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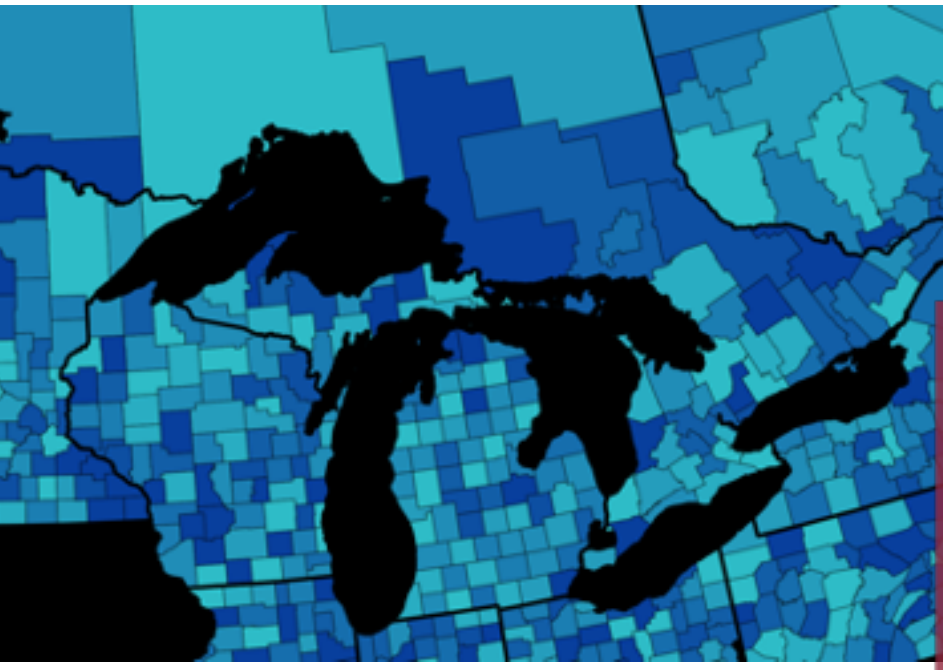

CANADA–U.S. TRADE IN A GLOBALIZED ECONOMY: ELASTICITIES, ASYMMETRIES, AND POLICY IMPERATIVES

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Canada–U.S. Trade in a Globalized Economy: Elasticities, Asymmetries, and Policy Imperatives

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Abstract / Résumé

This study examines the intricate trade interdependencies between Canada and the United States, highlighting how aggregate export–import figures can mask deeper economic realities. Approximately three-quarters of Canadian merchandise exports head to the United States each year, contributing to a bilateral merchandise trade surplus for Canada in the range of 100 to 170 billion Canadian dollars. Yet, when energy products are excluded, the United States shows a small surplus with Canada, illustrating how both sides benefit from specialized cross-border value chains. Analyses of selected sectors demonstrate that a hypothetical 25 percent tariff on Canadian goods would translate into lost export revenue for Canada, but it would also raise production costs for many U.S. manufacturers dependent on Canadian imports.

Despite Canada's smaller economy, the potential for economic harm runs in both directions. Automakers in Michigan and Ohio, for instance, rely on numerous Canadian inputs that cross the border multiple times, and integrated refiners on the Gulf Coast often process crude oil from Alberta. Inelastic supply chains amplify these vulnerabilities: short-run elasticity estimates indicate that energy flows might see only a 2 percent immediate reduction under a 10 percent tariff, yet over a longer horizon, both sides risk further setbacks if either country shifts to alternative markets. On both sides, adjustments to cross-border barriers are neither simple nor immediate because specialized capital investments and elaborate production networks cannot be realigned without significant cost.

These findings underscore the limitations of viewing trade solely through the lens of net balances. They suggest that resilience policies, dispute-resolution frameworks, and incremental diversification strategies are integral to mitigating risk. In a climate where protectionist rhetoric can swiftly translate into new barriers, maintaining stable, predictable conditions for trade in both Canada and the United States is essential to preserving the mutual gains flowing from decades of close economic integration.

Cette étude examine les interdépendances commerciales complexes entre le Canada et les États-Unis, mettant en évidence la manière dont les chiffres globaux des exportations et des importations peuvent masquer des réalités économiques plus profondes. Environ les trois quarts des exportations canadiennes

de marchandises sont destinées aux États-Unis chaque année, contribuant à un excédent commercial bilatéral en marchandises pour le Canada, se situant entre 100 et 170 milliards de dollars canadiens. Pourtant, lorsque les produits énergétiques sont exclus, les États-Unis affichent un léger excédent commercial avec le Canada, illustrant comment les deux pays bénéficient de chaînes de valeur transfrontalières spécialisées.

L'analyse de certains secteurs démontre qu'un tarif hypothétique de 25 % sur les produits canadiens entraînerait une perte de revenus d'exportation pour le Canada, mais augmenterait également les coûts de production pour de nombreux fabricants américains dépendants des importations canadiennes.

Malgré la taille plus modeste de l'économie canadienne, le potentiel de dommages économiques est réciproque. Par exemple, les constructeurs automobiles du Michigan et de l'Ohio dépendent de nombreux intrants canadiens qui traversent la frontière à plusieurs reprises, tandis que les raffineries intégrées de la côte du Golfe transforment souvent du pétrole brut en provenance de l'Alberta. La rigidité des chaînes d'approvisionnement amplifie ces vulnérabilités : les estimations de l'élasticité à court terme indiquent que les flux énergétiques pourraient ne diminuer que de 2 % en cas de tarif de 10 %, mais à plus long terme, les deux pays risquent des pertes supplémentaires si l'un d'eux se tourne vers des marchés alternatifs.

Des deux côtés, l'ajustement aux barrières transfrontalières est ni simple ni immédiat, car les investissements en capital spécialisé et les réseaux de production élaborés ne peuvent être réorganisés sans coûts significatifs.

Ces résultats soulignent les limites d'une approche du commerce basée uniquement sur les soldes nets. Ils suggèrent que des politiques de résilience, des cadres de règlement des différends et des stratégies de diversification progressive sont essentiels pour atténuer les risques. Dans un contexte où la rhétorique protectionniste peut rapidement se traduire par de nouvelles barrières, le maintien de conditions commerciales stables et prévisibles entre le Canada et les États-Unis est crucial pour préserver les bénéfices mutuels issus de décennies d'intégration économique étroite.

Keywords/ Mots-clés : Trade interdependencies, Trade balance, Supply chains, Tariffs, Economic integration / Interdépendances commerciales, Balance commerciale, Chaînes d'approvisionnement, Tarifs douaniers, Intégration économique

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1 | DECONSTRUCTION OF TRADE WAR ELEMENTS OF LANGUAGE

The notion of a "trade war" has become a mainstay in contemporary economic discourse, stirring alarms over escalating tariffs, retaliatory policies, and heightened geopolitical strain. Recently, the United States has once again signaled potential tariff increases on Canadian goods, echoing the dramatic language often used to describe economic conflicts. Yet beneath this politically charged rhetoric lies a more complex truth, anchored in intricate supply-chain interdependencies, regional specialization, and sophisticated global value chains. Understanding the dynamics of the Canada–U.S. trade relationship entails a departure from zero-sum narratives of winners and losers, and an appreciation of the multifaceted links that sustain modern cross-border commerce.

It remains striking that such a climate of heightened protectionist threats coexists with the renewed popularity of doctrines that predate the Industrial Revolution. Mercantilism, prevalent from the 16th to 18th centuries and epitomized by Thomas Mun, Jean-Baptiste Colbert, and Antonio Serra, has resurfaced in the form of tariffs, quotas, and other trade barriers. As Rodrik (2018) observes in *Straight Talk on Trade*, these measures appear out of step with 21st-century realities shaped by global economic integration and cutting-edge technology. In the context of ongoing U.S. threats to impose new tariffs on Canadian exports, such policies—premised on the belief that a favorable balance of trade secures national prosperity—raise pressing questions about their viability in a deeply connected world.

Indeed, core mercantilist beliefs rested on the notion of maximizing exports and minimizing imports to accumulate wealth. As Mun emphasized in *England's Treasure by Forraign Trade* (1664), this often entailed colonial expansion and militarized trade routes, practices further institutionalized by Colbert in his *Instructions for the Establishment of the French East India Company* (1664). These policies emerged in an era when international cooperation was limited and industry largely rudimentary. O'Brien (1988) underscores just how different that historical context was, and Irwin (2017) demonstrates in *Clashing over Commerce* that simple transplants of mercantilist frameworks into the 21st century carry inherent flaws. Modern production chains traverse multiple borders, and commodities frequently cross borders multiple times as components of a single finished product, illustrating how yesterday's isolationist doctrines may falter under current conditions.

Amid the present U.S. tariff threat, such mercantilist tendencies resurface in rhetoric extolling the virtues of domestic surpluses at the expense of trading partners. Yet in an age when producers rely on complex supply networks stretching from Windsor to Detroit and beyond, the unilateral imposition of tariffs risks weakening both sides. That it conjures the specter of 17th-century economic strategies, rather than harnessing the synergy of 21st-century integration, speaks to an ongoing tension between the language of conflict and the realities of cooperation that increasingly define international trade.

1.1 | The Dissolution of "Exports" and "Imports" in the Crucible of Global Value Chains

The modern economy, particularly after what Baldwin (2016) calls "The Great Convergence" driven by information technology, bears little resemblance to the one envisioned by mercantilists. Far from being discrete national entities trading finished goods, contemporary markets are organized into intricate global value chains. The traditional concepts of "exports" and "imports" simply fail to capture the economic reality of globalized production, rendering them increasingly obsolete as meaningful metrics.

Products are no longer the sole result of a single nation's labor and resources; instead, they are co-produced across multiple countries. A smartphone, for example, may integrate semiconductors from Taiwan, screens from South Korea, batteries from China, and design expertise from California. The "nationality" of such a product becomes almost irrelevant, as its creation depends on a vast network of interdependent processes. Much of what is counted as international trade today actually represents intra-firm exchanges, as multinational corporations move components across borders within their own networks. This reality underscores the artificiality of viewing trade solely through the lens of national boundaries, a point further emphasized by Pomeranz (2000) in *The Great Divergence*.

1.2 | The Illusion of Measurement: Deconstructing the Fallacy of Traditional Trade Metrics

When we attempt to force this complex, integrated reality into the outdated framework of exports and imports, we generate statistics that are not merely inaccurate but actively misleading. A German firm shipping components to its American factory for assembly is recorded as a German "export" and a U.S. "import." However, this is fundamentally an internal transfer within the same corporate entity, driven by global production strategies rather than a traditional market transaction between independent economic actors.

Moreover, focusing exclusively on national aggregates of exports and imports obscures the vital regional economic relationships that often transcend national borders. The economic exchanges between Quebec and New York, for example, are likely far more substantial and economically significant than those between Quebec and Vancouver, yet they are lumped together in national statistics. This "double-dipping bias" further distorts the true nature of economic activity, masking the integrated regional economies that have naturally evolved.

1.3 | From Trade to Integration: Embracing a New Paradigm

In this context, focusing narrowly on the **net trade balance** (exports minus imports) between Canada and the U.S. can be misleading and provides an incomplete picture of the economic relationship. While Canada typically runs a modest **merchandise trade surplus with the U.S.** (between C$100 and C$170 billion in recent years, according to Canadian data, equivalent to about 5% of Canada's GDP), this metric alone does not equate to a clear-cut advantage

or "winning" in the relationship. In fact, from the American perspective the imbalance is minor: U.S. data report a goods trade deficit of roughly **US$100 billion** with Canada (only ~0.27% of U.S. GDP). Moreover, **when one accounts for trade composition, the picture changes significantly**. Energy trade is the decisive factor behind the U.S.'s goods deficit with Canada – **if oil and gas imports from Canada are excluded, the U.S. would actually enjoy a trade surplus (on the order of $10+ billion) with Canada**. In other words, the entire U.S. goods trade deficit is explained by its import of Canadian energy, a commodity the U.S. actively needs and one that enhances its energy security. This highlights that a bilateral **"deficit" can simply reflect complementary needs (the U.S. importing commodities) rather than any fundamental imbalance in competitiveness**.

Furthermore, simple net balances ignore **services trade** and **value-added flows** (Anderson and Van Wincoop, 2003; OECD, 2021). The United States **runs a substantial surplus in services trade with Canada**, thanks to American exports in travel, financial services, film and entertainment, software, and other sectors. These service exports (e.g., Canadian tourists in Florida, or Canadian firms buying U.S. software) do not show up in the merchandise trade balance, but they generate income for the U.S. and reduce the overall imbalance when services are included. Perhaps most importantly, conventional trade statistics are recorded on a gross basis and thus **do not capture the complex supply-chain linkages**. A significant portion of Canada's exports to the U.S. contains U.S. value-added (for example, a Canadian-assembled car exported to the U.S. includes many U.S.-made components).

This means that **the bilateral trade balance measured in gross terms overstates the true one-sidedness** – much of the "Canadian" surplus actually accrues to U.S. firms who supplied intermediate inputs. As a recent analysis emphasizes, **intermediate inputs and capital goods dominate Canada-U.S. trade**, and **the majority of overall trade occurs between affiliates of the same firm or related parties across the border**. This high degree of intra-firm trade implies that **profits and benefits are shared**, and what appears as an import in one country's ledger might be a transfer within the same multinational enterprise.

For instance, the U.S. runs a deficit in automobiles with Canada, but Big Three U.S. automakers own many of the Canadian plants – the "import" is really a product of American companies' cross-border production networks. Such realities illustrate why many economists view bilateral trade balances as **poor indicators of economic welfare or fairness**. Trade balance figures also differ depending on data sources and definitions (customs data vs. balance-of-payments basis, for example), adding further uncertainty to their interpretation. In sum, a **more nuanced analysis** beyond the net balance – considering **trade composition, the role of global value chains, and two-way investment income** – is needed to truly understand Canada-U.S. economic interdependencies. Politically charged narratives focusing on deficits or surpluses often overlook these complexities, potentially leading to misguided policy conclusions.

Instead of clinging to the anachronistic notions of exports and imports, we must shift our focus to integration. We need to acknowledge that the global economy is a complex, interconnected system, and that national borders are increasingly irrelevant to the flow of goods, services, capital, and ideas, a concept supported by the work of North and Thomas (1973) in their analysis of the rise of the Western world. We should encourage policies that promote,

help, and foster this integration, strengthen global value chains, and facilitate the free movement of resources, aligning with the sustainable development goals outlined by the United Nations (2015).

In this new paradigm, the goal is not to maximize exports or minimize imports but to **optimize the efficiency and resilience of global production networks**. This requires a fundamental rethinking of economic policy, moving away from protectionism and mercantilist thinking and towards cooperation, coordination, and mutual benefit. By embracing the reality of global integration, we can build a more prosperous, sustainable, and equitable future for all nations, transcending the narrow confines of outdated trade metrics and embracing the full potential of the interconnected world.

2 | CANADA'S ECONOMIC TIES WITH THE UNITED STATES: INTERDEPENDENCE, ASYMMETRIES, AND POLICY CHALLENGES

A coherent understanding of Canada's economic relationship with the United States requires situating it within **broader global trade trends** and the experiences of other integrated economies. Although most countries confront benefits and risks in managing trade imbalances with key partners, Canada's dependence on the U.S. is unique among advanced economies. This dependence provides valuable insights into how deeply integrated trade relationships function, where vulnerabilities lie, and how strategies might be developed to ensure stability over the long term.

But should one then discard the concepts of exports and imports? The answer is no. These traditional measures still capture a portion of cross-border economic activity and can offer useful diagnostic clues. However, they risk being misleading if taken as the sole basis for policy design. In a world of complex, overlapping production networks, more granular analyses—ideally at the **firm level**—are needed to illuminate the nuanced ways in which specific industries and regions are interwoven across the Canada–U.S. border. This deeper approach enables **policymakers to develop strategies that balance the economic gains of integration with appropriate safeguards against potential shocks**.

2.1 | Global Trade Integration and the Canada–U.S. Relationship

Observers have recently spoken of a shift toward "deglobalization" or economic fragmentation, fueled by protectionist measures and events such as the pandemic. Nevertheless, Canada's situation remains illustrative of how deep integration can both foster economic gains and expose vulnerabilities. The scope and depth of the Canada–U.S. relationship, which ranks among the **largest bilateral trading partnerships worldwide**, thus hold lessons for policymakers grappling with balancing openness and resilience.

Comparative Perspectives on Integration

Canada and the United States share extensive cross-border supply chains that few bilateral relationships can rival. A useful comparison is with Mexico, the third member of USMCA, which similarly directs around 75–80% of its exports to the U.S. and coordinates manufacturing processes—particularly for automotive and electronics—across the North American continent. This shared dependence exposes both Canada and Mexico to abrupt U.S. policy moves, such as the steel tariffs of 2018, which harmed industries across the three countries. Model-based estimates suggested that a hypothetical 25% U.S. tariff on North American partners could reduce GDP by around 4.0% in Mexico and 4.5% in Canada, underscoring the tight production linkages that amplify the fallout of unilateral actions.

An additional benchmark is the European Union, where member states often conduct 60–70% of their trade with each other under a supranational governance structure. Arrangements such as **a shared court system and common regulations offer greater stability** than looser trade agreements such as USMCA, preventing individual nations from unilaterally imposing tariffs on fellow EU members. This contrasts with North America, where Canada benefits from

free trade access to the larger U.S. market yet remains susceptible to abrupt impositions of tariffs on national security grounds or other rationales.

Australia's extensive reliance on exports to China further illustrates how integrating closely with a single large partner creates both prosperity and exposure. When political tensions arose, China imposed import restrictions on Australian goods such as wine, barley, and coal, producing economic disruptions. Canadian policymakers have expressed comparable concerns regarding over-reliance on the U.S., though in Canada's case the primary partner is also a strategic ally rather than a rival. These examples collectively confirm that high degrees of economic integration require careful policy planning, given that concentrated trade relationships can deliver both growth and risk.

From Globalization to "Friendshoring"

The broader context in recent years has included a U.S.–China trade war, rising nationalist sentiments, and global supply chain disruptions triggered by the pandemic. Terms such as "reshoring," "nearshoring," and "friendshoring" now typify policy discussions. Friendshoring—prioritizing trade links with nations that share political or economic values—arguably aligns well with Canada's longstanding ties to the United States, which were built on allied interests (Baldwin, 2016; Rodrik, 2018). Recent U.S. efforts to secure critical minerals from politically reliable partners complement Canada's abundant resource endowment, suggesting new opportunities for the bilateral relationship. At the same time, friendshoring can exacerbate broader fragmentation, encouraging the formation of trading blocs and weakening global multilateral structures. Canada, as a middle power, has an interest in preserving the efficacy of institutions such as the WTO, since rules-based governance often serves as a counterbalance to the asymmetry inherent in its relationship with the U.S. **Balancing deeper ties with the United States against continued support for global norms remains a core strategic concern**.

Ensuring Long-Term Stability in Canada–U.S. Trade

The pivotal objective for Canada involves strengthening its already extensive U.S. ties while making the relationship less volatile. Successive trade agreements, culminating in USMCA, were designed to enhance predictability, although the ability of the U.S. to invoke national security to justify tariffs remains a persistent concern. Policymakers in both countries benefit from maintaining and updating these frameworks through negotiation, particularly as economic priorities shift to areas like **green technologies, digital trade, and labor and environmental standards**. Canada's insistence on rules-based dispute resolution—exemplified by its commitment to NAFTA/USMCA's panel processes—underscores how formal legal mechanisms can help stabilize a relationship with a large, more powerful partner. Similarly, regulatory cooperation programs jointly tackle non-tariff issues that arise from misaligned standards in advanced industries (for instance, electric vehicles or pharmaceuticals).

Canada's leadership also recognizes that replicating the scale and depth of U.S. integration with any alternative partner is exceedingly difficult. Shared borders, decades of infrastructure investment, and regionally integrated firms mean that North America offers efficiencies that overseas trade partners cannot match. This reality underscores why Canada's diversification strategies typically entail incremental expansions toward other regions, rather than wholesale

shifts away from the U.S. Alongside promoting an efficient physical border and smooth customs procedures, **Canada is working to reinforce supply chain security by coordinating on strategic commodities such as critical minerals**. The mutual benefits of a stable partnership may also temper the risk of policy reversals, given that **Canada serves as a top purchaser of U.S. exports** and a dependable source of raw materials and energy. In times of potential crisis—such as threatened tariffs in 2025—Canadian leaders have reiterated these shared advantages, hoping that recognition of mutual gains can prevail over transient policy tensions.

2.2 | Deep Trade Interdependence and Asymmetry

Canada–U.S. trade integration is characterized by robust two-way flows of goods, services, and investment. Although the U.S. absorbs around 75–80% of Canada's merchandise exports, accounting for nearly one-fifth of Canada's GDP, the American economy is about twelve times larger, so Canada's products represent only around 14% of total U.S. imports. Table 1 presents key figures illustrating this asymmetry: Canada's economy, while highly engaged with the U.S. market, exerts a modest influence on American demand relative to the proportion of Canadian output that depends on the United States.

Table 1: Descriptive Statistics on Canada and U.S. Trade

Indicator	Value (CAD)
Canada GDP	3,060 Billion
US GDP*	36,975 Billion*
Canada Exports to US	547 Billion
Canada Imports from US	376 Billion
Two-way Trade as % of Canada's GDP	30%
Two-way Trade as % of US's GDP	2.5%
Canada Total Exports	719 Billion
Number of employer business locations in Canada (Dec 2022)	1,200,000
Percent of businesses that produce goods	21%

Sources: World Bank, FRED, U.S. Census Bureau, Statistics Canada.

Converted from USD to CAD using an average 2024 exchange rate of approximately 1.37. Original U.S. GDP was 29,179.1 Billion USD.

Long-term liberalization—from the 1965 Auto Pact to USMCA—has yielded a tightly interwoven production ecosystem. Roughly half of bilateral trade consists of intra-firm or interrelated transactions featuring intermediate inputs,

which often cross the border multiple times before final assembly. This “just-in-time” paradigm tightly couples Canadian industries to U.S. business cycles. An upswing or downturn in the United States can reverberate swiftly in Canadian factories, given Canada’s high income elasticity in manufacturing, resource, and technology exports.

Although total Canadian exports reached about CAD 719 billion in 2024, a few key sectors—led by mineral fuels and oils—account for a large share of these outbound flows. This concentration compounds vulnerability when commodity prices fluctuate or when external factors, such as regulatory changes, impede smooth transactions. From a U.S. perspective, however, Canada remains a comparatively small supplier overall, reinforcing the power imbalance at the heart of the relationship.

The implications of this asymmetry become especially stark when the threat of tariffs emerges. Imposing tariffs on critical Canadian exports, such as automotive parts or mineral fuels, risks disproportionately affecting Canadian producers, who may lack ready alternatives for rerouting shipments if the U.S. market becomes less accessible. Yet despite its more diversified sourcing options and larger domestic market, **the U.S. itself is not immune to negative repercussions**. Sectors relying on Canadian inputs—including refineries configured for Canadian crude or automotive manufacturers in Michigan—will face rising operational expenses **if they must rely on less efficient international providers or higher-cost domestic sources**. Alternatively, they may see surging local demand for the same goods, which drives up prices and narrows profit margins. In either scenario, U.S. industries will often face higher production costs, supply-chain disruptions, and **weakened competitiveness over the longer run**.

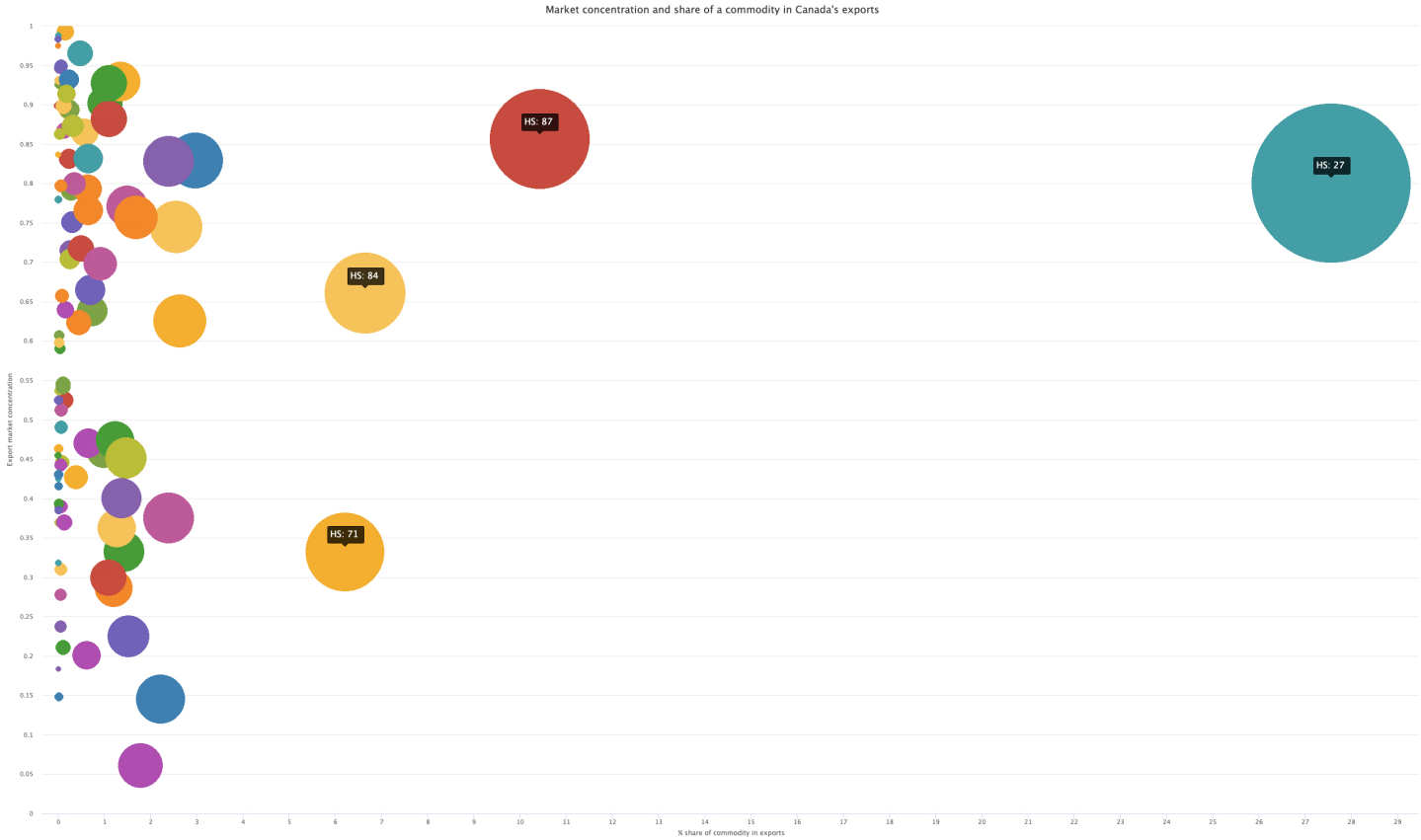
Figure 1 provides a visual mapping of individual commodity groups (identified by HS2 codes) according to their share of Canada’s total exports (plotted along the horizontal axis) and their level of export market concentration (plotted along the vertical axis via the Herfindahl–Hirschman Index, or HHI). The size of each bubble corresponds to the export value of that commodity, allowing a three-dimensional view of how important a commodity is, what fraction of total exports it comprises, and how geographically or market-wise concentrated it appears.

The four highlighted commodities—HS 27 (mineral fuels), HS 87 (vehicles), HS 84 (machinery), and HS 71 (precious metals and stones)—exemplify varying degrees of both overall significance and concentration. HS 27, for instance, sits high on the vertical axis, indicating that Canadian mineral fuel exports tend to cluster in a small number of foreign markets, dominated by the United States. Despite this narrow market distribution, its share of total exports is also sizable, underscoring the centrality of energy products to Canada’s export portfolio. HS 87 and HS 84 similarly occupy relatively elevated positions, pointing to a high degree of concentration alongside a substantial share of total exports. In contrast, HS 71 (precious metals and stones) appears lower on the vertical axis but still demonstrates a non-negligible share of Canadian exports, reflecting intermediate levels of concentration and overall economic importance.

Taken together, Figure 1 reveals the extent to which Canada’s export composition is weighted toward a handful of commodities that face varying, but often considerable, degrees of market concentration. This underscores a dual challenge for policymakers: managing the inherent volatility linked to commodities like energy and metals, and responding

to potential shocks in heavily integrated sectors such as vehicles and machinery. Since a high HHI indicates vulnerability to shifts in a small number of markets, the data support the notion that diversification—both geographically and in product mix—could help mitigate risks. At the same time, the relatively large share of exports held by these few commodities underscores their sustained value to the national economy, highlighting a complex policy dilemma between consolidation and diversification.

Figure 1: Market Concentration and Share of Commodity in Canadian Exports



Source: Statistics Canada. Full HS descriptions: 27 - Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes. 87 - Vehicles; other than railway or tramway rolling stock, and parts and accessories thereof 84 - Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof 71 - Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal, and articles thereof; imitation jewellery; coin

In this context of closely intertwined supply chains and high interdependence, U.S. tariffs on Canadian goods **can create several repercussions for the U.S. economy**. Because many of Canada's exports to the United States are intermediate products—particularly in automotive, aerospace, and energy—tariffs risk introducing cost increases at various stages of American production processes. **U.S. manufacturers relying on Canadian inputs may face immediate budgetary strains and a diminished ability to compete internationally, given that the materials required to finalize their products become more expensive**. Likewise, certain sectors that depend on uninterrupted access to Canadian energy resources could encounter rising operational costs if pipeline bottlenecks or shifts to alternative suppliers are needed. These cost pressures can translate into higher prices for American consumers, lower profit margins for U.S. firms, or a combination of both.

Moreover, imposing tariffs on Canadian goods can trigger retaliatory measures, as has occurred in past episodes of bilateral tension (for instance, with steel and aluminum). When Canada responds with its own tariffs, often targeting emblematic U.S. exports such as agricultural products or manufactured goods, American producers in affected states may lose access to an important export market. **This can inflict disproportionate harm on specific American regions or industries, leading to political and economic pressure on Washington to reconsider the tariff policy**. More structurally, tariffs impede the "just-in-time" manufacturing paradigm that has come to define much of North America's co-production network. Heightened trade barriers interfere with the seamless cross-border transfer of intermediate goods, thereby introducing inefficiencies, slowing production timetables, and raising logistical costs.

The interconnected nature of Canada–U.S. trade magnifies these effects. Over time, persistent tariffs can induce firms to relocate certain activities or source inputs elsewhere, prompting realignments of supply chains that may ultimately reduce North America's competitive advantage. If, for instance, an automotive plant in Michigan depends on a steady stream of Canadian parts, repeated tariff threats or rate hikes can push the automaker to shift sourcing to other regions—potentially overseas—or to scale back certain lines of production. **The resulting frictions can erode the deep integration that once fueled mutual growth, undermine investor confidence, and diminish the potential for both American and Canadian producers to leverage shared efficiencies**.

2.3 | Regional and Sectoral Trade Concentration in Canada and the United States

Recent data from Statistics Canada (see Table 2) reveal that Ontario, Alberta, and Quebec dominate Canada's merchandise exports to the United States, collectively accounting for a large share of the total CAD 546,602 million sent south in 2024. Ontario, for instance, ships CAD 194,855 million worth of goods to the United States, representing 77.2% of its provincial exports, while Alberta follows closely at CAD 161,572 million (88.7%). Quebec, at CAD 90,979 million (75.1%), underscores a different but equally pivotal industrial focus, encompassing aerospace, metals, and forestry. In contrast, provinces like British Columbia or Saskatchewan have lower overall export values but remain nonetheless vulnerable to policy fluctuations, given that well over half of their foreign-bound production flows to U.S. markets. Even smaller provinces such as New Brunswick (90.4%), Manitoba (70.3%), and Prince Edward Island (75.7%) exhibit

significant reliance on U.S. demand, though each province's mix of products and targeted industries shapes specific risks (see Table 2).

Table 2: Canadian Exports to the U.S. by Province (2024)

Province of Origin	Export Value to U.S. (CAD Millions)	Share of Total Exports
Ontario	194,855	77.2%
Alberta	161,572	88.7%
Quebec	90,979	75.1%
British Columbia	28,725	52.8%
Saskatchewan	26,700	59.0%
New Brunswick	15,776	90.4%
Manitoba	14,464	70.3%
Newfoundland and Labrador	6,875	50.7%
Nova Scotia	4,604	69.5%
Prince Edward Island	1,906	75.7%
Yukon	145	96.7%
Northwest Territories	1	0.07%
Nunavut	0	0.02%
Total	**546,602**	–

Source: Statistics Canada, author's calculations.

Patterns on the American side mirror these interdependencies. Alberta's focus on energy resonates strongly with energy-intensive states like Texas and Illinois, which depend on Canadian crude oil. Ontario's automotive sector aligns with the manufacturing corridors in Michigan and Ohio, linking assemblers and parts suppliers in a "just-in-time" framework. Quebec's diversified export basket—including aerospace and metals—ties into manufacturing hubs in states such as Washington, Kansas, or Pennsylvania, where companies frequently use Quebec-based components. **The result is a deeply integrated trade landscape in which local disruptions—whether pipeline bottlenecks in Alberta or regulatory changes in Ontario's auto industry—can reverberate across the border, increasing costs or slowing production in corresponding American regions**.

Some Canadian provinces and U.S. states exhibit greater resilience through diversification or intra-national trade. Nova Scotia, for example, exports CAD 4,604 million in goods to the U.S., constituting 69.5% of its total exports, yet it maintains a relatively varied product mix, moderating the effects of sudden downturns in any single sector. Likewise, certain American states lacking major automotive or industrial clusters may experience diffuse rather than concentrated impacts from bilateral tensions, though **broader macroeconomic forces will still drive up material or**

consumer prices. Policymakers in both countries consequently face a complex balancing act: measures such as steel or agricultural tariffs disproportionately affect provinces and states whose industries are highly specialized, potentially creating spillover effects in adjacent regions through supply-chain linkages.

In this environment, the dominance of a few core industries—energy products, automotive goods, and high-value machinery—both enhances economic efficiencies and limits rapid diversification when trade disputes escalate. Canada's strategic efforts to pursue trade agreements with Europe or Asia stem from the desire to mitigate an overreliance on the U.S. market. In parallel, some American states seek alternative import sources or domestically produced substitutes to lessen vulnerability to cross-border policy friction.

Ultimately, the data in Table 2 clarify how tightly Canada's regional economies are interlaced with specific U.S. counterparts, **illustrating why simple trade-balance figures rarely capture the true stakes of policy shifts**. An exclusive focus on **national aggregates obscures the local areas that derive most of their livelihoods from these exchanges**—be it an oil field in Alberta serving Gulf Coast refineries or an automotive plant in Ontario supplying Michigan-based manufacturers. **A more granular, targeted approach—combining knowledge of each region's key export sectors with the resilience or elasticity of its supply chains—enables policymakers and business leaders on both sides of the border to safeguard growth and minimize upheaval in the face of evolving trade conditions**.

3 | AN INTEGRATED ANALYSIS OF TRADE ELASTICITY, SECTORAL INTEGRATION, AND THE CANADA–U.S. ECONOMIC RELATIONSHIP

Canada's trade with the United States stands out for its deep integration and heavy concentration, with close to three-quarters of Canadian merchandise exports heading south (Growing Canada's Exports to Overseas Markets by 50 Percent). This high degree of economic dependence frames ongoing concerns about resilience and policy responses aimed at mitigating risk. The following analysis discusses the roles of **trade elasticity** and sectoral integration, situating Canada's reliance on the U.S. within a broader context of global trade.

3.1 | Trade Vulnerability and Economic Resilience for both Canada and the U.S.: Principles

Classical economic theory, as developed by Feenstra (1994) and Helpman and Krugman (1985), underscores the importance of elasticity and product differentiation in shaping trade flows. In today's environment, heightened participation in cross-border value chains reduces the ability of firms to adapt quickly, because producing across national borders involves intricate scheduling and cost structures. Within the Armington model, which treats goods as differentiated by country of origin, **firms intertwined in Canada–U.S. networks view foreign inputs as customized to their workflows, leading to a two-way dependence that influences both countries**.

Canada's reliance on U.S. markets exemplifies the risks and benefits of this interdependence. Low elasticity can stabilize export volumes when prices fluctuate, particularly for sectors like automotive or mineral fuels, but it also deepens vulnerabilities if unexpected shocks materialize. A sudden increase in tariffs, an unanticipated supply-chain disruption, or a cyclical downturn in U.S. consumption can reverberate sharply north of the border. At the same time, American firms also rely on Canadian supplies, whether refining Canadian crude or incorporating automotive parts assembled in Ontario. **Any interruption in these flows can elevate costs and sap the competitiveness of U.S. producers**. If the U.S. administration's trade policies are inconsistent or unpredictable, American companies may find themselves scrambling for alternative sources, undermining their own operational stability.

Historical precedents clarify these mutual dependencies. Threatened double-digit tariffs on Canadian steel and aluminum in 2018–2019 raised alarms that Canada might experience GDP losses akin to a significant recession. Yet U.S.-based manufacturers protested that the higher import costs would inflate prices, hamper manufacturing processes, and potentially erode export competitiveness. Similarly, short-term restrictions at the onset of the pandemic indicated how vital cross-border transfers are for both sides; halting certain products bound for Canada inadvertently limited American producers' revenue streams. American business cycles, which shape consumer demand and corporate investment, further demonstrate this relationship when downturns in the U.S. quickly dampen Canadian exports, leading to the familiar adage that "When the U.S. sneezes, Canada catches a cold." In some scenarios, particularly

when American industries have not planned for alternative sourcing, the U.S. might "catch the cold first" if abrupt policy shifts sever integral supply links.

Heavy reliance on bilateral trade compounds risks whenever political or logistical disruptions occur. Canada, as the smaller partner, is no stranger to abrupt tariff hikes—such as those imposed on steel and aluminum—capable of reverberating rapidly through provincial economies. Parallel vulnerabilities emerge in U.S. regions where industries depend on predictable Canadian shipments. **The automotive sector, integral to both Ontario and the industrial Midwest, exemplifies how a credible threat of a 25% tariff can spur discussions of mass layoffs and reallocated production facilities on both sides of the border**. Energy trade displays a similar dynamic. Pipelines that connect Alberta to U.S. refineries impose joint exposure: Canadian producers face challenges if demand or regulatory conditions shift, while American refiners must absorb sudden cost hikes or navigate different feedstock sources if Canadian flows are constrained.

Past disputes involving softwood lumber reflect the recurring fragility in this relationship. The United States has repeatedly altered legal or political stances, introducing new duties that disproportionately affect Canada's smaller economy. However, such measures also create unintended consequences in the U.S. housing market, by raising lumber prices or constraining supply. Meanwhile, Canada's broader diversification efforts—through trade agreements with Asia or Europe—demand years of negotiation and significant public and private investment. **American producers may likewise seek to insulate themselves from Canadian supply shocks, yet forsaking the benefits of proximity and aligned production standards could ultimately raise operating costs**.

Recent provincial export data confirm the uneven distribution of Canada–U.S. integration. Ontario alone ships about CAD 195 billion worth of goods to the United States, chiefly in automotive parts that shuttle across the border multiple times. Alberta's roughly CAD 162 billion in energy exports highlights how refineries and pipelines are engineered for particular crude grades, restricting alternative market channels. Quebec's more diversified mix—about CAD 91 billion in aerospace, metals, and forestry—also remains tethered to the U.S. through specialized supply chains that constrain flexibility. Conversely, certain simpler commodities demonstrate higher elasticity, implying quicker responsiveness to price changes but also greater vulnerability to sudden market contractions.

Combining these sectoral differences at a national level reveals how overspecialization in either country can expose industries to abrupt dislocations. From a U.S. standpoint, disruptions in Canadian inputs—ranging from automotive parts to energy—introduce parallel threats of stalled production, higher import costs, and decreased global competitiveness. Trade flows in automotive or heavy machinery (both pivotal for North America) cannot be easily rearranged, and new sourcing arrangements may require time-consuming changes in production layouts or logistics. Evaluating trade through a granular lens—rather than aggregate figures—offers a clearer picture of how deeply the two economies co-depend. Policymakers and industry leaders in both Canada and the United States thus benefit from carefully

monitoring each region's elasticity profiles and preparedness, ensuring that strategic measures—whether aimed at resilience, diversification, or targeted infrastructure upgrades—support rather than undermine mutual advantages within the integrated North American marketplace.

To quantify the impact of trade elasticity and sectoral integration on Canada's trade with the United States, we estimate the elasticity of key export sectors and simulate the effects of hypothetical U.S. tariffs on these industries (see Table 3) (fontagné et al., 2022). Our analysis focuses on ten major export categories, ranging from mineral fuels to aerospace products, that collectively account for a significant share of Canada's outbound flows to the U.S. We calculate the estimated elasticity of each sector, based on historical trade patterns and industry characteristics, and then project the potential reduction in trade volumes if the U.S. were to impose a 25% tariff on Canadian goods. Our results provide insights into the differential effects of trade shocks on various sectors and underscore the importance of targeted policy responses to mitigate risks.

Table 3: Elasticity by Industry and Tariffs' Impact on Trade for Main Export Sectors from Canada to the U.S.

Sector	Total Value (CAD Millions)	Estimated Elasticity	Tariff Rate	Trade Reduction* (%)	Estimated Trade Reduction* (CAD Millions)	Post-Tariff Trade Value* (CAD Millions)
Mineral fuels & oils (27)	177,390	Inelastic (-0.21)	0.10	2.1	3,725	173,665
Vehicles (87)	69,413	Moderately Inelastic (-0.7)	0.25	17.5	12,147	57,266
Nuclear reactors, boilers, machinery (84)	38,864	Moderately Inelastic (-0.7)	0.25	17.5	6,801	32,063
Plastics and articles thereof (39)	19,390	Elastic (-1.1)	0.25	27.5	5,332	14,058
Wood and articles of wood (44)	15,852	Moderately Inelastic (-0.8)	0.25	20.0	3,170	12,682
Aluminium and articles thereof (76)	15,667	Inelastic (-0.4)	0.25	10.0	1,566	14,101
Electrical machinery and equipment (85)	14,945	Inelastic (-0.5)	0.25	12.5	1,868	13,077
Precious metals and stones (71)	12,413	Inelastic (-0.4)	0.25	10.0	1,241	11,172
Iron and steel (72)	10,512	Inelastic (-0.4)	0.25	10.0	1,051	9,461
Aircraft, spacecraft and parts thereof (88)	10,412	Inelastic (-0.5)	0.25	12.5	1,302	9,110
Total of Above Sectors	**384,858**				**38,204**	**346,654**

Sources: Elasticity estimates draw from Feenstra (1994), Helpman and Krugman (1985), and Fontagné et al. (2022), along with sector-specific calibrations from OECD (2021) and the author's calculations.

Note: Total Canada Exports to the U.S. in 2024 = CAN$547 billion. Elasticities are selected to err on the side of caution (reflecting short-run behavior), and tariff rates are hypothetical.

**Trade reduction for each sector is computed as (Total Value × Trade Reduction (%)), with Post-Tariff Trade Value = Total Value – Estimated Trade Reduction. Just for illustration purposes.*

The table documents a series of hypothetical tariff impacts on ten core Canadian export sectors, each of which carries a particular price elasticity and potential scope for substitution. Highly elastic industries, such as plastics (HS 39), are projected to experience the steepest drops in export value under a 25% tariff—on the order of 27.5%—because global suppliers can quickly replace Canadian inputs if cross-border barriers emerge. By contrast, more inelastic sectors like mineral fuels (HS 27), which exhibit an elasticity of -0.21, would see smaller immediate percentage declines in trade—only about -2.1% from a 10% tariff—yet remain exposed to protracted disruptions due to difficulties finding alternative markets.

Vehicles (HS 87) typify a sector with relatively high elasticity (-0.7) and a sizable tariff rate in the table scenario (25%), resulting in an estimated 17.5% contraction in trade or a loss of more than CAD 12 billion in export value. For Canada, the most direct damage would manifest initially through lost revenues, potential layoffs, and shortfalls in regions heavily reliant on automotive production. However, because many U.S. automakers rely on Canadian parts within "just-in-time" supply chains, the immediate burden can shift to American manufacturers grappling with delayed inputs, higher costs, or productivity bottlenecks if they cannot smoothly source equivalent components from elsewhere. A similar two-sided effect emerges in energy and resource-based industries: petroleum exports appear relatively inelastic (-0.2), yet **American refineries configured for Canadian crude could incur sharp cost escalations or production hiccups if cross-border flows drop**.

Although conventional wisdom suggests the smaller partner, Canada, will shoulder the heaviest blow from tariffs, the table's elasticity estimates also reveal how U.S. industries can be quickly affected. Electrical machinery and equipment (HS 85), for instance, shows a moderately inelastic profile (-0.5), implying that about 12.5% of trade would be lost under a 25% tariff, translating to nearly CAD 1.9 billion in revenue. While Canadian firms might lack immediate alternate export destinations, U.S. buyers could likewise encounter significant price hikes or bottlenecks if they attempt to replace Canadian suppliers on short notice. Over time, persistent tariffs would prompt a reconfiguration of supply chains and possibly incentivize production relocation. In certain scenarios—particularly when American industries have few sourcing alternatives at comparable cost or quality—the short-term operational strain might even be felt more acutely south of the border than in Canada.

The data highlight a deeper interplay between immediate shocks and longer-term structural shifts. Sectors with larger trade reductions—such as plastics or aluminum—may witness earlier disruptions that force both Canadian and American firms to rethink their procurement strategies, potentially weakening the deep North American integration that has evolved over decades. Those with modest estimated trade reductions—like iron and steel (HS 72) and precious metals (HS 71)—might see less dramatic cuts, but their specialized character and capital-intensive nature complicate any abrupt pivot to new suppliers or buyers. In all cases, tariff-induced frictions risk damaging the competitiveness of North American industries, underscoring that neither side emerges unscathed from policy shifts that interrupt these entrenched production networks.

3.2 | Ontario and Quebec: Contrasting Dynamics

Let us have a look at two diversified provinces in Canada in order to be a bit more granular. Ontario's auto-centric trade underscores how integration curbs elasticity. A large share of its outbound flows consist of parts and semi-finished products whose complex specifications lock firms into mutual dependence with U.S. plants. Conversely, Quebec's export portfolio includes aluminum and aerospace goods, both relatively inelastic, and a variety of finished products more prone to substitution.

This equilibrium mitigates the full impact of any one policy change but cannot entirely eliminate vulnerability. Ontario and Quebec merit special attention in this report not only because of their overall economic weight—together they account for a majority of Canada's GDP—but also because they drive a significant share of Canada's trade with the United States. Ontario alone typically sends nearly half of Canada's merchandise exports south of the border, while Quebec plays a pivotal role in industries such as aerospace and aluminum that depend on reliable, long-term cross-border networks.

But, we need elasticity measures for short-term versus long-term trade flows. The former, which captures immediate responses to price changes or policy shifts, is often low in deeply integrated sectors. The latter, reflecting the ability to reconfigure supply chains or find new markets over time, is higher but requires substantial investment and planning. Ontario and Quebec's export profiles, with their mix of high- and low-elasticity goods, thus offer a microcosm of the broader Canada–U.S. relationship, where the benefits of integration coexist with the risks of overdependence.

We also need to acknowledge that the length of global value chains (GVCs) can influence trade elasticity. Ontario and Quebec's industries are deeply enmeshed in North American production networks, particularly with U.S. states like Michigan, New York, and Ohio. These GVCs, which often involve multiple rounds of cross-border transactions, can amplify the effects of trade shocks, as disruptions in one region cascade through the entire chain. The average GVC length for Ontario and Quebec, calculated based on the intensity of trade with U.S. states, underscores the intricate connections that underpin the provinces' export strategies. Longer GVCs, while enhancing efficiency and specialization, also heighten exposure to external shocks, making it crucial for policymakers to understand how these networks function and where vulnerabilities lie.

Although elasticity and global value chain (GVC) length provide valuable insights into how Ontario and Quebec navigate their trade relationships with the United States, these metrics cannot capture the entire story. **The resilience of bilateral ties rests on multiple interlocking elements, including the composition of each province's exports, patterns of U.S. demand, and the particular strategic decisions made by firms**. For instance, even within the same sector, not all businesses exhibit identical elasticities. Some may be bound by long-term contracts or specialized capital investments, while others respond quickly to price fluctuations or policy shifts. This heterogeneity implies that a single measurement—such as elasticity at the sectoral level—risks overlooking firm-level nuances that ultimately determine how trade flows adapt under stress.

A more fine-grained approach would geographically map elasticity for each major sector within Ontario and Quebec, recognizing that local clusters often function as distinctive production environments. **Advances in economic digital twins now make it possible to simulate various scenarios at a highly granular level, capturing differences between firms in the same industry and assessing the knock-on effects for supply chains in each locality**. Such modeling could clarify whether an automotive parts manufacturer in Windsor faces the same vulnerabilities as one in the Greater Toronto Area, or whether a metals producer in Montreal is equally exposed to market shocks as its counterpart in Quebec City.

In parallel, cities themselves emerge as pivotal proxies for these varied economic dynamics. Concentrations of industrial activities, labor markets, and infrastructure converge at the urban level, rendering major metropolitan areas both drivers and indicators of broader provincial trade outcomes. Identifying which cities have a cluster of more elastic industries, which rely on inelastic exports, and which maintain diverse export baskets offers policymakers and business leaders a more precise view of where resources and adaptation strategies are most urgently needed.

Cities that are most at risk are naturally those who export a high amount of goods to the U.S, and little elsewhere (see Table 4). Perhaps unsurprisingly, these cities specialize in the production of the major goods that Canada exports to the U.S., namely oil, automotive parts, and aluminum. For example, Saint John and Calgary, the two cities most exposed to tariffs, both export high amounts of either crude or refined oil south of the border. Windsor, the third most exposed city, exports millions of dollars of automotive parts.

Table 4: Canadian Cities Most Exposed to U.S. Tariffs

Canadian City	Exposure Level (Increase Compared to Average in Canada)
Saint John, NB	131%
Calgary, AB	82%
Windsor, ON	62%
Kitchener-Cambridge-Waterloo, ON	43%
Brantford, ON	28%
Guelph, ON	24%
Saguenay, QC	24%
Hamilton, ON	20%
Trois-Rivières, QC	19%
Lethbridge, AB	16%
Belleville - Quinte West, ON	14%
Drummondville, QC	12%
Thunder Bay, ON	11%
Oshawa, ON	11%
Abbotsford - Mission, BC	8%

Source: Stephen Tapp (Canadian Chamber of Commerce, 2025)

By weaving together firm-level detail, sector-specific nuances, and urban clustering, this more comprehensive framework can sharpen policy interventions and contribute to sustaining growth and stability in Canada–U.S. trade relationships.

As a result, any shift in trade policy or global economic conditions tends to produce magnified effects in these two provinces, making an assessment of their export composition and resilience strategies particularly instructive. Tables 4 and 5 show the breakdown of exports for Ontario and Quebec, highlighting the concentration of trade in the aforementioned sectors. The subsequent analysis delves into how these sectors interact with U.S. demand, the elasticity of their products, and the potential for strategic diversification.

Ontario's export portfolio to the United States is dominated by the vehicles sector (HS 87), with a total value of CAD 60,129 million, equivalent to 30.86% of the province's shipments south of the border (see Table 5). This substantial share reflects Ontario's historical role as the heart of Canada's automotive industry and underscores the extensive cross-border supply chains that move parts multiple times between Canada and the U.S. Notably, significant production steps for engines, transmissions, and final assembly take place across interconnected plants, pointing to the importance of policies that preserve frictionless trade in automotive goods.

The second-largest export sector from Ontario to the U.S. is nuclear reactors, boilers, and machinery (HS 84), with a total value of CAD 20,739 million, or 10.64% of Ontario's exports. This sector is characterized by a moderate demand elasticity, as machinery and equipment often have specialized uses that limit the availability of direct substitutes. Ontario's machinery exports are deeply integrated into U.S. supply chains, with many firms relying on specific components or technologies that are difficult to source elsewhere. This integration underscores the importance of maintaining stable trade relationships and minimizing disruptions that could affect the flow of machinery and equipment across the border.

Table 5: Ontario's Main Export Sectors to the U.S. (2024)

Section Description	Total Value (CAD Millions)	Estimated Elasticity	Tariff Rate	Trade Reduction* (%)	Estimated Trade Reduction* (CAD Millions)	Post-Tariff Trade Value* (CAD Millions)	Average GVC Length
Vehicles (87)	60,129	Moderately Inelastic (-0.7)	0.25	17.5	10,523	49,606	3.21
Nuclear reactors, boilers, machinery (84)	20,739	Moderately Inelastic (-0.7)	0.25	17.5	3,629	17,110	2.82
Plastics and articles thereof (39)	9,876	Elastic (-1.1)	0.25	27.5	2,716	14,058	2.76
Precious metals and stones (71)	9,580	Inelastic (-0.4)	0.25	10.0	958	8,622	2.90
Electrical machinery and equipment (85)	9,296	Inelastic (-0.5)	0.25	12.5	1,162	13,077	2.95
Iron and steel (72)	7,942	Inelastic (-0.4)	0.25	10.0	794	7,148	3.41
Cereals, flour, starch or milk (19)	7,690	Elastic (-1.1)	0.25	27.5	2,115	5,575	3.56
Pharmaceutical products (30)	4,417	Inelastic (-0.4)	0.25	10.0	442	3,975	3.04
Furniture; bedding, mattresses (94)	4,349	Elastic (1.0)	0.25	25.0	1,087	3,262	2.92
Iron or steel articles (73)	4,100	Inelastic (-0.5)	0.25	12.5	513	3,587	2.85
Total of Above Sectors	**138,118**				**23,939**	**114,719**	

Sources: Statistics Canada, Authors' calculations

*Note: Total Ontario Exports to the U.S. in 2024 = CAN$194.86 billion. * Just for illustration purposes.*

Beyond the automotive sector, a series of manufacturing and resource-based categories constitute smaller but still significant segments of Ontario's export mix. Nuclear reactors, boilers, and machinery (HS 84) reach nearly CAD 20,739 million, or about 10.64% of the province's total exports, highlighting Ontario's capacity in advanced manufacturing. Plastics (HS 39) add CAD 9,876 million, while precious metals and stones (HS 71) contribute another CAD 9,580 million. Electrical machinery and equipment (HS 85), at CAD 9,296 million, rounds out a technologically intensive grouping that depends on tight integration with U.S. production networks. Together, these categories reveal a balance between heavy industrial goods and higher value-added products that rely on reliable cross-border transactions and a steady flow of specialized inputs.

A focus on average GVC length further reflects the depth of inter-provincial and cross-border connections. Even for sectors with smaller shares—such as pharmaceuticals (HS 30) at 2.27% or furniture (HS 94) at 2.23%—the multi-step production processes, often measured by GVC length values above 2.5, highlight the extent of coordination and technological sophistication involved. For example, the iron and steel categories (HS 72 and HS 73) show GVC lengths of 3.41 and 2.85, respectively, indicating multiple value-adding activities across different plants. Taken as a whole, Ontario's total exports of CAD 194,855 million reflect a blend of large-scale automotive trade and an array of equally critical sectors that depend on stable market access, well-functioning logistics, and harmonized regulations to sustain North American competitiveness.

Table 6: Quebec's Main Export Sectors to the U.S. (2024)

Section Description	Total Value (CAD Millions)	Estimated Elasticity	Tariff Rate	Trade Reduction* (%)	Estimated Trade Reduction* (CAD Millions)	Post-Tariff Trade Value* (CAD Millions)	Average GVC Length
Aluminium and articles thereof (76)	10,841	Inelastic (-0.4)	0.25	10.0	1,084	9,757	2.90
Nuclear reactors, boilers, machinery (84)	9,763	Moderately Inelastic (-0.7)	0.25	17.5	1,709	8,054	2.80
Aircraft, spacecraft and parts thereof (88)	8,186	Inelastic (-0.5)	0.25	12.5	1,023	7,163	3.35
Vehicles (87)	6,265	Moderately Inelastic (-0.7)	0.25	17.5	1,096	5,169	2.68
Paper and paperboard (48)	4,975	Inelastic (-0.4)	0.25	10.0	498	4,477	2.79
Mineral fuels and oils (27)	4,452	Inelastic (-0.21)	0.10	2.1	93	4,359	3.55
Copper and articles thereof (74)	4,438	Inelastic (-0.4)	0.25	10.0	444	3,994	3.26
Wood and articles of wood (44)	4,199	Moderately Inelastic (-0.8)	0.25	20.0	840	3,359	3.13
Plastics and articles thereof (39)	3,553	Elastic (-1.1)	0.25	27.5	977	2,576	2.79
Precious metals and stones (71)	2,617	Inelastic (-0.4)	0.25	10.0	262	2,355	3.07
Total of Above Sectors	**59,289**	–	–	–	**8,026**	**51,263**	–

Sources: Statistics Canada, OECD, U.S. Census Bureau, Authors' calculations.

Note: Total Quebec Exports to the U.S. in 2024 = CAN$90.98 billion.

*Full HS descriptions: 76 – Aluminium and articles thereof; 84 – Nuclear reactors, boilers, machinery and mechanical appliances; 88 – Aircraft, spacecraft, and parts thereof; 87 – Vehicles; 48 – Paper and paperboard; 27 – Mineral fuels, mineral oils and products of their distillation; 74 – Copper and articles thereof; 44 – Wood and articles of wood; 39 – Plastics and articles thereof; 71 – Precious metals and stones. It is important to note that in the long run, as U.S. industries also incur higher costs from tariffs—whether through increased domestic prices or shifts to less efficient international suppliers—the pace of Canada–U.S. integration may slow, producing a "double dip" effect that further amplifies the overall economic impact on both sides of the border. * Just for illustration purposes.*

Quebec and Ontario likewise rely on the U.S. for key imports, underscoring reciprocal dependencies. Ontario's manufacturing sector cannot abruptly shift away from U.S. inputs, while Quebec's aerospace industry demands specialized components with limited alternate sources. Such interconnections can stabilize cross-border flows under normal conditions but accentuate risk if protectionist measures persist. Provinces with diversified export mixes may fare better against transient shocks, though they remain tied to U.S. demand cycles. Further details on these provincial imports are found below in Tables 7 and 8.

Quebec's export profile to the United States features a notable concentration in metals, machinery, and aerospace. Aluminum and related articles (HS 76) take the lead at CAD 10,841 million, or 11.92% of Quebec's total exports to the U.S. This reflects the province's well-established aluminum industry, anchored by access to abundant hydroelectric power and extensive smelting capacity. Nuclear reactors, boilers, and machinery (HS 84) follow closely at CAD 9,763 million, or 10.73%, underscoring Quebec's capacity in advanced manufacturing. Aircraft, spacecraft, and parts (HS 88) contribute CAD 8,186 million, or 9.00%, spotlighting the importance of Montreal as a global aerospace hub and the associated cross-border production networks connecting suppliers with assemblers in the United States.

Table 7: Ontario Imports from the U.S. (2024)

Section Description (HS code)	Total Value (CAD Millions)	% of Ontario Imports from US	% of Canadian Sector Imports from US	Estimated Elasticity	Tariff Rate	Trade Reduction* (%)	Estimated Trade Reduction* (CAD Millions)	Post-Tariff Trade Value* (CAD Millions)	Average GVC Length
Vehicles (87)	57,541	23.6	86.6	Moderately Inelastic (-0.7)	0.25	17.5	10,070	47,471	3.11
Nuclear reactors, boilers, machinery (84)	31,259	12.8	53.4	Moderately Inelastic (-0.7)	0.25	17.5	5,470	25,789	2.79
Unspecified commodities (99)	15,797	6.49	50.9	Elastic (-1.0)	0.25	25.0	3,949	11,848	3.36
Electrical machinery and equipment (85)	14,162	5.82	62.2	Inelastic (-0.5)	0.25	12.5	1,770	12,392	2.80
Plastics and articles thereof (39)	12,924	5.31	50.9	Elastic (-1.1)	0.25	27.5	3,554	9,370	2.86
Precious metals and stones (71)	7,821	3.21	77.2	Inelastic (-0.4)	0.25	10.0	782	7,039	3.36
Mineral fuels and oils (27)	7,146	2.94	1.89	Inelastic (-0.21)	0.10	2.1	150	6,996	3.02
Pharmaceutical products (30)	7,111	2.92	62.8	Inelastic (-0.4)	0.25	10.0	711	6,400	2.89

Section Description (HS code)	Total Value (CAD Millions)	% of Ontario Imports from US	% of Canadian Sector Imports from US	Estimated Elasticity	Tariff Rate	Trade Reduction* (%)	Estimated Trade Reduction* (CAD Millions)	Post-Tariff Trade Value* (CAD Millions)	Average GVC Length
Optical, measuring, medical or surgical instruments (90)	6,050	2.49	53.7	Moderately Inelastic (-0.7)	0.25	17.5	1,059	4,991	–
Iron and steel (72)	4,815	1.98	75.6	Inelastic (-0.4)	0.25	10.0	482	4,333	3.79
Total of Above Sectors	**164,626**	**67.56**	–	–	–	–	**27,997**	**136,629**	**3.11**

Sources: Statistics Canada, OECD, U.S. Census Bureau, Authors' calculations.

Note: Total Ontario Imports from the U.S. in 2024 = CAD 243,394 million.

*Full HS descriptions: 87 – Vehicles; 84 – Nuclear reactors, boilers, machinery and mechanical appliances; 99 – Commodities not specified according to kind; 85 – Electrical machinery and equipment; 39 – Plastics and articles thereof; 71 – Natural or cultured pearls, precious or semi-precious stones; 27 – Mineral fuels; 30 – Pharmaceutical products; 90 – Optical, photographic, measuring instruments; 72 – Iron and steel. * Just for illustration purposes.*

Although vehicles (HS 87) appear at a lower share—6.89%—they remain significant, demonstrating that Quebec's automotive links also tie into broader North American supply chains. Paper and paperboard (HS 48), valued at nearly CAD 4,975 million, reveal the continuing strength of Quebec's forestry sector, which has historically looked to the U.S. for export markets. Mineral fuels (HS 27) at 4.96% and copper and articles thereof (HS 74) at 4.88% reinforce the role of Quebec's natural resources, while wood products (HS 44) reflect an additional dimension of the province's forestry-based economy. Plastics (HS 39) and precious metals (HS 71) round out a roster of goods that, while comparatively smaller, nonetheless rely on well-integrated supply chains.

In contrast with Ontario's auto-centric orientation, Quebec's export basket appears more diversified across both manufacturing and primary resource sectors. Even so, the high average GVC lengths in areas such as aircraft, minerals, and metals highlight the province's deep participation in cross-border production networks. Though diversification can temper the fallout from sector-specific shocks—such as changing demand for one particular commodity or a tariff targeted at a single industry—it does not eliminate the province's overarching reliance on stable and predictable market access to the United States. The total of CAD 90,979 million in U.S.-bound exports underscores Quebec's global competitiveness in metals, aerospace, and resource-based industries, while also signaling how critical well-functioning supply chains remain for sustaining its economic performance.

Table 8: Quebec Imports from the U.S. (2024)

Table: Quebec's Main Import Sectors from the U.S. (2024)

Section Description (HS code)	Total Value (CAD Millions)	% of Provincial Imports from US	% of Canadian Sector Imports from US	Estimated Elasticity	Tariff Rate	Trade Reduction* (%)	Estimated Trade Reduction* (CAD Millions)	Post-Tariff Trade Value* (CAD Millions)	Average GVC Length
Mineral fuels and oils (27)	7,795	22.8	2.55	Inelastic (-0.21)	0.10	2.1	164	7,631	3.26
Nuclear reactors, boilers, machinery (84)	5,890	17.2	25.1	Moderately Inelastic (-0.7)	0.25	17.5	1,031	4,859	3.13
Vehicles (87)	3,035	8.89	9.03	Moderately Inelastic (-0.7)	0.25	17.5	531	2,504	3.39
Electrical machinery and equipment (85)	2,130	6.23	16.5	Moderately Inelastic (-0.6)	0.25	15	320	1,810	3.16
Aircraft, spacecraft and parts thereof (88)	1,750	5.12	78.6	Inelastic (-0.5)	0.25	12.5	219	1,531	3.18
Optical, measuring, medical or surgical instruments (90)	1,118	3.27	27.0	Moderately Inelastic (-0.7)	0.25	17.5	196	922	–

Section Description (HS code)	Total Value (CAD Millions)	% of Provincial Imports from US	% of Canadian Sector Imports from US	Estimated Elasticity	Tariff Rate	Trade Reduction* (%)	Estimated Trade Reduction* (CAD Millions)	Post-Tariff Trade Value* (CAD Millions)	Average GVC Length
Plastics and articles thereof (39)	1,104	3.23	18.3	Elastic (-1.1)	0.25	27.5	304	800	3.21
Unspecified commodities (99)	1,103	3.23	15.5	Elastic (-1.0)	0.25	25	276	827	3.67
Rubber and articles thereof (40)	929	2.72	25.8	Moderately Elastic (-0.9)	0.25	22.5	209	720	3.21
Paper and paperboard (48)	855	2.50	52.9	Inelastic (-0.4)	0.25	10.0	86	769	3.61
Total of Above Sectors	**25,709**	**75.19**	**–**	–	–	–	**3,336**	**22,373**	–

Sources: Statistics Canada, OECD, U.S. Census Bureau, Authors' calculations.

Note: Total Quebec Imports from the U.S. in 2024 = CAD 34,156 million.

*Full HS descriptions: 27 – Mineral fuels, mineral oils, etc., 84 – Nuclear reactors, boilers, machinery; 87 – Vehicles (other than railway or tramway); 85 – Electrical machinery and equipment; 88 – Aircraft, spacecraft, and parts thereof; 90 – Optical, photographic, cinematographic, measuring, checking, medical or surgical instruments; 39 – Plastics and articles thereof; 99 – Commodities not specified according to kind; 40 – Rubber and articles thereof; 48 – Paper and paperboard. * Just for illustration purposes.*

Quebec's imports from the United States total nearly CAD 34,156 million, signaling a significant reliance on U.S. goods for a variety of industrial, consumer, and energy needs. Mineral fuels and oils (HS 27) represent the largest category of these imports, at 22.8% of the provincial total. This underscores the importance of U.S. supply channels for Quebec's energy security, given that refineries and distribution networks in the province frequently rely on feedstock from south of the border. Machinery (HS 84), at 17.2%, stands next in scale, highlighting the ongoing demand for American-made equipment that supports advanced manufacturing, construction, and other sectors in Quebec.

Vehicles and parts (HS 87), accounting for 8.89% of total provincial imports, illustrate the breadth of automotive interdependence between Quebec and the United States, where numerous cross-border suppliers provide components essential to maintain production schedules. Electrical machinery (HS 85) also occupies a significant portion of Quebec's U.S. imports, reflecting the province's reliance on specialized inputs for electronics assembly and related manufacturing processes. Several other categories—ranging from aircraft and aircraft parts (HS 88) to plastics (HS 39) and rubber (HS 40)—collectively demonstrate the heterogeneous nature of Quebec's import profile. These goods, although smaller on an individual basis, together form the backbone of modern industrial operations, medical services, and daily consumer usage. In each case, sustained openness and predictability in cross-border trade remain vital for the efficient functioning of Quebec's economy. Although the table reports only provincial import shares, it also hints at how integral U.S. sourcing can be for particular industries or product lines. Any disruptions to these flows could reshape production decisions, while simultaneously affecting American suppliers who have come to rely on stable demand north of the border.

Recognizing the constraints imposed by inelastic trade, policymakers emphasize the need for thoughtfully managed integration. Negotiating dispute-resolution frameworks, pursuing targeted diversification, and investing in innovative technologies can cushion sudden transitions. In the near term, more elastic industries may absorb displaced workers or production when trade barriers emerge, although long-term strategies still hinge on reducing concentrated risks.

Canada–U.S. trade in 2024 continues to rest on deep ties that protect certain sectors from short-term cost fluctuations but magnify vulnerabilities to sustained disruptions. Inelasticity, while insulating exporters from minor shocks, traps them if the American market contracts or if policy obstacles endure. Across Ontario, Quebec, and other provinces, variations in trade elasticity shape distinct risk profiles, illuminating why certain industries suffer sharper declines and others maintain relatively steady demand. Trade elasticity thus emerges as a critical analytical tool: understanding it yields insights into how Canadian sectors might adapt—or not—when exposed to the evolving political and economic context in the United States.

4 | POLICY IMPLICATIONS AND STRATEGIC RECOMMENDATIONS

Canadian policymakers face the perennial challenge of addressing vulnerabilities rooted in deep economic integration with the United States, while still preserving the advantages of participation in North American networks. The tables presented in this section, which detail provincial export structures, inelasticities, and main commodities, underscore how both Ontario and Quebec exemplify the complexities of managing such relationships. In theory, greater diversification—through cultivating alternative export markets or finding new suppliers—can enhance elasticity and reduce the risks of overdependence on a single partner. In practice, however, industries ingrained in cross-border supply chains seldom relocate or retool overnight. Even when dislocations loom, incremental steps such as securing additional inventory or making small adjustments to supplier contracts usually take precedence over full-scale shifts.

A closer look at Quebec's aluminum (HS 76) and aerospace (HS 88) exports shows how a degree of diversification can buffer against certain disruptions, given that these sectors may not be fully interchangeable on the global market. Nonetheless, as Table 4 indicates, Quebec's mix remains heavily oriented toward the United States, leaving it vulnerable to prolonged U.S. policy shifts or cyclical downturns. Ontario, meanwhile, displays a powerful but also potentially fragile automotive core, as evident in Table 5, which reports that vehicles (HS 87) account for roughly 30.86% of its exports to the U.S. and command a significant share of the province's total export value. Although embedded "just-in-time" practices and regulatory frameworks can grant short-run stability, the same interdependence constrains rapid adaptation if new barriers arise. In elastic areas such as plastics (HS 39) or electrical machinery (HS 85), Ontario's exporters may experience more abrupt downturns when faced with tariff hikes, signifying a heightened need for policy contingency plans.

In this environment, elasticity emerges as a defining factor. High elasticity sectors, such as certain consumer-oriented goods or basic commodities, can experience swift trade reductions in the face of price increases, especially if foreign buyers or alternative suppliers exist. Low elasticity sectors, by contrast, may initially sustain their market positions but face outsized repercussions when barriers remain in place for an extended period. Simple currency depreciation strategies have limited efficacy in the Canadian–U.S. context, since so many businesses are locked into sourcing or market arrangements that do not readily adjust to nominal price changes.

The data further demonstrate that provincial reliance on the U.S. market, particularly in export-intensive regions such as Alberta, Ontario, and Quebec, remains a formidable reality. A handful of large industries within these provinces account for a majority of Canada's trade with the United States, generating potential for economies of scale and competitive advantage while intensifying the fallout from disruptions. Sectors featuring specialized inputs or long-term contracts, such as nuclear reactors, boilers, and machinery (HS 84) in both Ontario (Table 5) and Quebec (Table 6), can bear moderate cost shifts without immediate upheaval but become especially vulnerable during sustained crises. Although cost structures or global competition may eventually spur modest reconfigurations of supply lines, institutional inertia and significant capital investments slow these transitions.

From an academic perspective, modern frameworks that integrate gravity models with global value chain analyses confirm how deeply alignment of regulations, proximity, and historical ties magnify bilateral trade, while simultaneously restraining quick adjustments to policy changes. In a practical sense, this means that policy decisions on tariffs, market diversification, or supply-chain security must draw on granular data—such as the provincial breakdowns in Tables 4 and 5—and avoid reliance on aggregate trade balances alone. High-level figures can conceal a province's heavy exposure to certain commodity price swings or tariff threats, even as the broader national picture remains more stable.

Ensuring that Canadian policymakers can balance opportunity with risk requires adapting trade agreements and supportive frameworks to strengthen resilience. Sectors at high risk of sudden price shocks may necessitate interventions ranging from export credit guarantees to investment in alternative logistics routes. Meanwhile, industries with concentrated supply-chain hubs—particularly automotive and energy—benefit from legal certainties that discourage abrupt unilateral actions by the larger partner. This approach can be particularly valuable when consumer goods exports, documented in multiple provinces, face rapid declines once external conditions turn unfavorable.

Looking ahead, the year 2025 and beyond will likely see technology shifts, evolving environmental policies, and geopolitical frictions that place new pressures on established North American supply networks. Though the notion of "too much" reliance on the U.S. market remains an enduring concern, realigning production and distribution ties developed over decades is a gradual, capital-intensive process. In an environment defined by automotive transitions to electric vehicles, energy decarbonization, and digital manufacturing, policymakers must remain attentive to how different elasticity profiles—spanning automotive parts in Ontario, metals and aerospace in Quebec, and crucial raw materials in Alberta—continue to shape the structural realities of bilateral trade. The evidence suggests that a robust, well-informed strategy grounded in firm-level nuance and regional differentiation can help mitigate concentration risks, support agility when tariffs or disruptions arise, and safeguard the mutual gains from Canada's close association with the United States.

5 | CONCLUSION: EVOLVING PATHWAYS IN CANADA–U.S. TRADE

Canada's economic ties with the United States extend well beyond simple export–import tallies, reflecting sectoral integration, variable elasticity profiles, and supply chains that have developed over decades. Although official trade balances might suggest clear surpluses or deficits, the underlying reality is more nuanced. Certain Canadian industries, including mineral fuels and automotive components, benefit from short-term insulation due to capital-intensive infrastructures or specialized refinery constraints. Others, such as consumer goods and various raw materials, confront more elastic demand, causing sharper volume fluctuations when costs or policies shift. A comprehensive view emerges only by moving beyond headline statistics and examining vulnerabilities at the regional, sectoral, and product-specific levels. The data from 2024 confirm that Ontario's relative strength in inelastic automotive part exports contrasts with Quebec's more diversified, yet still U.S.-focused, portfolio; both provinces also contain consumer goods segments susceptible to cyclical swings in the American economy. At the sub-national scale, automotive hubs or resource-dependent communities may prove more resilient against moderate cost changes but face particular perils should tariff barriers persist or expand.

In this broader context, a likely scenario under a new tariff shock emphasizes the importance of elasticity variations across different time horizons, firm types, and industrial clusters. In the short term—spanning roughly six to twelve months—Canadian automotive producers could experience a 15–20% drop in cross-border trade if hit with a 25% tariff. Larger, well-diversified firms might limit this contraction to nearer 10% by absorbing part of the tariff, whereas smaller suppliers lacking alternative supply lines could encounter the full extent of lost demand. Cities such as Windsor, which depends heavily on auto exports, would bear the consequences in the form of immediate production cuts, potential layoffs, and partial shutdowns. On the American side, Detroit-based automakers could face 5–10% cost increases for certain vehicle lines, unless they quickly secure replacements for Canadian inputs.

Over the medium term—between one and three years—the influence of elasticities becomes more pronounced as firms find ways to relocate production or cultivate alternative supply networks. An initial 15% decline in Canada–U.S. automotive trade might expand to 20–25%, as some companies choose to expand in Mexico or source from overseas. Regions such as Kitchener–Waterloo or Windsor, where studies suggest 40–60% greater exposure relative to Canada's average, might undergo more pronounced negative effects, while American manufacturing centers reliant on specialized inputs from Ontario or Quebec could see rising costs and diminished competitiveness if forced to adopt less efficient supply chains. The oil and gas sector might weather only a modest 2–5% initial drop, but the persistent uncertainty surrounding pipelines or new policies in the U.S. could eventually spur refiners and energy traders to divert a larger fraction of demand elsewhere. This longer-term process would likely deepen economic disruptions in places like Saint John, New Brunswick, and Calgary, Alberta, where exposure surpasses national norms by 80–130%, potentially precipitating a 10–15% immediate fall in exports and as much as 20–25% if no new markets appear.

From the American vantage point, the initial question is whether higher tariffs produce localized shortages or prompt cost hikes. Motor vehicle prices may rise by an estimated 3–5% in the short term, exerting particular pressure on Midwestern states if suppliers cannot pivot smoothly. Medium-term plans could involve retooling production lines or reconfiguring entire distribution networks, imposing frictional costs that could stretch into the billions of dollars. Firms with preexisting global supply chains may adapt relatively quickly, while those rooted in specialized industrial clusters in Ontario or Quebec face steeper short- and medium-term disruptions. By the two- or three-year mark, automotive trade might contract by as much as 20–25%, with other sectors such as machinery or electrical equipment rebalancing by 10–15%, depending on how firms respond to elevated transaction costs.

Together, these insights highlight a layered process of adjustment for both Canada and the United States. In the immediate aftermath of a tariff shock, Canada—by virtue of its smaller market—tends to bear the largest burden. However, significant U.S. industries, particularly those connected to automotive production, machinery, and capital goods, also encounter elevated costs and potential operational setbacks. Cities most exposed to cross-border linkages—Windsor and Saint John in Canada, along with Detroit in the U.S.—are liable to suffer the earliest disruptions, while more diversified centers can adapt more smoothly over time. Within a few years, shifts in global sourcing and manufacturing practices could indeed reduce North America's once closely integrated supply chains, shaping an environment of clear winners and losers based on each locality's resilience, industrial mix, and capacity for policy intervention. This evolving landscape underscores the value of a deeply informed trade framework that goes beyond simplistic balance-of-payments measurements and directly engages the granular realities of elasticity, supply-chain coordination, and local economic structures.

Introducing tariffs or quotas into this intricate web of production is akin to disrupting the very machinery of global economic growth. When multinational corporations are compelled to reorganize their supply chains to conform to protectionist policies, they face higher costs and inefficiencies. Specialized manufacturing clusters lose their competitive edge, and companies are forced to duplicate production capabilities in less optimal locations.

Proponents of protectionism, echoing Colbert's advocacy for state-supported industries, often argue that it preserves domestic jobs. However, this perspective is myopic. While some industries might experience temporary gains, the overall effect is a net loss. The forced restructuring of global value chains distorts comparative advantages, leading to economic inefficiencies that result in higher prices, reduced competitiveness, and ultimately, job losses in other sectors. As Krugman (1997) warns in *The Age of Diminished Expectations*, the interconnectedness of the global economy transforms such policies into a negative-sum game where all nations—proponents and adversaries alike—suffer diminished growth.

The lessons of history, as articulated by early economic thinkers like Antonio Serra in his *Breve Trattato della Ricchezza delle Nazioni* (1613), warn us against the perils of clinging to outdated paradigms. Serra recognized that prosperity stemmed not from rigid isolationism but from fostering systems of mutual benefit. Today, this insight holds even greater weight. Global challenges—from climate change, as highlighted by Sachs (2015), to technological innovation,

and ensuring equitable globalization as discussed by Stiglitz (2006)—demand cooperative solutions that transcend national borders.

The revival of mercantilist-inspired protectionism represents a step backward in economic policy. It ignores the profound transformation brought by globalization, where economic activity thrives on interconnected value chains rather than national silos. Far from safeguarding prosperity, such policies undermine it by fragmenting economies and diminishing their collective potential. Rather than chasing the mirage of mercantilism, policymakers must embrace a vision of cooperation and integration, strengthening global value chains, acknowledging regional trade flows, and fostering openness. Only through such strategies can we unlock the full potential of the global economy and build a foundation for shared prosperity in the 21st century.

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