stone, plaster, glass articles (13)	0.17
Wood and articles (9)	0.15
Arms and ammunition (19)	0.07
Animal, vegetable fats (3)	0.06
Footwear, umbrellas, sticks (12)	0.02
Hides, leather and articles (8)	0.01

Note: Total share across sectors is computed using the U.S. goods import shares from [Table 1](#). For good g , the total share is computed as $I_g = \sum_s \omega_{s,g}^{US}$, and measures the relative importance of a good category as imported input.

Table A4: Section Names (Goods Category) and Codes

Section title	Section number
Live animals; animal products	1
Vegetable products	2
Animal, vegetable fats	3
Prepared food, beverages, spirits, tobacco	4
Mineral products	5
Chemical products	6
Plastics and rubber	7
Hides, leather and articles	8
Wood and articles	9
Wood pulp, paper and cardboard	10
Textiles	11
Footwear, umbrellas, sticks	12
Stone, plaster, glass articles	13
Precious stones and metals	14
Base metals	15
Machinery and appliances	16
Transport equipment	17
Optical, medical, measuring articles	18
Arms and ammunition	19
Misc manufactures	20
Artwork	21

Source: Canadian Export Classification.