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ABSTRACT

This paper uses a new dataset on the universe of Canadian imports and tariffs between 1924 and 1936, disaggregated into 1697 goods originating in 112 countries, to analyze the impact on Canadian imports of interwar Canadian trade policy, including the 1932 Ottawa trade agreements. Rather than use a dummy variable approach, we compute the impact of individual tariffs which varied substantially across goods, trade partners, and time. We develop a novel method of controlling for multilateral resistances in the context of a one-country dataset, and perform a variety of counterfactual exercises to determine the impact of tariffs on trade flows. The overall impact of post-1929 tariff shifts, including the 1932 agreements, was relatively small, reflecting the fact that Canadian trade policy was already highly protectionist: trade agreements can have heterogenous effects on participants because the shocks involved are different. Compared with a free trade counterfactual, the impact of the overall structure of protection on the level and composition of trade was large.

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1 Introduction

Adam Smith once described the British Empire as "not an empire, but the project of an empire" (Darwin, 2009, p. xi). The Great Depression provided an opportunity to make the project a reality. Previous proposals to create an imperial trade bloc had been inconsistent with Britain's post-1846 multilateral free trade policy. But now protection was universally on the rise, even in the UK itself, raising the possibility of preferential tariff arrangements between Britain and its empire. Welcoming delegates to the Ottawa Imperial Economic Conference in July 1932, Canadian Prime Minister R.B. Bennett called for "closer Empire economic association" based on tariff preferences, while cautioning that any outcome should be "compatible with those domestic considerations fundamental to the development of our natural resources. Those considerations cannot be forgotten if the Empire project is to succeed" (British Parliamentary Papers, 1931-32, p. 69).

Canada signed several bilateral trade agreements at Ottawa, including one with the UK. But pursuing Bennett's Empire project also meant discriminating against other countries, notably the United States, which was already facing Canadian retaliation against the 1930 Hawley-Smoot tariff. Canadian trade policy was increasingly hurting its most important trade partner, the United States, while favouring its second-most important partner, the UK. And a third feature of Canadian trade policy further complicated matters: Bennett's "domestic considerations" implied a rise in the overall level of protection, potentially reducing imports from everywhere.

This paper provides the first detailed quantitative study of all three facets of Canadian trade policy during the interwar period: the general rise in tariffs; the preferential trade deals with the rest of the British Empire; and the increasing discrimination against third countries, notably the United States. We not only study changes in trade policy following the onset of the Depression in 1929, but estimate the impact of the entire structure of protection in every year from 1924 to 1936. We make several original contributions. First, we construct a new dataset of Canadian imports and tariffs, covering the universe of Canadian imports between 1924 and 1936 and disaggregated into 1697 consistently defined product categories. This involved digitizing 7280 printed pages taken from contemporary primary sources, merging product categories so that they were consistently defined over time. Second, we use these data to estimate trade elasticities, allowing these to vary across sectors, trade partners, and time periods. Third, we do so using a novel method allowing us to control for all relevant multilateral resistances, even though we only have import data for one country. And fourth, we embed our econometric estimates within a small open economy model of the Canadian economy, combining a simple supply side with an extremely detailed model of Canadian import demand that allows for trade diversion, incorporating substitution effects across a variety of margins. This allows us to calculate the impact on imports of Canadian trade policy, disaggregated by product, trade partner, and year.

There is little previous literature on the quantitative impact of interwar Canadian trade policies. The paper which comes closest to our own is Jacks (2014), who uses quarterly data on Canadian imports and exports by country, disaggregated into nine broad commodity categories, and deflated using the wholesale consumer price index. Using a difference in differences approach and dummy variables, the paper looks for the impact of the Ottawa trade agreements, which promoted trade within the British Empire from 1932 onward. The

conclusion is that this impact was small. In contrast we use disaggregated data on 1693 goods from the universe of trade partners;[1] we estimate trade elasticities using data on nominal trade flows in a standard structural gravity framework; we calculate the impact over time of all trade policies, using commodity-level tariff data rather than dummy variables; and we do so using a detailed model of Canadian import demand which allows for substitution between imports and domestic output; between different imported goods; and between different national varieties of goods. Taking account of substitution across these different margins turns out to be essential for understanding the impact of Canadian protectionism during this period.

Our paper speaks to several literatures, most obviously that on interwar trade blocs. Traditional historians have doubted whether the Ottawa trade agreements had a big impact on British exports: based on pre-1932 trends, Drummond (2006, p. 102) guesses that they raised them by at most 3 percent. In an early quantitative contribution, Eichengreen and Irwin (1995) estimate (pre-structural) gravity models using cross-section bilateral trade data for 1928, 1935, and 1938. While they find a strong positive impact on bilateral trade flows of mututal membership of the British Empire in the 1930s, the effect is almost as strong in 1928, before the Ottawa agreements of the 1930s. The implication is that the Empire effect largely reflected a long history of pre-existing commercial links.[2] More recently, Gowa and Hicks (2013) analyze a much larger panel dataset in a structural gravity framework, finding that while imperial preferences boosted trade between the UK and its Dominions, it left trade between the Dominions unchanged. These studies are based on aggregate trade flows and trade bloc dummy variables; in contrast, we use detailed disaggregated information on trade and trade policy, and look at the commodity-level impact of tariff changes. Previous work has shown that doing so can uncover strong effects of trade policy that aggregate studies conceal (de Bromhead et al., 2019; Arthi et al., 2020).

Second, our work is related to recent papers on the heterogenous effects of trade agreements. Baier et al. (2018) analyse "the heterogeneity of trade elasticities to *given ad valorem tariff-rate...changes*" (our emphasis), and find that as a consequence of this, economic integration arrangements have heterogenous effects across participants.[3] Because we collect data on individual tariffs we are able to able to look in greater detail at what tariff changes these agreements involved. de Bromhead et al. (2019) and Arthi et al. (2020) find that imperial preferences had a strong distorting effect on the level and direction of trade in interwar Britain and India respectively, boosting intra-imperial trade flows substantially. This paper finds a more modest impact of 1930s trade policy changes in Canada. An important reason for this discrepancy is that the shocks involved (as opposed to the trade elasticities) differed across countries: Canadian trade policy was protectionist and discriminatory *before* the Great Depression, and was already having a major impact on the level and structure of imports in the 1920s. In contrast, the post-1929 British and Indian shifts in trade policy were much more dramatic. This novel source of heterogeneity would be difficult or impossible to

[1] For reasons that Section 4 will explain we do not include four of our 1697 products in the analysis.

[2] Consistent with this finding, and in line with the recommendations of Baier and Bergstrand (2007), Wolf and Ritschl (2011) analyze the same data in a panel setting, introducing country-pair fixed effects into the specification, and find that the creation of the Empire trade bloc had no effect on bilateral trade flows.

[3] Baier et al. (2019) find that most of this heterogeneity occurs within rather than across free trade agreements.

uncover using aggregate data and trade bloc dummies alone.

Third, our paper speaks to the literature on colonial trade ties. Head et al. (2010) argue that the strong trading links between colonies and colonisers reflect "trade-promoting capital embodied in institutions and networks of individuals with knowledge of trading opportunities" (p. 12), a "sticky" determinant of trade flows that nonetheless depreciates over time once colonies become independent. Similarly, as we have seen, Eichengreen and Irwin (1995, p. 15) argue that "the prevelance of Commonwealth trade" largely reflected "commercial and financial linkages that had developed over the years". Importantly, they acknowledge that preferential trade policies might have had an impact before the Ottawa accords, but their emphasis is far more on the effects of long-standing historical ties. Our results suggest that despite its discriminatory nature, Canadian trade policy before the Ottawa accords and the Great Depression actually lowered imports from Britain, although it hit exports from the US and the rest of the world by more.

Fourth, several authors have studied foreign retaliation against the American Hawley-Smoot tariff of June 1930 (Eichengreen, 1989; Irwin, 1998; 2017). In a recent contribution Mitchener et al. (2022) use quarterly aggregate bilateral trade data and retaliation dummies to identify the impact of retaliation, and conclude that it was big. Our data can provide an alternative angle on this issue, by focussing on one retaliator's policies in granular detail.

And finally, there is an extensive literature on trade elasticities to which we contribute, heeding the call of Goldberg and Pavcnik (2016, p. 199) for more evidence based on variations in trade policy.[4] Interwar Canada offers an ideal setting for this purpose, featuring substantial variation in tariffs across goods, trading partners, and time. We obtain a set of elasticity estimates based on these historical data that are on the lower end of what previous authors have found.

1.1 Roadmap

As Section 2 will document, Canadian trade policy began to shift in a more protectionist and discriminatory direction from 1930 onwards. To analyze the implications of that shift, we ask: what would imports into Canada in 1929 have looked like if tariffs had changed as they actually did subsequently, with everything else remaining the same? In order to answer that question, we need a model of Canadian imports in 1929, with imports disaggregated by product and exporting country. We need the tariff rates actually imposed by Canada in 1929 (disaggregated again by product and country) so that we can replicate the actual 1929 equilibrium, which we will refer to as the benchmark equilibrium. Finally, we need Canadian tariff rates in every subsequent year. We can then shock our 1929 model, by counterfactually imposing these later tariffs on it, and seeing how imports, for every product and country, would have responded. We can thus trace out how the level and structure of Canadian imports in 1929 would have been different had the economy faced the tariffs of 1930, 1931,

[4]For example, see Broda and Weinstein (2006), Egger et al. (2012), Hillberry and Hummels (2013), Simonovska and Waugh (2014), Soderbery (2015), Caliendo and Parro (2015), Feenstra et al. (2018), and Fontagné et al. (2020).

and so on.[5]

Section 2 also makes it clear that Canadian trade policy was already quite protectionist prior to the Great Depression. The second counterfactual question that we ask is therefore: what would the level and structure of Canadian imports have been in each year from 1924 to 1936, if all tariffs had been counterfactually set to zero? By comparing these counterfactual imports with the actual imports in each year, we can calculate the impact of the entire structure of protection on Canada's imports over time. In order to do this, we need models of Canadian imports in every year, similar to the one for 1929 mentioned above, which we can then shock by abolishing all tariffs imposed in the year in question.

These models (one for each year), which will be described in greater detail in Section 3, will involve nested CES utility functions on the demand side. These utility functions are defined over 1693 imported products coming from 112 countries, as well as an aggregate 'domestic' commodity produced and consumed within Canada. Because the utility functions are CES, all their parameters can be recovered, for each year, if we know the actual levels of consumption of every commodity, the relevant elasticities of substitution, and the tariff rates imposed on all imported products. We take our data on imports and tariff rates directly from the contemporary Canadian trade statistics; Section 4 will introduce our new dataset and indicate how it was constructed, while the elasticities are derived in Section 6, using the novel single country methods described in Section 5. The results of our counterfactual experiments are presented in Section 7, and Section 8 offers some concluding remarks.

2 Canadian Trade Policy: A Brief Overview

In this section we provide a brief introduction to Canadian trade policy during the interwar period. In order to understand the significance of the changes which occurred at that time it is necessary to place them within a longer-run context. Unless otherwise stated, we rely on the two standard accounts of Canadian trade policy provided by McDiarmid (1946) and Hart (2002).

By the 19th century, the reliance of Britain's remaining North American colonies on exports of fur and fish was being replaced by a growing dependence on timber and wheat, shipped in ever-growing quantities to the British market. Timber could be shipped to Britain more cheaply from the Baltic, and Canada also faced competition from both British and European grain. Its exports of these goods were thus heavily reliant on the British tariff system, which gave preferences to Canadian exporters. Britain's unilateral move to free trade in 1846 therefore posed a significant challenge to Canadian export interests. Reorienting exports towards the United States was one obvious countervailing strategy, but this was made more difficult by the fact that the large neighbour to the south was itself increasingly resorting to protection. At the same time, nascent Canadian manufacturing interests were beginning to demand protection from British and American competition. The challenge for legislators was thus to secure a privileged position in either the British or American market for Canadian raw materials exports, while at the same time shielding its domestic

[5]Alternatively, we could ask what would the level and structure of imports have looked like in subsequent years, had the Canadian economy faced 1929 tariffs in those years, rather than the tariffs actually imposed. This was the approach taken in de Bromhead et al. (2019) and Arthi et al. (2020).

manufacturers from competition originating in precisely these two countries.

Initially, the focus was on securing a privileged position for Canada's raw materials exports in the US market –a policy goal known as "reciprocity". First the colonies established free trade in most raw materials amongst themselves, and then, in 1854, a treaty was signed with Washington establishing free trade in 28 products, mostly raw materials. In exchange the US obtained access to Canadian fishing waters, and free navigation on the Great Lakes. The agreement was undermined, however, by a later Canadian decision to extend free trade in many raw materials to all countries, undermining American preferences, as well as by increases in Canadian manufacturing tariffs. The latter decision was motivated not only by a need to increase government revenue, but by a desire to develop Canadian manufacturing. The United States thus terminated the agreement in 1866, but many in Canada, united politically from 1867 onwards, continued to pursue the goal of reciprocity in the decades that followed. These attempts were however repeatedly rebuffed by Washington.[6]

From 1878 onwards, Canadian policy became more explicitly protectionist, with import substitution and industrialisation being promoted by Conservative Prime Minister John McDonald's National Policy. This effort would become a core feature of Canadian trade policy for several decades, being pursued by Liberal as well as Conservative governments. Over time the policy became more sophisticated, both in terms of the selectivity of the tariff schedule and the way it was implemented in practice. In 1904 the world's first anti-dumping duty was introduced. An alternative way of dealing with competition considered to be unfair was to value imported goods, not at the price declared by the merchants concerned, but at a "fair price" to be determined by the Canadian authorities. This practice had first been authorised in 1888 (McDiarmid, 1946, p. 217), and while little resorted to initially, it would eventually become a standard tool in the Canadian authorities' arsenal.

A second development occurred towards the end of the century. By that stage legislators had realised that reciprocity was unattainable, and sought instead to strengthen economic ties with Britain, which had by now, albeit only temporarily, regained its traditional status as Canada's leading export market. The time seemed propitious for such an initiative, since on the British side Colonial Secretary Joseph Chamberlain strongly favoured closer economic relationships between members of the British Empire. In 1898 Canada unilaterally extended tariff preferences to the United Kingdom, Bermuda, the British West Indies, and British Guiana. These preferences would soon be extended to most members of the British Empire, aside from Australia, Newfoundland, and entrepôt colonies such as Aden, Gibraltar, and Hong Kong. In 1907 the country went one step further, with Finance Minister Fielding introducing three tariff schedules: the British preferential rate; a "treaty" or "intermediate" rate for countries concluding trade treaties with Canada and consequently enjoying most favoured nation status; and a third, general rate for other countries. This basic tripartite structure was retained through the interwar period. Treaty rates tended to be around 5 to

[6]In a final twist, in 1910 it was the United States that initially proposed that the two countries negotiate closer trade ties. This was successfully done, and the ensuing treaty was ratified in Washington. But in September 1911 the Liberal Government that had negotiated the treaty was defeated by the Conservative opposition and the treaty was never brought into effect. Canadian manufacturing interests breathed a sigh of relief: their opposition, as well as appeals to Imperial unity, had carried the day. The episode well illustrates the influence of the competing attractions of the United States and United Kingdom on the course of Canadian trade policy.

7.5 percent lower than general rates, but according to McDiarmid the innovation was not so important in practice: "Not until it was extended to the United States in 1935 did any important volume of trade enter under it" (p. 224).

The introduction of this third intermediate rate reflected growing Canadian autonomy vis-à-vis Britain. In 1893 the country had negotiated its first ever trade treaty, with France, but did so in the shadow of British concerns about the most favoured nation obligations of her colonies, and with the participation of British officials (Shields, 1968). By the end of the century, however, the UK treaties that were most problematic for Canadian aspirations (those concluded with Belgium and Germany in 1862 and 1865 respectively) had been abrogated by London, and a truly independent Canadian trade policy now became possible. A second treaty with France was independently negotiated by Canada in 1907,[7] and was followed by agreements with Italy in 1910 and the British West Indian colonies in 1912.

The world war saw a temporary increase in protection for fiscal reasons, but this was reversed after the war. Furthermore, specific tariffs, some of which had been introduced during the long price slump of the late 19th century so as to maintain tariff revenues, now implied falling ad valorem rates of protection as prices rose sharply. The net upshot was that, somewhat atypically, Canada entered the post-war period with tariffs that were if anything lower than at the turn of the century (Hart, 2002, p. 89). During the 1920s Canada negotiated trade agreements with Cuba, Czechoslovakia, France, and the West Indies. It also agreed to exchange most favoured nation status with Belgium, Estonia, Finland, Hungary, Italy, Latvia, Lithuania, the Netherlands, Portugal, Romania, Spain, and Yugoslavia.[8] The margin of British preference was further increased, and in 1928 British preferential rates were extended to Newfoundland (Macleod, 1985, p. 85). Otherwise trade policy remained relatively stable.

That would change with the onset of the Great Depression and the shift towards protection in Canada's two most important trading partners, the United States and United Kingdom. As America started debating what would become the Hawley-Smoot tariff, Liberal Prime Minister Mackenzie King held off on the tariff reductions he was apparently contemplating, and warned instead of potential retaliation (McDonald et al., 1997). In May 1930 he announced that a general election would be held in July. To pre-empt the Conservatives, who wanted higher tariffs on American products and closer ties with Britain, King's government introduced a new tariff bill moving in that direction. The bill lowered tariffs on 270 goods imported from the UK and Dominions, while raising just 11 preferential tariffs; there were 35 increases and 98 decreases on the intermediate tariff schedule affecting countries with whom Canada had negotiated trade agreements; and there were 54 increases and 46 decreases on the general tariff schedule affecting countries like the United States. Notably, countervailing tariffs were introduced on 16 US export goods accounting for around 30 percent of American exports to the country. Formally the duties applied to all countries whose tariffs on the goods concerned were higher than Canadian tariffs: the importation of potatoes, for example, remained duty-free, but now with the proviso that "if any country

[7] Although the Canadian negotiators were supposedly representing Britain: McDiarmid (1946, p. 223).

[8] Some of these agreements are characterized in the secondary literature as representing fully fledged trade agreements, but this is not the case. See for example the 1924 Belgian agreement, detailed in 14-15 George V, Chapter 9, and available at https://archive.org/details/actsofparl1924v01cana/page/20/mode/2up. All that it involved was the mutual exchange of most favoured nation status.

imposes a duty on potatoes grown or processed in and imported from Canada, an equal duty shall be imposed on potatoes coming into Canada from such country."[9] King however made it clear that the United States was the intended target (McDonald et al., 1997, p. 810). The net impact of the new tariff schedule was thus to deepen Imperial preferences, at the expense notably of the United States.

King's manoeuvring was to no avail: the Conservatives, who wanted even more protection, greater import substitution, even stronger action against the US, and even closer ties with Britain, won the election. Tariffs on a wide range of goods were increased in September 1930 and again in June of the following year. Their impact was heightened by a variety of administrative devices, having to do for example with the setting of prices at which imports were valued: according to McDiarmid (1946, p. 276) such tactics may in practice have raised tariff rates by as much as 10 percent. The maximum permitted anti-dumping duty was raised to 50 percent. As in other Dominions, an across-the-board surcharge on imports was imposed by the Canadian government for revenue reasons, reaching 3 percent in 1932 (Chalmers,1933, p. 14; Glickman, 1947, p. 144).

MacKay (1932, p. 874) argues that Bennett's tariff revision "wiped out most of the preferences" afforded to British exporters, but both McDiarmid (1946, p. 275) and Kindleberger (1989, p. 172) concur that general and treaty rates typically increased more than preferential rates, though the latter also rose. Consistent with his belief that Canada should use higher tariffs to force concessions abroad, the new Prime Minister R.B. Bennett indicated that preferential rates could be lowered in return for British concessions to Canada. This was in sharp contrast to Canada's traditional policy of offering British preferences unilaterally.

Bennett further demonstrated his willingness to ruffle British feathers in the autumn of 1931, following Britain's decision to leave the gold standard in September. In the aftermath of the war Canada had instituted policies protecting domestic producers from "exchange dumping". For example, following Britain's return to gold in 1926 imports from European countries not yet on gold were valued at British prices converted at par into Canadian dollars (McDiarmid, 1946, p. 313). Now sterling itself was no longer at par. The immediate response was to continue to use the old sterling exchange rate for valuation purposes, with the rate being subsequently modified on several occasions. An anti-dumping duty was also imposed on British goods (Elliott, 1955, p. 199). While Britain was not the only country to be treated this way, its officials nevertheless protested vociferously.

Events would soon take yet another dramatic turn. The British general election of October 1931 saw a national government elected, dominated by Conservative politicians who were favourable to both protectionism and closer ties with the Empire. The following month the UK imposed high tariffs on a variety of goods originating outside the Empire, and in February the Import Duties Act set a 10 percent tariff on most remaining goods. Britain's colonies were exempted from this new tariff, while the Dominions were exempted until November 15 1932, pending the outcome of the Imperial Economic Conference due to begin on July 21 in Ottawa. This obviously gave the British delegation to that conference a powerful initial bargaining position (Glickman, 1947, pp. 442-3).

In 1931, Canada had reached a trade agreement with Australia, cutting duties on specified goods to rates which were below the British preferential rate. Goods not specified in

[9] 20-21 George V, Chapter 13, available at https://archive.org/details/actsofparl1930v01cana/page/170/mode/2up.

the treaty were accorded British preferential tariffs. The country's British preferences now extended to essentially the entire Empire. In April 1932 a new trade agreement was negotiated with New Zealand, increasing the preferential treatment which that country enjoyed in the Canadian market. The Ottawa Conference would further deepen Imperial preferences, with the participants concluding a series of bilateral deals with each other. Canada negotiated trade treaties with the Irish Free State, South Africa, and Southern Rhodesia, but the agreement that mattered most was that with the United Kingdom.

Broadly speaking, the United Kingdom agreed to maintain or increase the preferences accorded to Canada in February, and "invited" the colonies, subject to certain specified exceptions, "to accord to Canada any preference which may for the time being be accorded to any other part of the British Empire".[10] For its part, Canada lowered its tariffs on a variety of British goods, and increased tariffs on imports from outside the Empire. Changes were made to 225 Canadian tariff lines, with the margin of British preference increasing in 223 of these (Canada. Dominion Bureau of Statistics, 1933, p. 485). Canada's discrimination in favour of Britain thus increased. Canada also agreed to extend its British preferences to the colonies, although the extent to which it abided by this commitment has been questioned (Miners, 2002, footnote 27, p. 74). Canada promised "that all existing surcharges on imports from the United Kingdom shall be completely abolished as soon as the finances of Canada will allow", and "to give sympathetic consideration to the possibility of reducing and ultimately abolishing the exchange dumping duty in so far as it applies to imports from the United Kingdom".

Canada now had deeper economic ties with one of its main trading partners, but trade barriers with its most important partner, the United States, remained high. McDiarmid (1946, pp. 284-5) notes that under Bennett British preferences were raised most in the tariff lines where the United States was particularly dominant. An opportunity to remedy this situation arose following Roosevelt's victory in 1932, with his Secretary of State, Cordell Hull, committed to lowering trade barriers. In 1934 the US passed the Reciprocal Trade Agreements Act, allowing the President to negotiate tariff agreements without the approval of Congress (Irwin, 1998). Under the terms of the Act, a trade agreement was negotiated between Canada and the United States in 1935, with its provisions becoming effective at the start of the following year.[11] Duties were lowered on both sides, and Canada finally granted most favoured nation status to its southern neighbour. It was, however, still entitled to discriminate in favour of the British Empire.

To summarize: interwar Canada had been pursuing a tariff policy promoting import-substituting industrialization since the 1870s, and had been discriminating in favour of Britain and (most of) the rest of the Empire since before World War I. Trade policy remained relatively stable between the war and the Great Depression. In 1930 and 1931 it raised tariffs across the board, but particularly targeting goods exported by the United States, and deepened Imperial preferences. While anti-dumping measures were taken against Britain in the autumn of 1931, Imperial preferences were further deepened in 1932, following the Ottawa Conference. The United States found itself being increasingly discriminated against in the

[10]The text of the agreement is available in British Parliamentary Papers (1932).

[11]As Section 4 notes, our trade and tariff data are for fiscal years ending on 31 March, so this change occurred nine months into what we label 1935.

Canadian market. This trend was eventually reversed in 1935, following the signing of the Canada-US trade agreement, with tariff reductions being agreed by the two countries, and with the US receiving MFN status in Canada. Those changes became effective in 1936.

3 Theoretical Framework

As Section 4 will describe, we have constructed an extremely detailed dataset giving us Canadian imports of 1693 products from 112 countries in every year from 1924 to 1936. We have also collected tariff data at the same level of disaggregation. In order to evaluate the impact of trade policy on the level and structure of Canadian imports, we need to compare our actual import data with the imports that would counterfactually have been observed had tariffs been different. This requires a model.

While we have extremely disaggregated information on imports, we do not have correspondingly detailed domestic production data. We do however have Canadian GDP. We therefore construct, for each year t, a small open model of the Canadian economy inspired by Anderson and Neary (1996) and Broda and Weinstein (2006). The supply side is very simple. A representative household is endowed with the sole factor of production, GDP_t, which is transformed by a single production sector into two goods, an export good X_t and a domestic good D_t, via a constant elasticity of transformation production function with elasticity η:

$$GDP_t = \theta_t D_t^{(1+\eta)/\eta} + (1-\theta_t) X_t^{(1+\eta)/\eta} \tag{1}$$

The export good is sold abroad to generate the foreign exchange needed to buy imports, while the domestic good is consumed locally; we assume that trade is balanced.

The demand side of the model is more complex, reflecting the richness of our import data. The representative household has a nested CES utility function (Figure 1). At the top level the household chooses between a domestic good D_t and a composite imported good I_t, with elasticity of substitution κ:

$$U_t = (\alpha_t D_t^{(\kappa-1)/\kappa} + (1-\alpha_t) I_t^{(\kappa-1)/\kappa})^{\kappa/(\kappa-1)} \tag{2}$$

The composite imported good is a CES aggregate, with elasticity γ, of up to 1693 imported goods M_{gt}:

$$I_t = (\sum_{g \subset G_t} \beta_{gt} M_{gt}^{(\gamma-1)/\gamma})^{\gamma/(\gamma-1)} \tag{3}$$

where G_t is the subset of our 1693 goods imported in year t. Finally, each good g imported in year t is a CES aggregate, with elasticity σ_g, of up to 112 national varieties m_{gct}, each originating in a separate country c:

$$M_{gt} = (\sum_{c \subset I_{gt}} \delta_{gct} m_{gct}^{(\sigma_g - 1)/\sigma_g})^{\sigma_g/(\sigma_g - 1)} \tag{4}$$

where I_{gt} is the subset of our 112 countries exporting good g to Canada in year t. We assume that Canada takes the world prices of traded varieties, p_{gct}^W as given; domestic prices p_{gct}^D are then simply equal to world prices multiplied by $(1 + \tau_{gct})$, where τ_{gct} is the ad valorem equivalent tariff rate imposed on national variety c of good g in year t. As mentioned earlier, all the parameters of the model (that is, θ_t, α_t, β_{gt}, and δ_{gct}) can be retrieved given data on imports m_{gct}, tariff rates τ_{gct}, consumption of the domestic good D_t, and the elasticities in the model (η, κ, γ, and σ_g).[12] The tariff rates can then be exogenously varied in counterfactual simulations. We hold the extensive margin fixed in all simulations, consistent with the observation that movements in aggregate trade flows occurred overwhelmingly on the intensive margin during this period: in other words, we hold G_t and I_{gt} fixed for all g and t.[13] We next provide a brief description of our import and tariff data, before proceeding to estimate the elasticities of substitution between different imported varieties, σ_g.

4 Data Description and Sources

Our data are taken from the annual trade reports published by the Canadian Bureau of Statistics (Canada. Dominion Bureau of Statistics, 1925-1937). We digitized detailed import tables taken from the thirteen reports covering the fiscal years 1924-25 (ending on March 31 1925, which we assign to 1924) to 1936-7 (ending on March 31, 1937, taken to represent the calendar year 1936). In all we digitized 7280 printed pages. The import tables provide comprehensive information on import values, tariff revenues, and (in 56 percent of cases) import quantities by product and trading partner. 2784 distinct product lines were listed in the import tables we digitized, originating in 116 separate regions or countries. However, not all product categories were reported in every year, with some appearing and others disappearing as reforms led to the separation or merging of the tariff lines of previous years. We were however able to merge the 2784 original categories into 1697 product categories which are consistently defined in every year.[14] These 1697 products can be further aggregated into 100 aggregate categories, which we label industries, and 11 even broader categories which we label sectors (Table A2). We also merged the Canary Islands into Spain, Madeira and the Azores into Portugal, and Alaska and Hawaii into the United States, leaving us with 112 countries.

Countries not listed as exporting a particular product to Canada in a given year were assigned an import value of zero for that product and year. We were able to eliminate all typos and other errors by exploiting the fact that the import tables reported import values and duties not only for individual products, but for more aggregate categories; and that in

[12] The assumption of balanced trade means that given information on imports m_{gct} we can calculate exports X_t. D_t is then simply equal to GDP_t, taken from McInnis (2001), minus X_t.

[13] A simple decomposition of the 1929-33 trade collapse based on Kehoe and Ruhl (2013) suggests that the intensive margin accounted for 100.8 percent of the collapse.

[14] Of these, 1317 were already consistently defined across years in the original sources.

each year they also reported the import values in the four preceding years. As a result, when we sum import values over our 1697 goods and 112 countries, we obtain the official total Canadian import values for each year, accurate to the nearest dollar.

We dropped four of our product categories from the analysis, two involving gold and bullion, and two which reported tariff revenues but no corresponding imports. This implied dropping one of our 100 industries, and one of our 11 sectors, namely "Coins and bullion". We are thus left with 1693 products coming from 112 countries, falling into 99 industries and 10 broad sectors, the latter being listed in Table 1.

The import tables list not only the imports of each product, broken down by country, in each year, but the tariff revenue collected by country and product as well. The ad valorem tariff paid on imports of each variety (i.e. product-country combination) is computed as the ratio of the duty paid to the value of imports for that product, country, and year. We then have to assign tariff rates to countries not exporting a particular product in a given year: the vast majority of observations involve zero trade flows, and we want to include these in our regressions.[15]

Fortunately, the import tables report not only total import values and tariff revenues per product and country, but imports and duties broken down by tariff regime, distinguishing between imports paying the Canadian preferential rate (which, as we saw in Section 2, was payable by most members of the British Empire), the treaty or intermediate rate (payable by countries with which Canada had negotiated a trade agreement), and the general rate (all others). By adding up all imports and duties coming in under a given regime, we were able to compute up to three "regime" tariff rates per product and year: a general, a preferential, and a treaty rate. For some products imports might only have come in under one or two of these headings; for example, a product would only be associated with a preferential or treaty rate if Canada had introduced such rates for that particular product.

If a product was only imported under one regime, every country with zero exports was assigned the tariff associated with that regime. If a product was imported under more than one regime, every country with zero exports was assigned the lowest regime rate to which it was entitled. For example, if a preferential tariff rate existed for a particular product, and a country was exporting other products to Canada that year under the preferential regime, then we consider it to have been eligible for the preferential rate for this product also. Where we had good reason to believe that a particular tariff was specific rather than ad valorem, we made further adjustments for regime-specific unit values, with the aim of ensuring, insofar as it was possible, that differences in imputed tariff rates reflect differences

[15]Of the 2,465,008 observations in our dataset, just 114,146 involved positive import values. Although we include all observations in our main regressions, the rich set of fixed effects that we use ensures that most observations involving zero trade flows are dropped by the PPML estimator.

in specific tariff rates rather than differences in unit values.[16] As a robustness exercise, we estimate elasticities excluding observations involving specific tariffs, or only including such observations.

4.1 Some stylized facts

Canadian imports rose steadily during the 1920s, peaking in 1928, but fell precipitously from 1930 to 1932. Imports in 1932 were 68 percent lower than at the peak, and they were still 47 percent lower in 1936. As can be seen from Figure 2 exports from the United States were particularly badly hit, declining by 73 percent between peak and trough; the corresponding figure for the United Kingdom was 55 percent, with the experiences of the rest of the British Empire, and the rest of the world, lying between these two extremes. By 1936 British exports had fully recovered, whereas US exports were still 55 percent below peak.

While American exports to Canada were particularly badly hit during the Depression, the US was by far the most important exporter to Canada throughout the period, accounting for 64 percent of Canadian imports in 1924 (Figure 2). That share declined from 1930, reaching a low of 54.9 percent in 1933, before recovering to 58.6 percent by 1936. The UK was the second most important exporter, accounting for 19 percent of imports in 1924. Its share rose from 1930, reaching a peak of 24.2 percent in 1933 before falling back to 19.3 percent in 1936. The rest of the Empire saw its share of Canadian imports double between 1929 and 1936, from 5.1 percent to 10.2 percent, while the rest of the world's share was relatively stable throughout, hovering between 11 and 13 percent. We will highlight these four "regions" in much of the analysis that follows.

Figure 3 plots the shares of the ten broad sectors listed in Table 1 in total Canadian imports. As can be seen, Canadian imports were largely concentrated in four broad sectors: iron and iron products; non-metallic minerals and associated products (including coal and petroleum); fibres and textiles; and vegetable products (including grain).

The top panel of Figure 4 plots unweighted average tariffs, computed across all 1693 goods, for each of our four regions. Several features stand out. First, tariff levels were relatively stable in the 1920s, confirming the qualitative accounts in Section 2. Second, there was a clear hierarchy of preferences, with the UK facing the lowest tariffs, followed by the rest of the British Empire and foreign countries other than the United States. The US faced the highest average tariffs in every year bar 1936, the year in which it was finally accorded most favoured nation status by Canada. Third, the margin of imperial preference increased from 1930 onwards, peaking in 1934 or 1935, depending on whether you focus on

[16] More precisely, when it was clear that tariffs were specific, quantity data were available, and units were consistently specified, we calculated regime-specific unit values in each year t, p_{rt}, and an aggregate unit value for all imports p_t. We then multiplied the regime-specific rates described in the text by p_{rt}/p_t. There were 26 cases in which we could not do this because quantities were missing. 25 of them concerned just two goods, "Extracts of meats and fluid beef, not medicated." and "Corn flour, hominy, cracked, evaporated or dried corn." For these two goods general rates were consistently higher than preferential and treaty rates, suggesting that a correction was probably not needed. The remaining observation, "Ale, beer, porter and stout, in bottles. [and other beer]" in 1935, has lower rates for general than for preferential imports. The reason seems to be an error in the original source regarding 72,323 gallons of beer from the United Kingdom, assigned to the general instead of to the preferential regime. In this case, we assign the lower general rate to all zero import countries.

the UK-US comparison, or on the difference between the average tariffs facing our other two regions. The average margin by which US tariffs exceeded British ones increased from less than 6 percent before the Great Depression to almost 10 percent in 1935.[17] Fourth, the tariffs facing all four regions increased in 1931, as Bennett increased protection and imposed anti-dumping duties on Britain and elsewhere. Tariffs on British imports peaked in 1931, while those on foreign countries continued to rise through 1933.

The lower panel of Figure 4 shows that there was a wide variety of tariff experiences across our ten broad sectors which we will exploit when estimating trade elasticities. Tariffs on textiles and vegetable products rose substantially, while increases were more modest for categories such as wooden and miscellaneous products. In some sectors, notably animal products and textiles, tariffs rose on both British and foreign exports. In others, such as non-ferrous metals and vegetable products, tariffs remained relatively stable on imports from the Empire but rose on products from elsewhere. And for iron and non-metallic mineral products tariffs on foreign imports rose modestly, while those on British goods fell following an upward blip in 1931.

5 Econometric Specification

To specify our econometric model, we rely on structural gravity theory (e.g., Anderson (1979), Eaton and Kortum (2002), Anderson and van Wincoop (2003), and Arkolakis et al. (2012)), capitalizing on many of the developments in the empirical gravity literature (e.g. as summarized by Head and Mayer (2014) and Yotov et al. (2016)). A potential challenge is that our data are for a single importer, i.e. Canada. Thus, we cannot implement all of the standard estimation techniques from the literature (particularly the use of fixed effects to control for all multilateral resistances). To address this, we propose and implement a procedure to construct proxies for the structural multilateral resistance (MR) terms that can be helpful beyond our setting, i.e. for other country-specific trade regressions.

5.1 Main estimating equation

The following is our main estimating equation, from which we will recover the key trade elasticity parameters σ_g :

$$m_{gct} = \exp[\ln(1+\tau_{gct}) \times \beta + \psi_{gc} + \phi_{gt} + \pi_{ict} + \alpha \times \ln(OMR_{gct})^{1-\sigma_g}] \times \epsilon_{gct} \qquad (5)$$

Here, m_{gct} denotes nominal (cf. Baldwin and Taglioni (2006)) imports into Canada of product g from exporter c in consecutive years t (Egger et al. (2022)).[18] m_{gct} enters (5) in levels because the model is estimated with the Poisson Pseudo Maximum Likelihood (PPML) estimator which accounts for possible heteroskedasticity in the trade flows data (cf. Santos

[17] In the aggregate, therefore, MacKay (1932) was incorrect to suggest that Bennett's across-the-board tariff increases wiped out the higher imperial preferences established by his predecessor.

[18] Many papers have followed the recommendation of Cheng and Wall (2005) to estimate gravity with interval data. However, more recently, Egger et al. (2022) have demonstrated that there is no need to (randomly) throw data away when the gravity model is properly specified, and they recommend using all years. We follow this recommendation when obtaining our main estimates.

Silva and Tenreyro (2006; 2011)) and which, due to its multiplicative form, also takes into account the information contained in the zero trade flows.

The key covariate of interest to us is $\ln(1+\tau_{gct})$, the log of one plus the ad valorem tariff rate imposed on product g from exporter c at time t. Since tariffs are direct price shifters, theory implies that the coefficient on $\ln(1+\tau_{gct})$ is only a function of the trade elasticity, and we will recover and utilize this important parameter for our simulation analysis.[19] For the sake of simplicity equation (5) only includes a single β coefficient; however, in the empirical analysis below we will allow it to vary across sectors, across countries, and over time. The separability property of the structural gravity model (e.g., Anderson and van Wincoop (2004), Costinot et al. (2012)) facilitates this, since it implies that equation (5) can be estimated separately at any desired level of aggregation. Our baseline simulations use β coefficients estimated at the sectoral level: importantly, these utilize the most disaggregated (product-level) data but impose common coefficient constraints at the sectoral level of interest. To obtain our main estimates, we use three-way clustered (by exporter, product, and time) standard errors, but we also experiment with two-way clustered standard errors in the robustness analysis and find that our conclusions do not change.

Equation (5) includes three sets of fixed effects.[20] ψ_{gc} denotes the vector of country-product fixed effects, which control for all time-invariant determinants of trade at the exporter-product level (also absorbing, by construction, any time-invariant country and product characteristics). Importantly, ψ_{gc} allows us to control for any time-invariant trade cost differences across products (e.g., differential effects of distance across products). This is consistent with some of the theoretical foundations of the gravity equation, e.g., Anderson and van Wincoop (2004) and Costinot et al. (2012), and there is plenty of empirical evidence that trade costs vary across sectors and products. Including these fixed effects has the further advantage that our identification occurs purely along the time dimension.

ϕ_{gt} denotes the set of product-time fixed effects, which will absorb and control for any time-varying product changes and characteristics (e.g., global structural change or shifts across goods in Canadian demand). By construction, ϕ_{gt} will also control for all time-invariant product characteristics (e.g., units of measurement) as well as any common time trends (e.g., the Great Depression). Finally, in our single-country setting, product-time fixed effects control for all Canadian inward structural multilateral resistance terms.

π_{ict} is a vector of industry-exporter-time fixed effects. The exporter dimension of these fixed effects ensures that we fully control for any time-invariant country characteristics (e.g., area) and also, given our one-country setting with Canada as the single importer, for any time-invariant bilateral trade costs between exporter c and Canada (e.g., bilateral distance). In addition, the exporter-time dimension of our fixed effects ensures that we fully control for any time-varying exporter-specific determinants of trade (e.g., exporter GDP) and exporter-Canada-specific effects (e.g., the exchange rate between the exporter and Canada, as well as

[19] Depending on the theoretical treatment of tariffs, the coefficient on $\ln(1+\tau_{gct})$ can be interpreted as either '$-\sigma_g$' or '$1-\sigma_g$', where σ_g is the elasticity of substitution (see Yotov et al. (2016)). We will adopt the former interpretation, and take the absolute value of β to be an estimate of σ_g.

[20] In Appendix 2 we experiment with alternative sets of fixed effects, which are less demanding than those used in our preferred specification (5) but which enable us to decompose the importance of various types of determinants of Canada's imports and to use larger estimating samples. Overall, our results are relatively robust to the use of alternative sets of fixed effects. See Appendix 2 for further details.

all bilateral treaties between Canada and the exporters in our sample).

The industry dimension ('i') in our fixed effects π_{ict} is based on the categories from Table A2. From a theoretical perspective, the aim of this additional dimension in our fixed effects is to control (at least partially) for the structural outward multilateral resistance terms (OMR) in exporting countries of Anderson and van Wincoop (2003), who demonstrate that not controlling for these may lead to significant estimation biases.[21] Controlling for the OMRs with fixed effects would require that the latter be of dimension product-exporter-time. However, given our focus on the imports of a single country it is not possible to include these, since they would be of the same dimension as the dependent variable. Therefore, instead of products we use industries, including fixed effects of dimension industry-exporter-time. We note that our sample includes 99 industries, which is a quite disaggregated classification, with on average fewer than 17 products in each industry.

Finally, the last term in equation (5), OMR_{gct}, is a proxy for the OMRs. The standard (and also easiest) method to control for the structural MR terms in panel gravity regressions with data pooled across products or sectors is to use product-exporter-time and product-importer-time fixed effects (see Hummels (2001) for cross-section settings and Olivero and Yotov (2012) for panel settings). However, as noted above we cannot do this. We thus propose and implement a procedure to construct structural MR terms for settings when fixed effects cannot be used. Our procedure is not only applicable to cases such as ours, when gravity models are estimated with bilateral data for a single exporter and/or importer, but to settings with country-specific (not bilateral) data on exports and/or imports (e.g., macro regressions involving the evolution of country-specific trade over time).

5.2 Structural MR terms for country-specific gravity regressions

Guided by theory (Anderson and van Wincoop, 2003), we define the following system (where j, like c, is a country index) which enables us to solve for the multilateral resistances that we need:

$$(OMR_{gct})^{1-\sigma_g} = \sum_j \left(\frac{T^g_{cjt}}{IMR_{gjt}} \right)^{1-\sigma_g} \times \frac{E^g_{jt}}{Y^g_t}, \tag{6}$$

$$(IMR_{gjt})^{1-\sigma_g} = \sum_c \left(\frac{T^g_{cjt}}{OMR_{gct}} \right)^{1-\sigma_g} \times \frac{Y^g_{ct}}{Y^g_t}. \tag{7}$$

Even though our setting only requires calculating the outward multilateral resistances, in order to obtain them we need to solve the MR system (6)-(7) for both the OMRs and the

[21] They also control for any time-invariant and time-varying industry characteristics (e.g. industry size). Baldwin and Taglioni (2006) dub the omission of the multilateral resistances as the 'gold medal mistake' in trade gravity regressions. More recently, Felbermayr and Yotov (2021) show that simply using weighted averages of bilateral trade costs (e.g., GDP-weighted bilateral distances) leads to significant estimation and prediction biases in gravity regressions.

corresponding inward multilateral resistances (IMRs).[22] We obtain the OMR indices that we need in three steps: (i) We construct the vector of bilateral trade costs T^g_{cjt} between each pair of countries c and j; (ii) We select size variables for the weights (i.e., output (Y^g_{ct}) and expenditure (E^g_{jt})) in the MR system; and (iii) We solve the MR system (6)-(7). Given the specifics of our data and setting, we need to address some challenges at each step. We use this as an opportunity to discuss possible caveats (and their respective solutions) that may arise in other similar settings.

- *Construct the vector of bilateral trade costs* (T^g_{cjt}). Even though our main regressions are estimated only with data for Canadian imports, the vector T^g_{cjt} is bilateral (i.e., of dimension $N \times N$, where N is the number of countries in the sample) for each year and product in our sample. Consistent with gravity theory, we can write:[23]

$$(T^g_{cjt})^{1-\sigma_g} = \mathbf{GRAV^g_{cjt}} \times \beta^{\mathbf{g}}, \tag{8}$$

  where $\mathbf{GRAV^g_{cjt}}$ is a vector of variables that proxy for bilateral trade costs for good g between countries c and j, and $\beta^{\mathbf{g}}$ is the corresponding vector of trade cost elasticities for each of the gravity variables. The content of vector $\mathbf{GRAV^g_{cjt}}$ is only limited by data availability and can include time-invariant variables (e.g., bilateral distance, contiguity, etc.), time-varying variables (e.g., free trade agreements, currency unions, etc.), and variables that are product- and/or sector-specific (e.g., tariffs, non-tariff barriers, etc.).

  Given the period under investigation, the set of variables that we are able to include in the vector $\mathbf{GRAV^g_{cjt}}$ consists of (the log of) bilateral distance ($DIST_{cj}$), an indicator for common official language ($LANG_{cj}$), and an indicator for empire links ($EMPR_{cjt}$).[24]. Note that, due to data limitations, none of our trade cost proxies vary at the product dimension. This is a potentially important limitation because we need multilateral resistances that vary by product.[25] To address this challenge, we generate a vector of trade costs (T^g_{cjt}) that also varies across products by obtaining product-specific trade cost elasticities for each of the trade cost proxies. This brings us to the discussion of the vector $\beta^{\mathbf{g}}$ in equation (8).

  In principle, it might be possible to 'borrow' the trade cost elasticities from the existing

[22] We would have also needed the IMR indices for countries other than Canada if, in addition to Canadian imports, we also had data on Canadian exports in our main regressions. Applied to analysis of total (as opposed to bilateral) trade, studies that estimate regressions with total exports as the dependent variable should control for the corresponding country-time-specific OMRs, while regressions with total imports as the dependent variable should include controls for country-time-specific IMRs. Such OMR and IMR indices can be obtained with the procedure that we outline here. Intuitively, the MRs are theory-consistent aggregates of the bilateral trade costs for the exporters and importers in each country.

[23] Note that, in order to construct the vector of bilateral trade costs for the MR system, there is no need to assume a value for the trade elasticity (or the elasticity of substitution). The reason is that T^g_{cjt} enters the system (6)-(7) as a power transform, which can be obtained directly according to (8).

[24] Data on distances and language are from Conte et al. (2022), and empire definitions follow the grouping of countries by empire given in the Canadian trade statistics. In contrast to most of the contemporary gravity literature, we do not use an indicator for contiguous borders. The reason is that the U.S. is the only country with which Canada shares a common border

[25] We remind the reader that the fixed effects in our econometric model (5) already fully control for all differences across the country-industry-time dimension.

literature.[26] However, we are not aware of existing estimates that match the time and product dimension of our analysis. Therefore, we obtain our own product-specific trade cost elasticities with the Canadian data that we have, based on the following econometric gravity specification:

$$m_{gct} = \exp[\beta^g_{DIST} \times DIST_c + \beta^g_{LANG} \times LANG_c + \beta^g_{EMPR} \times EMPR_{ct} + \beta^g_{GDP} \times GDP_{ct}] \times \epsilon_{gct}, \quad (9)$$

where, similar to specification (5), c denotes each of the exporters in our sample, Canada is the single importer, and all trade-cost covariates are defined earlier.[27] The only new variable is GDP_{ct}, which is used to proxy for country size.[28] Capitalizing on the separability of the gravity model across products, we estimate (9) for each of the 1,693 products in our sample.

Due to the relatively small number of observations at the product level, we could not obtain estimates for all products in the sample, and not all estimates of the trade cost elasticities had the expected signs (i.e. negative for distance, positive for empire, etc.). To address this issue, we implement an iterative, three-step procedure.

First, we pool the products within each of the industries in our sample and estimate specification (9) at the industry level. Then, we replace the missing product-level estimates as well as estimates with 'wrong' signs with the corresponding estimates from the regressions at the industry level.

Second, we repeat the same procedure at the sector level (i.e., for each of the 10 sectors in our sample). Given that we only have 10 sectors (as opposed to 99 industries, and 1,693 products), we report these estimates in columns (2)-(11) of Table 2. As can be seen from this table, almost all coefficients have the expected signs and reasonable magnitudes. For example, all estimates of the coefficient on $DIST_c$ are negative and statistically significant, as expected. Some interesting and intuitive patterns stand out. First, the estimated distance elasticities are larger than those based on recent data. This is consistent with the remarkable improvement of transportation and communication over the past century. Second, the variation across sectors is intuitive; the largest (in absolute value) estimates are for resource sectors (such as metals, minerals, and wood), followed by agriculture (e.g., plants, vegetables and animals) and manufactured goods (e.g., chemicals and fibre).

Interestingly, we do not obtain significant estimates for the impact of common language. Most of the estimates on $LANG_c$ are positive and sizable, but the only (marginally) statistically significant estimate is for 'Animals'. Our estimates suggest that language was not such a strong determinant of trade flows during the period of investigation,

[26] For example, Head and Mayer (2014) offer benchmark trade cost elasticity estimates for a large set of trade cost proxies based on a meta analysis of the gravity literature.

[27] Note that the rich fixed effects structure in specification (5) controls for and fully absorbs all the covariates from equation (9) as well as all other observable and unobservable determinants of Canada's trade that are of the same dimension as the fixed effects.

[28] Nominal GDP data for countries other than Canada are from Klasing and Milionis (2014). We convert the latter to current Canadian dollars and adjust for interwar borders (Broadberry and Klein, 2012).

which is in stark contrast to estimates based on more recent data. A possible explanation for this result could be a high correlation between our 'language' and 'empire' indicators. However, while large and positive, the correlation is far from perfect – 0.50.

Turning to the policy covariate in our specification, we see that all estimates of the effects of 'empire' are positive and the only one that is not statistically significant is that for 'Vegetables'. The coefficients on $EMPR$ are also very large in magnitude, revealing the strong impact of economic ties within the empire. Finally, we note that the estimates of the effects of size, as captured by the log of GDP, are all positive, and all but one of them are statistically significant. The exception, with a positive but small and not statistically significant estimate, is non-metallic minerals. Overall, we find the results in Table 2 intuitive in terms of sign and reasonable in terms of magnitude.

The third and final step is to obtain common trade costs estimates across all products in our sample. These results appear in column (1) of Table 2. Not surprisingly (since, by construction, they are weighted averages of the sectoral estimates), these estimates are in line with benchmark estimates from the gravity literature,[29] and we use them to replace any remaining missing or incorrectly signed estimates at the product level. Finally, to control for outliers, whenever a product-level estimate is more than one standard deviation away from the corresponding common estimate, we replace this product estimate with the corresponding common coefficient plus one standard deviation.[30]

We are now finally able to combine the resulting vector of product-specific trade cost elasticities with the data on the gravity variables $\mathbf{GRAV^{g}_{cjt}}$, and construct the vector of bilateral trade costs for our MR system as follows:

$$(\hat{T}^{g}_{cjt})^{1-\sigma_g} \;=\; \exp[\hat{\beta}^{g}_{DIST}\times DIST_{cj} \;+\; \hat{\beta}^{g}_{LANG}\times LANG_{cj} \;+\; \hat{\beta}^{g}_{EMPR}\times EMPR_{cjt}] \quad (10)$$

- *Select size variables (Y^{g}_{ct} and E^{g}_{jt}) for the weights in the MR system.* The theory-consistent weights for our MR system (6)-(7) are product-level output values (Y^{g}_{ct}) and expenditure (E^{g}_{jt}) for each country and year in the sample, both measured on a gross basis. Such data are not available to us, both because of the time period that we consider and also because of the very disaggregated nature of our data.[31] As a second-best option, we recommend the use of total (as opposed to bilateral) exports

[29] The only insignificant, but still positive and sizable, estimate is on common language.

[30] In absolute terms. Take the example of the distance coefficient, which is negative. We implement an iterative procedure. First, if an industry-level estimate is smaller than the corresponding sectoral estimate from Table 2 *minus* one standard deviation, then we replace the industry-level estimate with the corresponding sectoral estimate *minus* one standard deviation. Then, if a product-level estimate is smaller than the corresponding industry-level estimate *minus* one standard deviation, then we replace the product-level estimate with the corresponding industry-level estimate minus one standard deviation.

[31] Disaggregated output and expenditure data are difficult to obtain even for recent years, and are unavailable for the interwar period. Even for those countries where disaggregated data were collected, we face the insuperable obstacle that there was no standard international industrial or trade classification in use at this time.

and imports for each country, year, and product in the sample.[32] This has several advantages: (i) Exports and imports are measured on a gross basis; (ii) The use of total exports and imports captures the presence of trade imbalances; and (iii) Total exports and imports vary across products. Unfortunately, we do not have data on total exports and imports for each product and country during our period, and therefore use GDP data to proxy for size in (6)-(7). While far from perfect, using GDP does imply significant variation in the OMR indices both across countries and over time.

- *Solve system (6)-(7) for the multilateral resistances.* Armed with the vector of bilateral trade costs and the best available size weights, our last step is to solve system (6)-(7) for the multilateral resistances. As noted in Anderson and Yotov (2010), system (6)-(7) does not have a unique solution and a normalization (i.e., selecting one OMR or IMR index as a reference group) is needed. For our (estimation) purposes, the choice of a reference MR term is inconsequential. [33] We also note that, similar to the construction of the bilateral trade cost vector (T^g_{cjt}), there is no need to solve directly for the MR terms. Instead, we can solve system (6)-(7) for the power transforms of the MRs (i.e., $(OMR_{gct})^{1-\sigma_g}$ and $(IMR_{gjt})^{1-\sigma_g}$). This makes the solution of system (6)-(7) very easy, since it becomes a quadratic system. Thus, the OMR covariate that enters our estimating equation (5) is the log of $(OMR_{gct})^{1-\sigma_g}$.

  Finally, we note that, due to the separability of the structural gravity model (Anderson and van Wincoop (2004)), we can solve system (6)-(7) separately for each product and each year in our sample. Given the dimensions of our data, this means that we solve 22,009 versions (1,693 products $\times$ 13 years) of system (6)-(7). In each case, we obtain a set of inward and outward resistances but, for our purposes, we only retain the OMRs to estimate equation (5). Availability of GDP data limits the number of countries (and corresponding multilateral resistances) in our sample to 59. As a robustness check, we also estimate our elasticities using data for all possible countries, at the expense of not controlling for the OMRs.

6 Estimation Results and Analysis

We first estimate a common impact across all products of tariffs on Canadian imports and provide some sensitivity analysis (Subsection 6.1). Subsection 6.2 allows the impact of Canadian tariffs to be heterogeneous across sectors, across countries, over time, and simultaneously across countries and sectors.

[32] The use of total exports and imports as weights is theory-consistent under the assumption of a constant production to export ratio (i.e., home bias) across the countries in the sample.

[33] We therefore let Stata select the fixed effect to be dropped. However, when the MR terms are used to construct counterfactual general equilibrium indices, Yotov et al. (2016) recommend using as a reference the (i) inward multilateral resistance, (ii) for a country with reliable data, (iii) that is as 'remote' (economically) as possible from the countries involved in the counterfactual experiment.

6.1 Common Tariff Effects

Our main estimate of the average effect of tariffs on Canada's imports, obtained from specification (5), appears in column (1) of Table 3. We obtain a negative, sizable, and statistically significant estimate of the average impact of tariffs on Canadian imports, implying that, on average, tariffs were an important impediment to Canadian imports during this period. In terms of magnitude, the estimate on $\ln(1+\tau_{gct})$, (-3.671, std.err. 0.807), is comparable to corresponding estimates from the related literature.[34]

The other columns in Table 3 report estimates from a series of robustness experiments. In column (2) we use two-way clustered standard errors, i.e., by exporter and product. This specification corresponds to the standard two-way clustering by pair in bilateral gravity regressions with multiple exporters and multiple importers. As expected, the estimates are unchanged. Moreover, the standard errors are also very similar. Column (3) reproduces the results from column (1) without controlling for the multilateral resistances. The estimate of the effect of tariffs is slightly smaller, but is not statistically different from our main estimate.[35]

Column (4) of Table 3 uses the OLS estimator. The estimated tariff elasticity is still negative and statistically significant, but is significantly smaller as compared with our main estimate. Consistent with the argument of Santos Silva and Tenreyro (2006) that OLS may deliver biased estimates, this result reinforces our decision to use the PPML estimator for our main analysis.[36] In column (5) we use 2-year interval data and in column (6) we use data that are balanced across products and across countries for each year in the sample. In both cases, the resulting estimates are comparable to our main estimate in column (1). In sum, the results in columns (2)-(6) of Table 3 confirm the robustness of our main estimate of the impact of Canada's tariffs on its imports.

The results in Table 4 are based on specification (5), but each set of estimates is obtained with a different sample. For ease of comparison, column (1) reproduces our main estimate from the first column of Table 3. In column (2) we use the same tariff variable as in column (1), but drop observations with zero trade flows. The next two columns of Table 4 report estimates where we limit our observations to cases where there are no specific tariffs (column (3)) and where there are only specific tariffs (column (4)). The overall conclusion from Tables 3 and 4 is that our main results are robust.

6.2 On the Heterogeneous Impact of Tariffs

In this subsection we investigate how the impact of Canadian tariffs varied across sectors, across countries, and over time. All estimates are obtained from our main specification (5).

[34] For example, see the references in footnote 4.

[35] The number of observations is, as expected, larger than when we control for multilateral resistances, but perhaps not as large as one might expect given that we are using data for 112, as opposed to 59, countries. This is because many observations are dropped due to the rich set of fixed effects in our econometric model.

[36] Despite being smaller, our OLS estimate implies a trade elasticity that is within the established bounds, consistent with theory, and comparable to estimates from the RBC macro literature (e.g., Backus et al. (1994) and Zimmermann (1997)) and also to some recent estimates from trade papers (e.g., Anderson and Yotov (2020) and Boehm et al. (2020)).

The only difference is that, instead of imposing a common tariff coefficient, we allow β to vary across each of these three dimensions and some combinations of them.

We start with an analysis of variation across sectors. As discussed in the previous section, such variation is consistent with gravity theory (e.g., Anderson and van Wincoop (2004), Costinot et al. (2012)). Thus, based on our main econometric model (5) we estimate:

$$m_{gct} = \exp[\sum_{s \in S} \beta^s \times \ln(1+\tau_{gct}) + \psi_{gc} + \phi_{gt} + \pi_{ict} + \alpha \times \ln(OMR_{gct})^{1-\sigma_g}] \times \epsilon_{gct}, \quad (11)$$

where the set of sectors S is that given in Table 1.

The results appear in the top panel of Figure 5. Two features stand out. First, all but one of the estimates are negative. The exception is non-ferrous metals, where we obtain a positive, but small and statistically insignificant, estimate of the effect of tariffs. The implication is that Canada's tariffs were an important impediment to trade in all but the non-ferrous metals sector. Second, the estimates vary significantly across the 10 sectors in our sample. The sectors with the smallest tariff effects are the three agricultural sectors (vegetable, plant, and animals), followed by non-metallic minerals and wood. The sectors with the largest tariff effects are iron and textile products. Overall, we find the results intuitive, and we will use these elasticities to perform our baseline simulation analysis in Section 7.

Next, we investigate how the impact of Canadian tariffs varied across its major trading partners. We start by distinguishing between countries that were part of the British Empire and those that were not. To this end, we modify equation (5) to introduce an interaction term between our tariff variable and an indicator variable EMP_{ct}, which takes a value of one if c was part of the British Empire in year t. The coefficient on the interaction term β_E is thus the deviation, for members of the Empire, from the common tariff effect:

$$m_{gct} = \exp[\beta \times \ln(1+\tau_{gct}) + \beta_E \times (\ln(1+\tau_{gct}) \times EMP_{ct}) + \psi_{gc} + \phi_{gt} + \pi_{ict} + \alpha \times \ln(OMR_{gct})^{1-\sigma_g}] \times \epsilon_{gct} \quad (12)$$

We obtain a negative and (marginally) statistically significant estimate of the interaction effect ($\hat{\beta}_E = -0.995$, std.err. 0.582), which, in combination with the common estimate on $\ln(1+\tau_{gct})$ (-3.390, std.err. 0.834), implies that the effect of Canada's tariffs on trade with Empire members is -4.385 (std.err. 0.773). The implication is that the negative impact of tariffs on imports from the Empire was stronger than the corresponding impact on imports from non-empire polities.

The estimates in the middle panel of Figure 5 are obtained from specification (5), where, instead of imposing a common tariff effect, we allow for the effects of tariffs to be heterogeneous across Canada's main trading partners according to:

$$m_{gct} = \exp[\sum_{k \in C} \beta_k \times \ln(1+\tau_{gct}) + \psi_{gc} + \phi_{gt} + \pi_{ict} + \alpha \times \ln(OMR_{gct})^{1-\sigma_g}] \times \epsilon_{gct} \quad (13)$$

where the set of countries C includes the United States, the United Kingdom, Germany, France, Japan, and all other countries (Other). In other words, we obtain five country-

specific estimates of β plus an additional estimate for all other countries. The estimates in Figure 5 show that the impact of Canada's tariffs was relatively homogeneous across Canada's main trading partners with one important exception: the elasticity for the United Kingdom is significantly larger in absolute value than all other estimates. This result is consistent with the larger estimate that we obtained in our previous experiment for British Empire members.

Next, we investigate the simultaneous variation of β across countries and sectors. To this end, we amend specification (5) by introducing interactions between the 5 countries and 10 sectors from Figure 5, and estimate:

$$m_{gct} = \exp[\sum_{s\in S,k\in C} \beta_k^s \times \ln(1+\tau_{gct}) + \psi_{gc} + \phi_{gt} + \pi_{ict} + \alpha \times \ln(OMR_{gct})^{1-\sigma_g}] \times \epsilon_{gct} \quad (14)$$

Our results appear in Table 5. While they are obtained from a single specification, for the sake of clarity we report them in several columns. The rows of the table list the sectors, and the columns of the table list the countries that we use in this analysis. The country-sector estimates are broadly consistent with our previous findings but also uncover some new insights. For example, the estimates for Iron are largest for the US and UK, but are smaller and insignificant for the other countries. This accounts for the relatively large sectoral estimate for Iron that we obtained earlier. We also see some heterogeneity within countries and across sectors. For example, for both the UK and US we see large estimates for iron and textiles, but small and insignificant estimates for animals and non-ferrous metals.

We finish with an analysis of the variation of β over time, allowing it to vary for each year in our sample. Thus, our econometric model becomes:

$$m_{gct} = \exp[\sum_{t=1924}^{1936} \beta_t \times \ln(1+\tau_{gct}) + \psi_{gc} + \phi_{gt} + \pi_{ict} + \alpha \times \ln(OMR_{gct})^{1-\sigma_g}] \times \epsilon_{gct} \quad (15)$$

The results are in the bottom panel of Figure 5. Two main findings stand out. First, all estimates are negative and statistically significant. Second, while most of the elasticities are not statistically different from each other, they are smaller in absolute value (i.e. less negative) during the Depression. This is an intriguing result for two related reasons. First, from a methodological perspective, we are not aware of existing time-varying estimates of the trade elasticity, and our results imply that it may not be constant over time. This is consistent with the sub-convex gravity theory of Carrère et al. (2020). Second, from a policy perspective, the smaller tariff estimates during the Depression imply that trade volumes may not have fully adjusted to higher tariffs during that period. Trade dependence and persistence are possible explanations.

7 Counterfactual Analysis

We are almost ready to analyze the impact of tariffs on the level and structure of Canadian imports using the model outlined in Section 3. The data on imports and tariffs needed to calibrate our annual models were outlined in Section 4, while Section 6 provided a range of

estimates for the σ_g's. In our baseline results we will use the sectoral estimates in the top panel of Figure 5, assuming that σ_g is the same for all goods g falling within a particular sector S. In Appendix 3 we explore the impact of using the common elasticity estimate in column (1) of Table 3, and show that our main results go through.

We also need to assume a value for γ, the intermediate-level elasticity of substitution between goods. In the baseline we assume a value of one for this elasticity, and again explore the implications of varying this in the appendix.

We estimate κ, the upper-level elasticity of substitution between goods, using data on aggregate imports M_t, domestic consumption D_t, and unweighted average tariffs τ_t, for Canada, the Dutch East Indies, India, the Netherlands, and the UK.[37] We simply estimate:

$$ln(M_{it}/D_{it}) = \alpha_i - \kappa \times ln(1 + \tau_{it}) \tag{16}$$

where i is an index representing the five countries in our sample. We obtain a point estimate for κ of 3.358, with a standard error of 0.527. Finally, we take our estimate of η from Tokarick (2014).[38]

We are now in a position to estimate the impact of changing tariffs on Canadian imports. By counterfactually adjusting any or all tariffs, we can see how imports in a given year would have adjusted, all else being equal. Since our elasticities (with the exception of γ) were econometrically estimated, we do not content ourselves with estimating counterfactual scenarios using the point estimates alone. Rather, we take 1000 draws of each elasticity from normal distributions, with means and standard deviations equal to the point estimates and standard errors of our econometric estimates, and perform our counterfactual calculations 1000 times. If the draw of a particular elasticity is negative, we constrain the elasticity used in the simulation to be equal to zero.[39]

As we saw earlier, tariffs began to rise in the spring of 1930. Our first set of counterfactuals thus focuses on the tariff changes that occurred after 1929. We ask: what would Canadian imports have looked like in 1929, had tariffs changed as they did subsequently, but everything else (in particular, Canadian endowments and the structure of demand) stayed the same? We can answer this question by taking our model of the Canadian economy in 1929 and imposing on it, first, the tariffs it actually faced in that year, τ_{gc1929}, and then (counterfactually) the tariffs of every year t between 1930 and 1936, τ_{gct}. As noted earlier, when imposing the tariffs of a given year on the model, we calculate 1000 counterfactual equilibria of the model, each

[37]The data for the UK and India are taken from de Bromhead et al. (2019) and Arthi et al. (2020) respectively, while the data for the Dutch East Indies and the Netherlands are taken from de Zwart et al. (2022). Domestic consumption is taken to be equal to GDP, scaled up by the ratio of gross output to value added, minus exports. For Canada this ratio is taken from Canada. Dominion Bureau of Statistics (1956, p. 16). For the UK and India it is taken from the afore-mentioned sources, and since there is no Indonesian input-output table available for this period we assume that the Indian ratio also applies to the Dutch East Indies. For the Netherlands the ratio is taken from den Bakker (2019, p. 653).

[38]More precisely, based on Tokarick (2014), we follow de Bromhead et al. (2019) and assume a log-normal distribution, with the mean and standard deviation of the underlying normal distribution being 0.403 and 0.468, respectively.

[39]This is obviously especially relevant in the non-ferrous metals sector. We solve the model using MPSGE (Rutherford, 1999).

corresponding to a different set of elasticity draws. Our simulations give us counterfactual levels of imports, under alternative tariff scenarios, of all 1693 goods from all 112 countries in 1929,[40] but in what follows we mostly confine ourselves to reporting the effects of changing tariffs on total imports, imports in each of the 10 sectors listed in Table 1, and imports from the four regions described in Section 4.1. For the sake of concision, we will make statements of the form "tariffs in year t increased/lowered trade flows by x percent", where "x percent" refers to the mean estimated impact, but in all cases it should be noted that this is based on a comparison of actual and counterfactual trade flows in 1929.

The top panel of Figure 6 plots the impact of changing tariffs on the total value of Canadian imports. It plots not only the mean impact across our 1000 simulations, but the 5th, 25th, 75th, and 95th percentiles, reflecting the uncertainty surrounding our elasticity estimates. As expected, post-1929 tariff changes lowered imports, other things being equal; the largest impact came in 1932, when our mean estimate suggests that tariff changes since 1929 were depressing imports by roughly 4 percent. While this is non-negligible, it is a smaller effect than previous papers using similar methods have found for India and the UK (de Bromhead et al., 2019; Arthi et al., 2020). There, post-1929 increases in protection depressed imports by roughly 9-10 percent between 1929 and 1933, accounting for between a fifth and a quarter of the aggregate trade collapse.[41] In Canada, protection accounted for just 6 percent of falling imports over the same period.

The middle panel of Figure 6 focusses on total exports from each of our four regions. As can be seen, the tariff changes of 1930-31 had no discernible effect on UK exports to Canada: this was a period of increased imperial preferences, combined (in 1931) with higher tariffs on UK imports. With the signing of the Ottawa accords in 1932 the margin of preference continued to rise, and the average tariffs facing UK exports declined from their peak (Figure 4). By 1933 tariffs were raising UK exports by 6.4 percent relative to the 1929 benchmark.

Figure 7 provides some additional perspective on this "Empire effect", reporting the effects of a second set of counterfactual simulations. In these, we ask: what would have been the impact on 1929 Canadian imports if the tariffs facing UK exporters had been changed to the levels of subsequent years, but all other tariffs had remained constant at their 1929 levels.[42] As can be seen, higher tariffs on UK goods in 1931 would, other things remaining equal, have depressed UK exports to Canada by 6.5 percent. Subsequent reductions in the tariffs facing UK exporters lowered but never reversed that initial negative impact. Why then did Figure 6 show tariff changes leaving UK exports unchanged in 1931, and increasing them thereafter?[43] The answer is that the tariffs facing other countries' exporters increased by more: when assessing the impact of changing protection you need to take all relevant margins of substitution into account, rather than relying on partial equilibrium models. The positive impact of the Ottawa accords on British exports to Canada was due to rising tariffs on foreign goods, not falling tariffs on British ones.

[40] Or more precisely, of those goods and varieties that were actually imported in a given year, since we hold the extensive margin fixed throughout.

[41] See de Bromhead et al. (2019) and Arthi et al. (2020). It should also be noted that both those papers used lower values for κ than we do here, which would tend to lower the impact of rising protection on the value of aggregate imports, other things being equal.

[42] To avoid cluttering the graphs, the mean impacts alone are reported for this and the following figure.

[43] The mean impact from that figure is reproduced in Figure 7.

That net positive impact never exceeded 6.5 percent: in contrast, Arthi et al. (2020) find that post-1923 Indian tariff reforms boosted UK exports to that country by almost a quarter. Similarly, Canadian retaliation against the Hawley-Smoot tariff (and other tariff increases) hit American exports, but not by very much: whether the focus is on the effects of all tariffs, or just those tariffs facing US exporters, the impact was never greater than 6 percent (Figure 6 and Appendix Figure A1), accounting for just 7.5 percent of the 1929-1933 decline. This is much smaller than the back of the envelope calculation in Irwin (2011), or the *average* estimated impact of retaliation against Hawley-Smoot reported by Mitchener et al. (2022).

The largest impact of post-1929 Canadian tariff changes was on foreign countries other than the US, reducing their exports to Canada by almost 9 percent in 1932: 14 percent of the actual decline experienced between 1929 and 1932. Figure 8 highlights the experiences of France, Germany, and Japan, the most important exporters to Canada after the UK and US. Japan was particularly badly hit: by 1936, rising tariffs were depressing Japanese exports by almost 20 percent, accounting for 32 percent of their decline since 1929.

Finally, the bottom panel of Figure 6 makes the point that the impact of changing tariffs could vary greatly across sectors. Our mean estimates suggest that they raised British exports to Canada of iron-related products by well over 20 percent, but that they lowered British textile exports for most of our period. Focusing on aggregate impacts obscures the fact that trade deals target specific goods, and can have substantial (but sometimes offsetting) effects on trade in these goods (Lampe, 2009).

Why was the impact of post-1929 protectionism in general, and the Ottawa Agreements in particular, so much smaller in Canada than it was elsewhere in the British Empire? Figure 9 suggests a simple explanation: the shifts in protection experienced in India and the UK were far more dramatic than those experienced in Canada. Tariffs had already been relatively high in Canada, and did not increase by much in relative terms; furthermore, discrimination in favour of the British Empire had been a feature of Canadian tariff legislation since the 19th century, whereas it only started to emerge in India in the 1920s, and was unknown in the UK before the Great Depression. The Ottawa accords changed tariff structures much more in some parts of the Empire than in others.

This observation suggests a third set of counterfactual experiments, in which we ask: what would imports have been like in every year had tariffs been equal to zero, and how would that have compared with what was actually observed? Focussing on our mean estimates, the top panel of Figure 10 shows that protection was already lowering total Canadian imports by more than 13 percent in the 1920s, and by over 17 percent in 1931-2. It was lowering imports from the US by more than 13 percent in the 1920s, and by 19 percent in 1932-3; and it was lowering imports from other foreign countries by over 20 percent in the 1920s, and by almost 30 percent in 1932. These are sizable effects.

More surprisingly, perhaps, despite imperial preferences, Canadian protection was lowering imports from the UK by over 8 percent in the 1920s. The net impact was to boost the share of Canadian imports coming from Britain, but to reduce the level. By 1931 Canadian protection was lowering British exports to the country by almost 10 percent. Increasing imperial preference following the Ottawa accords did increase British exports to Canada, but only to the point where the net impact of the entire structure of protection on imports from the mother country was approximately zero. By the mid-1930s Canadian protection was

neither lowering nor boosting British exports, net; but this was achieved via a combination of high protection coupled with increasing trade discrimination.

8 Conclusion

The trade agreements concluded in Ottawa in the summer of 1932 moved the British Empire project closer to reality, at least insofar as economic integration was concerned. Britain and her Dominions deepened the trade preferences accorded to each other, with a discernible impact on trade flows. Between 1930 and 1935, the Empire's share of British imports rose from 27 to 39 percent, with increased discrimination in favour of the Empire accounting for almost two-thirds of the increase (de Bromhead et al., 2019, p. 348). The impact went in both directions: as noted earlier, British exports to India were boosted by almost a quarter as a result of the tariff changes adopted in the sub-continent.

Bennett's Canadian Conservatives had long favoured closer economic ties with the mother country, and now found themselves hosting a summit representing a high-water mark for the British imperial project. And so it is at first sight surprising that the Ottawa agreements had so little impact on the trade of the host country itself. Granted, in the two years following the accords, changes in Canadian trade policy raised imports from the UK by over 6 percent, but this is a small figure compared with the impact of Indian trade policy. Furthermore, the only reason that British exports were boosted at all was increasing trade diversion from other countries facing even higher tariffs. If the focus is solely on tariffs levied on UK goods in isolation, their impact after 1929 was to lower UK exports, not raise them. When the focus is on the entire structure of protection, rather than on post-Ottawa changes, Canadian tariffs lowered UK exports: all that Ottawa accomplished was to gradually eliminate this negative effect via increasing discrimination against foreign countries.

These relatively small impacts were not necessarily due to the relevant trade elasticities being lower in Canada than elsewhere: the estimates in Section 6 are comparable in magnitude to those obtained in other contexts. Rather, the shock implied by the Ottawa accords was smaller for Canada than for other participants at the conference. Trade deals involve specific deals on specific products, not a blanket "treatment" affecting all goods and trade partners symmetrically. Taking this into account is important when quantifying their impact.

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Table 1: Data Coverage: Broad Sectors

ID	Sector Description	Sector Label
1	AGRICULTURAL AND VEGETABLE PRODUCTS - A. Mainly Food	Vegetable
2	AGRICULTURAL AND VEGETABLE PRODUCTS - B. Other Than Food	Plant
3	ANIMALS AND ANIMAL PRODUCTS	Animal
4	CHEMICALS AND ALLIED PRODUCTS	Chemical
5	FIBRES, TEXTILES AND TEXTILE PRODUCTS	Fibre
6	IRON AND ITS PRODUCTS	Iron
7	MISCELLANEOUS COMMODITIES	Misc
8	NON-FERROUS METALS AND THEIR PRODUCTS	Metals
9	NON-METALLIC MINERALS AND THEIR PRODUCTS	Minerals
10	WOOD, WOOD PRODUCTS AND PAPER	Wood

Notes: This table lists the 10 broad sectors that are included in the estimating sample and the labels that we use for them in the analysis. See text for further details.

Table 2: Sectoral Gravity Estimates, 1924-1936

	(1) Aggr	(2) Vgtbl	(3) Plant	(4) Animl	(5) Chemcl	(6) Fibre	(7) Iron	(8) Misc	(9) Metl	(10) Minrl	(11) Wood
LN_DIST	-1.423	-1.110	-1.396	-1.032	-0.969	-0.663	-2.094	-1.260	-1.871	-1.917	-1.566
	(0.124)**	(0.189)**	(0.689)*	(0.284)**	(0.257)**	(0.352)+	(0.406)**	(0.440)**	(0.363)**	(0.343)**	(0.302)**
LANG	0.235	0.252	-0.874	1.266	-0.190	0.585	0.059	-0.474	0.515	0.507	0.552
	(0.194)	(0.451)	(1.258)	(0.535)*	(0.270)	(0.461)	(0.795)	(0.762)	(0.789)	(0.555)	(0.428)
EMPR	1.603	0.494	2.856	0.682	1.041	1.745	2.141	1.771	1.480	1.305	1.268
	(0.163)**	(0.493)	(1.278)*	(0.295)*	(0.208)**	(0.501)**	(0.632)**	(0.669)**	(0.663)*	(0.552)*	(0.322)**
GDP	0.457	0.174	0.688	0.295	0.741	0.671	0.684	1.056	0.327	0.119	0.717
	(0.069)**	(0.062)**	(0.197)**	(0.143)*	(0.161)**	(0.154)**	(0.194)**	(0.143)**	(0.166)*	(0.169)	(0.141)**
N	210409	22294	16681	19255	18831	29786	25053	29656	15734	16015	17104

Notes: This table reports gravity estimates of the effects of various determinants of trade flows. The results are based on specification (9). The dependent variable is Canada's product-level imports. The estimator is PPML, and all estimates are obtained with product-year fixed effects. The results in column (1) are obtained with data on all products and the results in each of the subsequent columns are obtained with pooled data within each of the ten broad sector. All standard errors in this table are clustered three-way (i.e., by exporter, product, and time). See text for further details.

Table 3: The Impact of Canada's Tariffs

	(1) Main	(2) Cluster	(3) No OMR	(4) OLS	(5) Interval	(6) Balanced
LN_TARIFF	-3.671	-3.671	-3.576	-1.571	-3.724	-3.988
	$(0.809)^{**}$	$(0.795)^{**}$	$(0.899)^{**}$	$(0.245)^{**}$	$(0.839)^{**}$	$(0.389)^{**}$
LN_OMR_STR	0.138	0.138		0.188	0.088	0.143
	$(0.069)^{*}$	$(0.079)^{+}$		$(0.073)^{*}$	(0.084)	$(0.070)^{*}$
N	179788	179788	194182	91832	86530	145035
R^2				0.918		

Notes: This table reports estimates of the common effects of tariffs on Canadian imports. Column (1) includes our main results based on specification (5). The estimates of all fixed effects, including the constant term, are omitted for brevity. Column (2) clusters the standard errors two way (by exporter and product). All other standard errors in this table are clustered three-way (i.e., by exporter, product, and time). Column (3) reproduces the results from column (1) without controlling for the multilateral resistances. Column (4) reproduces the results from column (1) with the OLS estimator. Column (5) uses interval data for every 2 years. Finally, column (6) uses data that are balanced across products and countries across the whole period in our sample. See text for further details.

Table 4: The Impact of Canada's Tariffs: Alternative Samples.

	Main	No Zeros	No Specific	Only Specific
LN_TARIFF	-3.671	-3.889	-4.991	-2.260
	$(0.809)^{**}$	$(0.698)^{**}$	$(0.862)^{**}$	$(0.969)^{*}$
LN_OMR_STR	0.138	0.180	0.122	-1.609
	$(0.069)^{*}$	$(0.088)^{*}$	$(0.061)^{*}$	(1.669)
N	179788	91832	152497	21324

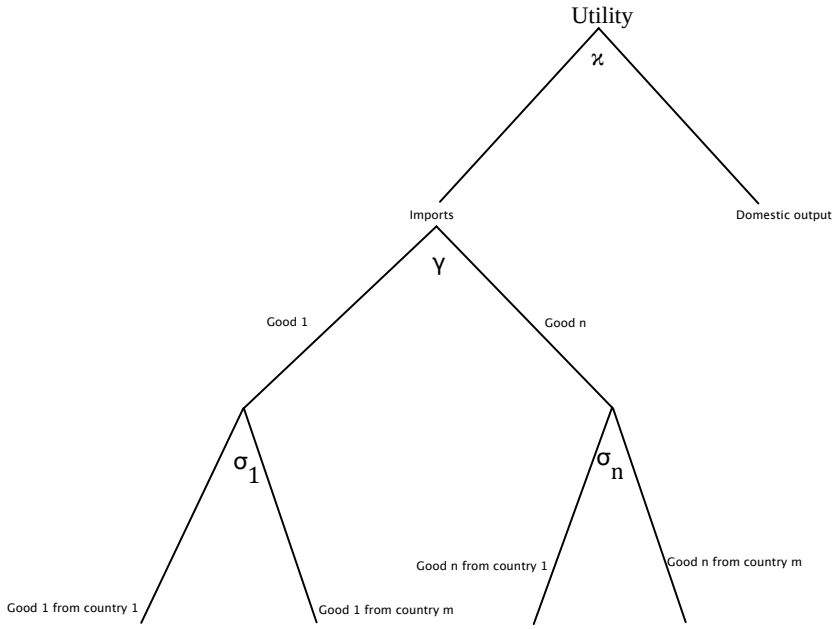
Notes: This table reports estimates of the common effects of tariffs on Canadian imports using different samples. All estimates are based on specification (5), and the estimates of all fixed effects, including the constant term, are omitted for brevity. Column (1) reproduces the main results from column (1) of Table 3. Column (2) only uses observations with positive imports. Column (3) excludes observations with specific tariffs. Finally, column (4) only uses observations with specific tariffs. All standard errors are clustered three-way (i.e., by exporter, product, and time). See text for further details.

Table 5: The Impact of Canada's Tariffs: Across Sectors and Countries.

	(1) OTHER	(2) USA	(3) FRA	(4) GBR	(5) DEU	(6) JPN
AGRICULTURAL AND VEGETABLE PRODUCTS - A. Mainly Food	-1.599	-1.031	3.127	-5.462	-10.43	-2.339
	(.781)*	(1.245)	(.936)**	(2.178)*	(3.524)**	(2.042)
AGRICULTURAL AND VEGETABLE PRODUCTS - B. Other Than Food	-0.841	-3.680	-1.670	-3.495	-0.563	-3.598
	(.572)	(1.411)**	(1.171)	(2.163)	(1.437)	(1.436)*
ANIMALS AND ANIMAL PRODUCTS	-3.594	0.363	-8.242	-1.613	-0.160	-5.529
	(1.273)**	(1.925)	(5.201)	(1.993)	(2.724)	(8.42)
CHEMICALS AND ALLIED PRODUCTS	-2.082	-5.028	-3.196	-5.422	-2.836	-22.71
	(1.336)	(1.901)**	(1.32)*	(1.212)**	(1.55)+	(3.806)**
FIBRES, TEXTILES AND TEXTILE PRODUCTS	-5.176	-4.242	-4.983	-6.851	-5.382	-2.897
	(1.793)**	(1.931)*	(2.267)*	(1.983)**	(1.769)**	(1.415)*
IRON AND ITS PRODUCTS	-6.358	-7.111	2.440	-6.688	-2.497	-1.306
	(3.305)+	(1.767)**	(1.925)	(1.595)**	(2.072)	(4.393)
MISCELLANEOUS COMMODITIES	-2.873	-7.041	-13.02	-4.341	-7.167	-6.953
	(2.135)	(3.011)*	(2.24)**	(3.054)	(2.352)**	(1.489)**
NON-FERROUS METALS AND THEIR PRODUCTS	2.850	3.131	-6.053	0.294	-3.277	-0.184
	(4.061)	(2.878)	(2.938)*	(1.762)	(2.296)	(3.935)
NON-METALLIC MINERALS AND THEIR PRODUCTS	-8.677	-2.566	-7.717	-4.863	-9.809	-11.01
	(2.179)**	(2.048)	(2.548)**	(2.45)*	(2.419)**	(4.388)*
WOOD, WOOD PRODUCTS AND PAPER	-5.052	-3.726	-3.812	-5.454	3.116	4.982
	(3.053)+	(2.061)+	(1.341)**	(1.484)**	(1.623)+	(1.378)**

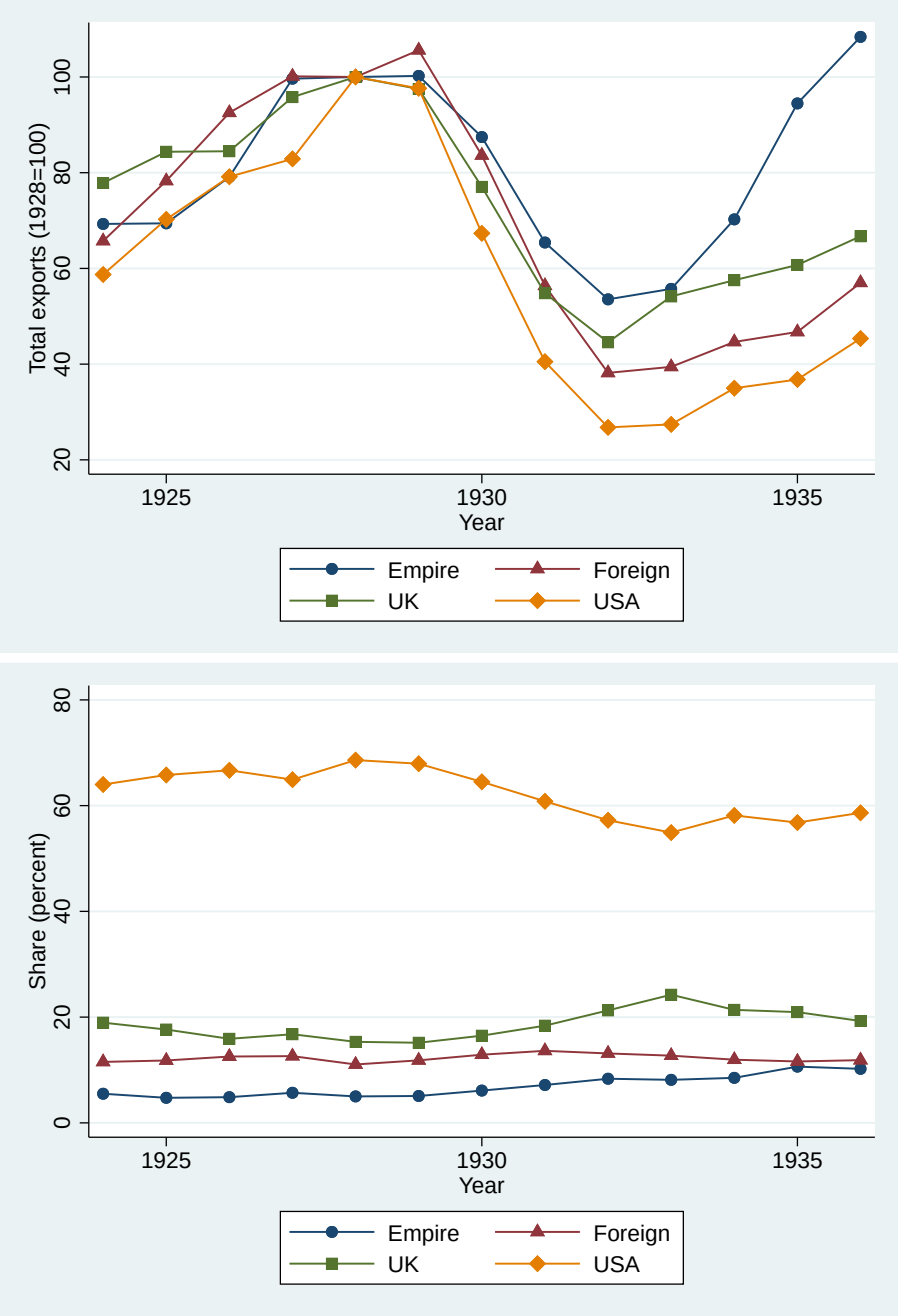
Notes: This table reports estimates of the effects of tariffs on Canadian imports across countries and sectors. The results in this table are obtained from a single specification, i.e., equation (14), but we report them in several columns for clarity. We also omit the estimates of the fixed effects and of the OMR control variable. The rows of the table list the sectors and the columns list the countries. All standard errors are clustered three-way (i.e., by exporter, product, and time). See text for further details.

Figure 1: Nested Utility Function



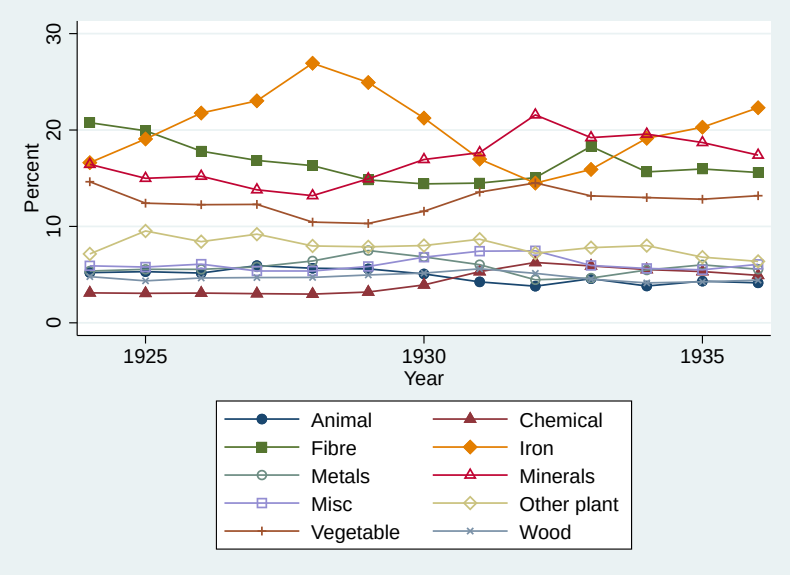
Note: This figure illustrates the 3-tier nested CES utility function used in our counterfactual analysis. See the text for further details.

Figure 2: Regional Exports to Canada, 1924-1936



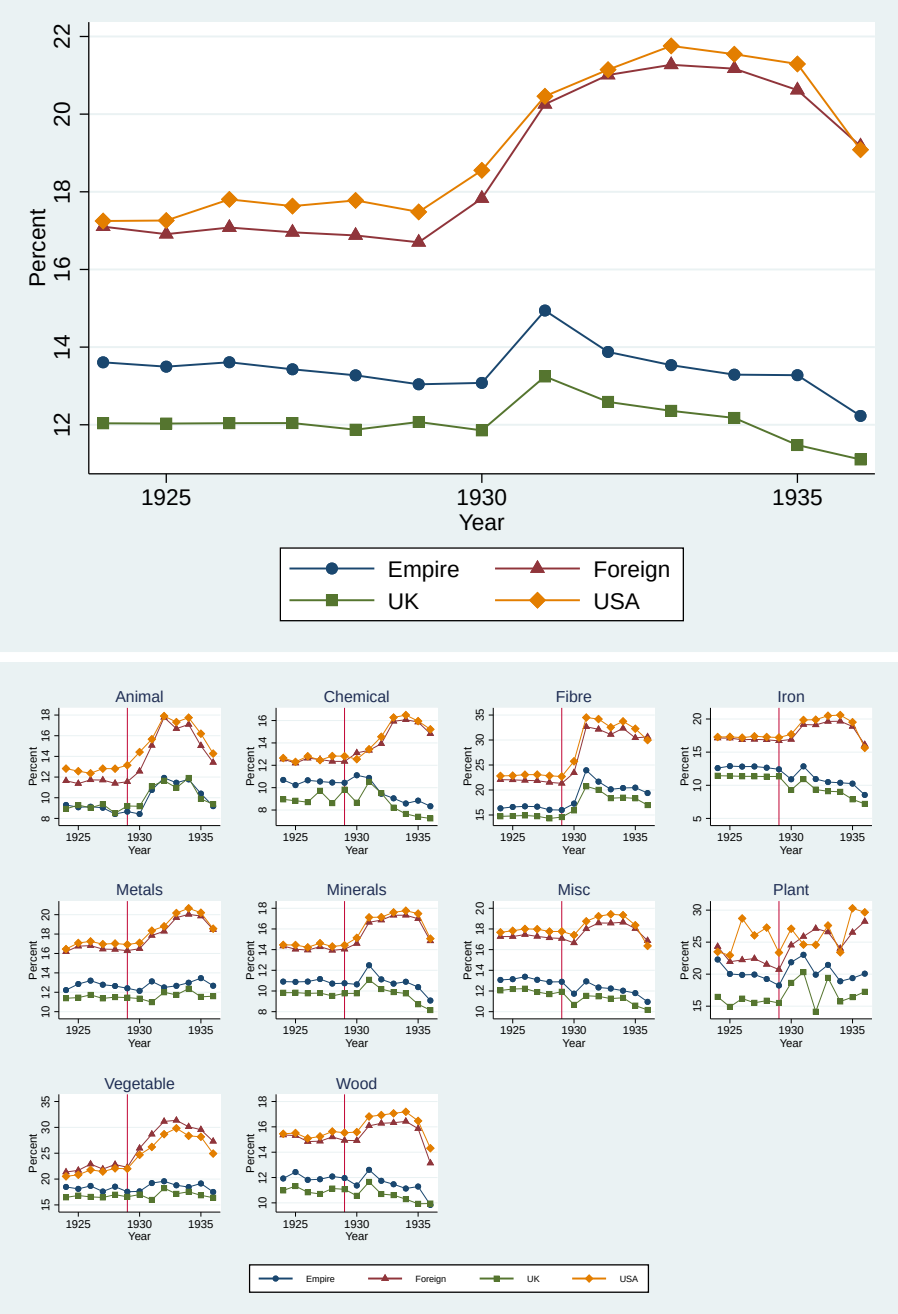
Note: This figure plots the total exports to Canada (upper panel) of the UK, USA, the British Empire exclusive of the UK, and the rest of the world, as well as their shares in total Canadian imports (lower panel).

Figure 3: Sectoral Shares in Canadian Imports



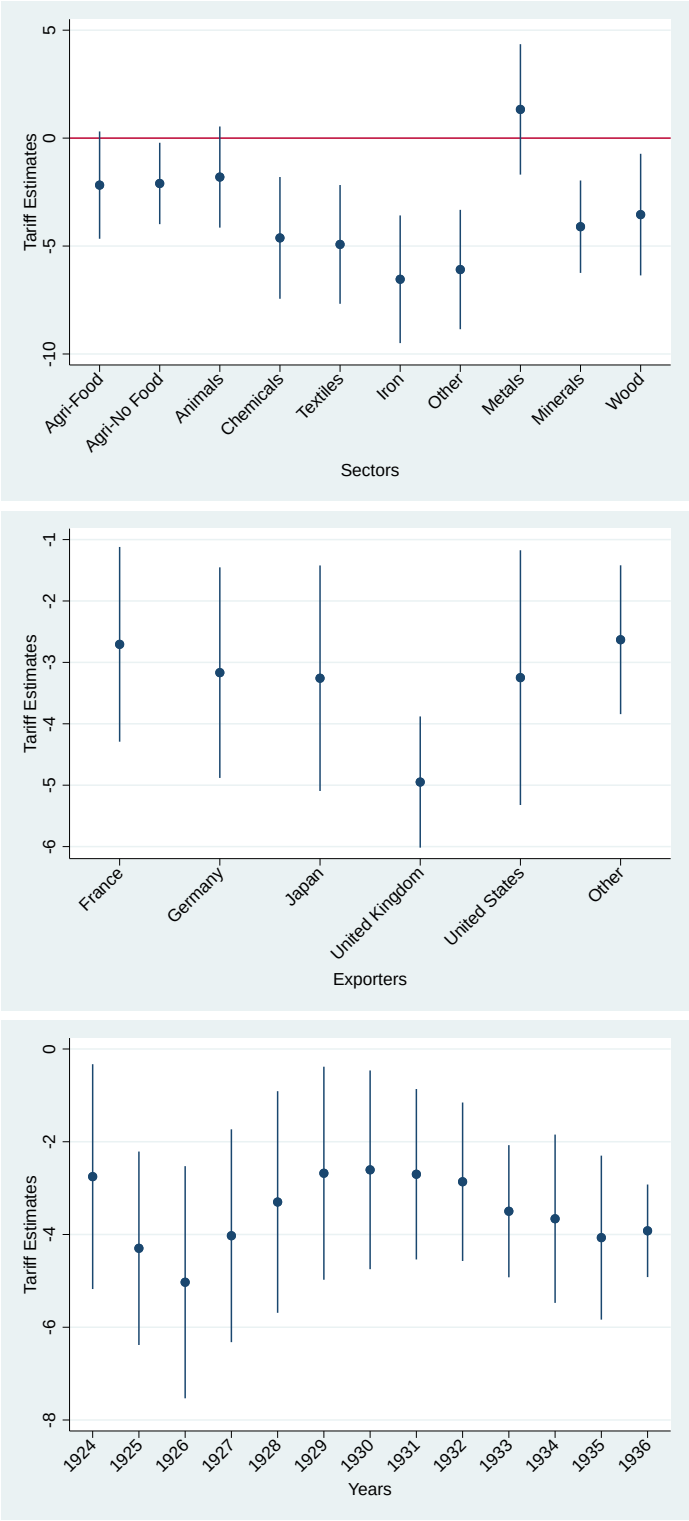
Note: This figure plots the shares of the 10 sectors listed in Table 1 in total Canadian imports.

Figure 4: Average Canadian Tariffs, 1924-1936



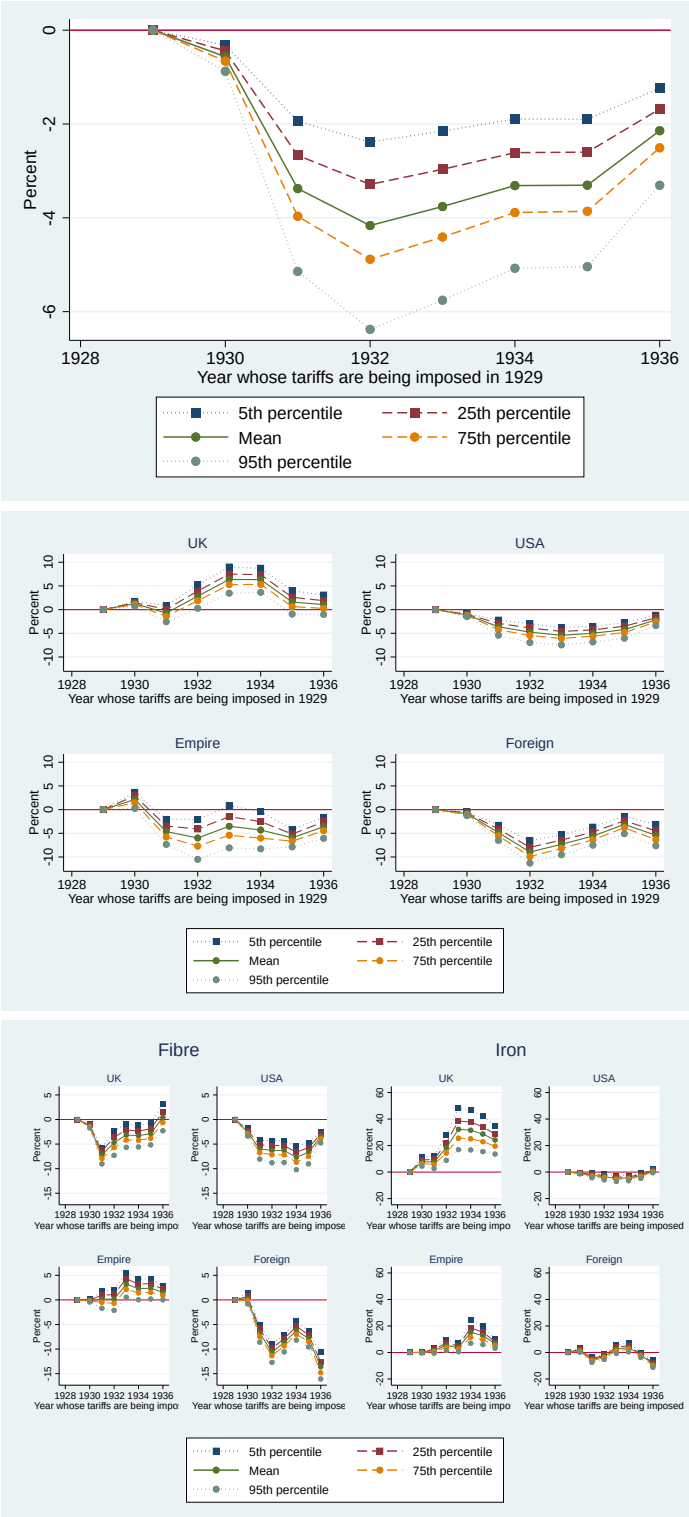
Note: The top panel plots unweighted average tariffs imposed by Canada on exports from the UK, USA, the British Empire exclusive of the UK, and the rest of the world. The lower panel plots unweighted average tariffs, by broad sector, imposed on exports from the same four regions.

Figure 5: The Heterogenous Impact of Canadian Tariffs, 1924-1936



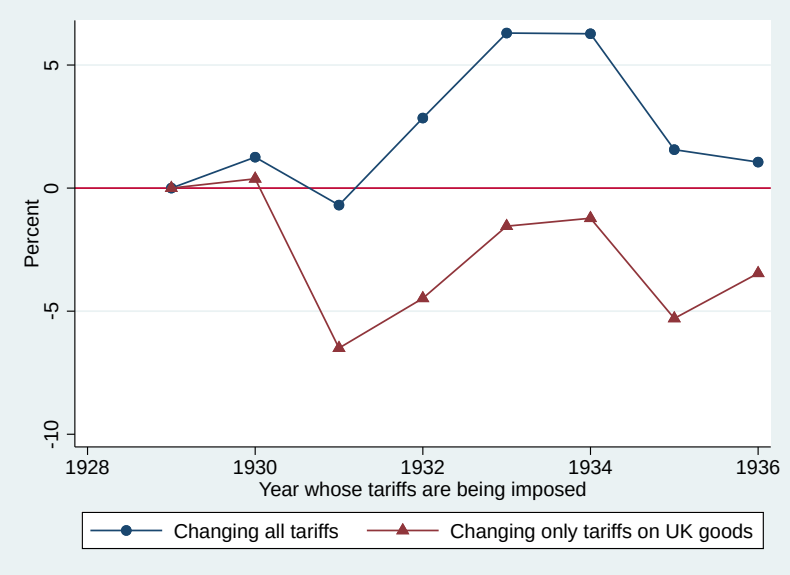
Note: This figure plots the estimated tariff coefficients discussed in the text, allowing these to vary across sectors (in the top panel), across main trading partners (in the middle panel), and over time (in the bottom panel). The results are obtained from specifications (11), (13), and (15), but we only report the tariff coefficients and associated 95 percent confidence intervals. All standard errors are clustered three-way (i.e., by exporter, product, and time). See text for further details.

Figure 6: Impact on 1929 Imports of Imposing Later Years' Tariffs



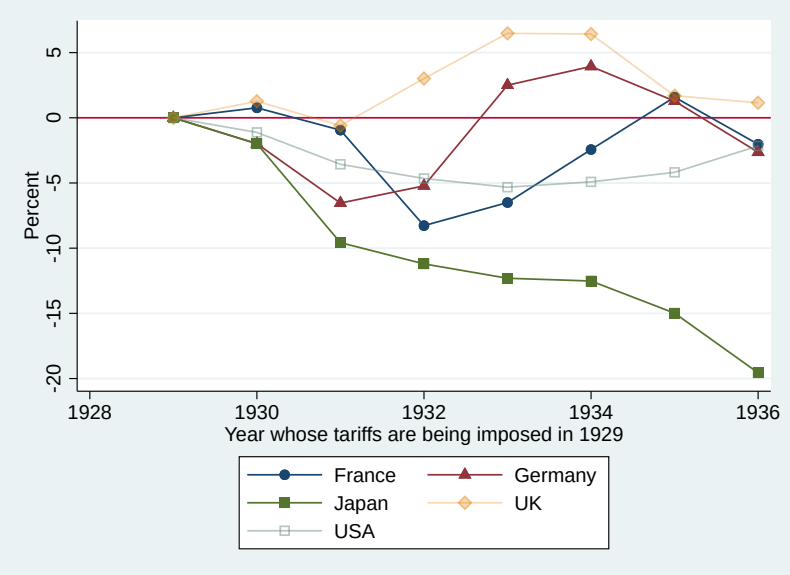
Note: The top panel plots the percentage impact on the total value of 1929 Canadian imports of imposing later years' tariffs, rather than 1929 tariffs as actually occurred. The middle panel does the same for our four regions, and the lower panel does the same for two sectors (textiles and iron products) broken down by region. See text for further details.

Figure 7: Impact on 1929 Imports from the UK of Imposing Later Years' Tariffs



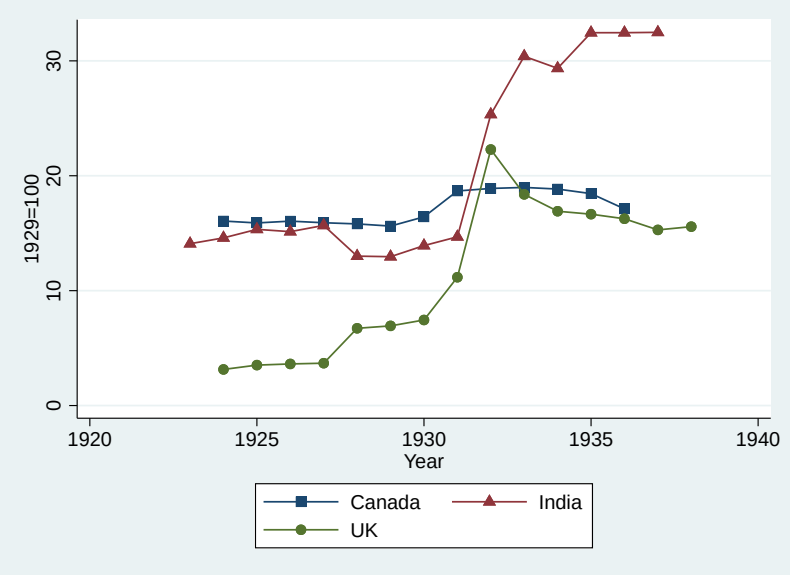
Note: This figure plots the percentage impact on the total value of 1929 Canadian imports from the UK of imposing later years' tariffs, rather than 1929 tariffs as actually occurred. See text for further details.

Figure 8: Impact on 1929 Imports from 5 Countries of Imposing Later Years' Tariffs



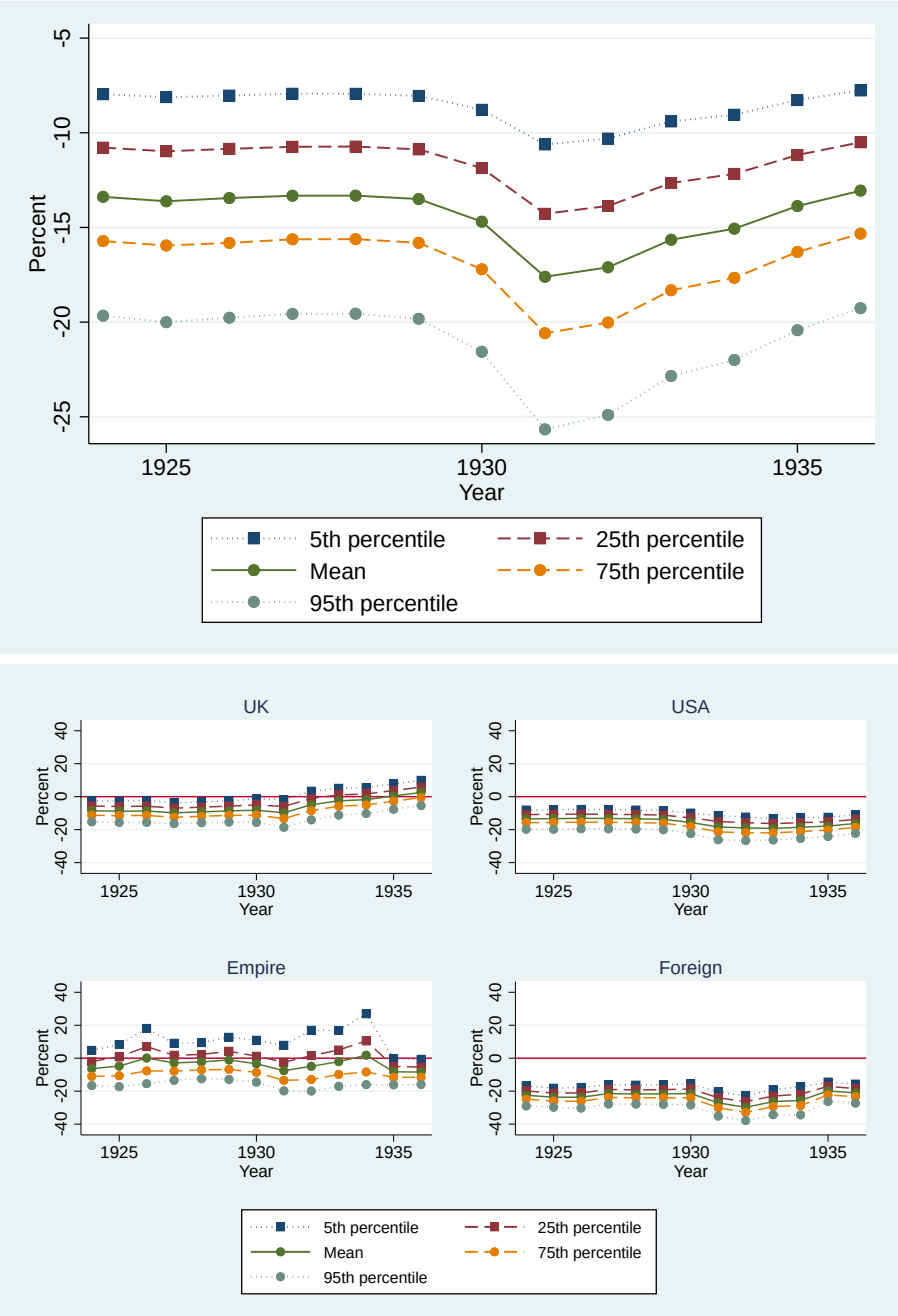
Note: This figure plots the percentage impact on the total value of 1929 Canadian imports from 5 countries of imposing later years' tariffs, rather than 1929 tariffs as actually occurred. See text for further details.

Figure 9: Unweighted Average Tariffs in Three Countries



Note: This figure plots unweighted average tariffs in Canada, the UK, and India. See text for further details.

Figure 10: Impact of Entire Structure of Protection on Aggregate Canadian Imports



Note: The top panel plots the percentage impact on aggregate Canadian imports of imposing the actual structure of protection in each year, compared with a free trade counterfactual. The lower panel does the same for aggregate imports from each of our four regions.

Appendix 1. Data

Table A1: Data Coverage: Countries

Abyssinia	Hayti
Aden	Honduras
Afghanistan	Hong Kong
Africa, British - East	Hungary
Africa, British - South	Iceland
Africa, British - West - Gambia	Iraq (Mesopotamia)
Africa, British - West - Gold Coast	Irish Free State
Africa, British - West - Nigeria	Italy
Africa, British - West - Other	Italy - Tripoli
Africa, British - West - Sierra Leone	Japan
Albania	Japan - Korea
Argentina	Latvia
Armenia	Liberia
Austria	Lithuania
Belgium	Malta
Belgium - Belgian Congo	Mexico
Bermuda	Morocco
Bolivia	Netherlands
Brazil	Netherlands - Dutch East Indies
British East Indies - British India	Netherlands - Dutch Guiana
British East Indies - Ceylon	Netherlands - Dutch West Indies
British East Indies - Other	Newfoundland
British East Indies - Straits Settlements	Nicaragua
British Guiana	Norway
British Honduras	Oceania - Australia
British Sudan	Oceania - Fiji
British West Indies - Barbados	Oceania - New Zealand
British West Indies - Jamaica	Oceania - Other
British West Indies - Other	Palestine
British West Indies - Trinidad and Tobago	Panama
Bulgaria	Paraguay
Chile	Persia
China	Peru
Colombia	Poland and Danzig
Costa Rica	Portugal
Cuba	Portugal - Portuguese Africa

Continued on next page

Table A1: Data Coverage: Countries

Czechoslovakia	Roumania
Denmark	Russia (U.S.S.R.)
Denmark - Greenland	Salvador
Ecuador	San Domingo
Egypt	Siam
Estonia	Southern Rhodesia
Falkland Islands	Spain
Finland	Spain - Spanish Africa
France	Sweden
France - French Africa	Switzerland
France - French East Indies	Syria
France - French Guiana	Turkey
France - French Oceania	United Kingdom
France - French West Indies	United States
France - Madagascar	United States - American Virgin Islands
France - St. Pierre and Miquelon	United States - Philippine Islands
Germany	United States - Puerto Rico
Gibraltar	Uruguay
Greece	Venezuela
Guatemala	Yugoslavia

Notes: This table lists the 112 countries that are included in the estimating sample. See text for further details.

Table A2: Data Coverage: Industries and Sectors

ID	Industry Description	Sector Description
1	SUGAR AND ITS PRODUCTS	AGRICULTURAL AND VEGETABLE PRODUCTS - A. Mainly Food
2	OILS, VEGETABLE, FOR FOOD	AGRICULTURAL AND VEGETABLE PRODUCTS - A. Mainly Food
3	GRAINS AND FARINACEOUS PRODUCTS	AGRICULTURAL AND VEGETABLE PRODUCTS - A. Mainly Food
4	TEA, COFFEE, COCOA AND SPICES	AGRICULTURAL AND VEGETABLE PRODUCTS - A. Mainly Food
5	OTHER AGRICULTURE AND VEGETABLES (FOOD)	AGRICULTURAL AND VEGETABLE PRODUCTS - A. Mainly Food
6	FRUITS, NUTS AND VEGETABLES	AGRICULTURAL AND VEGETABLE PRODUCTS - A. Mainly Food
7	VINEGAR	AGRICULTURAL AND VEGETABLE PRODUCTS - A. Mainly Food
8	YEAST	AGRICULTURAL AND VEGETABLE PRODUCTS - A. Mainly Food
9	BEVERAGES, ALCOHOLIC	AGRICULTURAL AND VEGETABLE PRODUCTS - B. Other Than Food
10	PLANTS, SHRUBS, TREES AND VINES	AGRICULTURAL AND VEGETABLE PRODUCTS - B. Other Than Food
11	OTHER AGRICULTURE AND VEGETABLES (NO FOOD), N.O.P.	AGRICULTURAL AND VEGETABLE PRODUCTS - B. Other Than Food
12	SEEDS	AGRICULTURAL AND VEGETABLE PRODUCTS - B. Other Than Food
13	OIL CAKE AND MEAL	AGRICULTURAL AND VEGETABLE PRODUCTS - B. Other Than Food
14	TOBACCO	AGRICULTURAL AND VEGETABLE PRODUCTS - B. Other Than Food
15	OTHER AGRICULTURE AND VEGETABLE S (NO FOOD)	AGRICULTURAL AND VEGETABLE PRODUCTS - B. Other Than Food
16	GUMS AND RESINS	AGRICULTURAL AND VEGETABLE PRODUCTS - B. Other Than Food
17	OILS, VEGETABLE, NOT FOR FOOD	AGRICULTURAL AND VEGETABLE PRODUCTS - B. Other Than Food
18	RUBBER AND ITS PRODUCTS	AGRICULTURAL AND VEGETABLE PRODUCTS - B. Other Than Food
19	FISHERY PRODUCTS, N.O.P.	ANIMALS AND ANIMAL PRODUCTS
20	MISCELLANEOUS ANIMAL PRODUCTS, N.O.P.	ANIMALS AND ANIMAL PRODUCTS
21	ANIMALS, LIVING	ANIMALS AND ANIMAL PRODUCTS
22	BONE, IVORY AND SHELL PRODUCTS	ANIMALS AND ANIMAL PRODUCTS
23	HAIR AND BRISTLES, N.O.P.	ANIMALS AND ANIMAL PRODUCTS
24	MILK AND ITS PRODUCTS	ANIMALS AND ANIMAL PRODUCTS
25	OILS, FATS, GREASES AND WAXES	ANIMALS AND ANIMAL PRODUCTS
26	FEATHERS AND QUILLS	ANIMALS AND ANIMAL PRODUCTS
27	HIDES AND LEATHER	ANIMALS AND ANIMAL PRODUCTS
28	MEATS	ANIMALS AND ANIMAL PRODUCTS
29	FURS	ANIMALS AND ANIMAL PRODUCTS
30	FERTILIZERS	CHEMICALS AND ALLIED PRODUCTS
31	INORGANIC CHEMICALS, N.O.P.	CHEMICALS AND ALLIED PRODUCTS
32	DYEING AND TANNING MATERIALS	CHEMICALS AND ALLIED PRODUCTS
33	OTHER DRUGS, DYES AND CHEMICALS, N.O.P.	CHEMICALS AND ALLIED PRODUCTS
34	ACIDS	CHEMICALS AND ALLIED PRODUCTS
35	ALCOHOLS, INDUSTRIAL	CHEMICALS AND ALLIED PRODUCTS
36	EXPLOSIVES	CHEMICALS AND ALLIED PRODUCTS
37	PAINTS, PIGMENTS AND VARNISHES	CHEMICALS AND ALLIED PRODUCTS
38	DRUGS, MEDICINAL AND PHARMACEUTICAL PREPARATIONS	CHEMICALS AND ALLIED PRODUCTS
39	SOAPS	CHEMICALS AND ALLIED PRODUCTS
40	CELLULOSE PRODUCTS	CHEMICALS AND ALLIED PRODUCTS
41	PERFUMERY, COSMETICS AND TOILET PREPARATIONS	CHEMICALS AND ALLIED PRODUCTS
42	Coin and Bullion	COIN AND BULLION
43	SILK AND ITS PRODUCTS	FIBRES, TEXTILES AND TEXTILE PRODUCTS
44	FLAX, HEMP AND JUTE PRODUCTS	FIBRES, TEXTILES AND TEXTILE PRODUCTS
45	COTTON AND ITS PRODUCTS	FIBRES, TEXTILES AND TEXTILE PRODUCTS
46	ARTIFICIAL SILK (RAYON) AND ITS PRODUCTS	FIBRES, TEXTILES AND TEXTILE PRODUCTS
47	OTHER FIBRES AND THEIR PRODUCTS, N.O.P.	FIBRES, TEXTILES AND TEXTILE PRODUCTS
48	WOOL AND ITS PRODUCTS	FIBRES, TEXTILES AND TEXTILE PRODUCTS
49	MIXED TEXTILE PRODUCTS	FIBRES, TEXTILES AND TEXTILE PRODUCTS
50	TUBES, PIPES AND FITTINGS	IRON AND ITS PRODUCTS
51	FARM IMPLEMENTS AND MACHINERY	IRON AND ITS PRODUCTS

Continued on next page

ID	Industry Description	Sector Description
52	MACHINERY (EXCEPT AGRICULTURAL)	IRON AND ITS PRODUCTS
53	OTHER IRON AND STEEL PRODUCTS	IRON AND ITS PRODUCTS
54	SCRAP IRON OR STEEL	IRON AND ITS PRODUCTS
55	RAW IRON	IRON AND ITS PRODUCTS
56	ROLLING MILL PRODUCTS, N.O.P.	IRON AND ITS PRODUCTS
57	VEHICLES, CHIEFLY OF IRON	IRON AND ITS PRODUCTS
58	CASTINGS AND FORGINGS, N.O.P.	IRON AND ITS PRODUCTS
59	WIRE	IRON AND ITS PRODUCTS
60	PIGS, INGOTS, BLOOMS AND BILLETS	IRON AND ITS PRODUCTS
61	CHAINS	IRON AND ITS PRODUCTS
62	TOOLS AND HAND IMPLEMENTS	IRON AND ITS PRODUCTS
63	STAMPED AND COATED PRODUCTS	IRON AND ITS PRODUCTS
64	ENGINES AND BOILERS, N.O.P.	IRON AND ITS PRODUCTS
65	SPRINGS	IRON AND ITS PRODUCTS
66	HARDWARE AND CUTLERY	IRON AND ITS PRODUCTS
67	SHIPS AND VESSELS	MISCELLANEOUS COMMODITIES
68	MUSICAL INSTRUMENTS	MISCELLANEOUS COMMODITIES
69	MISCELLANEOUS IMPORTS (SPECIAL CONDITIONS)	MISCELLANEOUS COMMODITIES
70	MINERAL AND AERATED WATERS	MISCELLANEOUS COMMODITIES
71	BRUSHES	MISCELLANEOUS COMMODITIES
72	WORKS OF ART, N.O.P.	MISCELLANEOUS COMMODITIES
73	OTHER MISCELLANEOUS COMMODITIES, N.O.P.	MISCELLANEOUS COMMODITIES
74	SCIENTIFIC AND EDUCATIONAL EQUIPMENT	MISCELLANEOUS COMMODITIES
75	AMUSEMENT AND SPORTING GOODS, N.O.P.	MISCELLANEOUS COMMODITIES
76	CONTAINERS, N.O.P.	MISCELLANEOUS COMMODITIES
77	HOUSEHOLD AND PERSONAL EQUIPMENT, N.O.P.	MISCELLANEOUS COMMODITIES
78	VEHICLES, N.O.P.	MISCELLANEOUS COMMODITIES
79	ALUMINIUM AND ITS PRODUCTS	NON-FERROUS METALS AND THEIR PRODUCTS
80	COPPER AND ITS PRODUCTS	NON-FERROUS METALS AND THEIR PRODUCTS
81	OTHER NON-FERROUS METAL PRODUCTS	NON-FERROUS METALS AND THEIR PRODUCTS
82	TIN AND ITS PRODUCTS	NON-FERROUS METALS AND THEIR PRODUCTS
83	LEAD AND ITS PRODUCTS	NON-FERROUS METALS AND THEIR PRODUCTS
84	BRASS AND ITS PRODUCTS	NON-FERROUS METALS AND THEIR PRODUCTS
85	NICKEL AND ITS PRODUCTS	NON-FERROUS METALS AND THEIR PRODUCTS
86	ZINC AND ITS PRODUCTS	NON-FERROUS METALS AND THEIR PRODUCTS
87	PRECIOUS METALS AND THEIR PRODUCTS	NON-FERROUS METALS AND THEIR PRODUCTS
88	STONE AND ITS PRODUCTS	NON-METALLIC MINERALS AND THEIR PRODUCTS
89	GRAPHITE AND ITS PRODUCTS	NON-METALLIC MINERALS AND THEIR PRODUCTS
90	PETROLEUM, ASPHALT AND THEIR PRODUCTS	NON-METALLIC MINERALS AND THEIR PRODUCTS
91	OTHER NON-METALLIC MINERAL PRODUCTS	NON-METALLIC MINERALS AND THEIR PRODUCTS
92	MICA AND ITS PRODUCTS	NON-METALLIC MINERALS AND THEIR PRODUCTS
93	GLASS AND GLASSWARE	NON-METALLIC MINERALS AND THEIR PRODUCTS
94	CLAY AND ITS PRODUCTS	NON-METALLIC MINERALS AND THEIR PRODUCTS
95	ASBESTOS	NON-METALLIC MINERALS AND THEIR PRODUCTS
96	COAL AND ITS PRODUCTS	NON-METALLIC MINERALS AND THEIR PRODUCTS
97	PAPER	WOOD, WOOD PRODUCTS AND PAPER
98	BOOKS AND PRINTED MATTER	WOOD, WOOD PRODUCTS AND PAPER
99	WOOD, MANUFACTURED	WOOD, WOOD PRODUCTS AND PAPER
100	WOOD, UNMANUFACTURED OR PARTIALLY MANUFACTURED	WOOD, WOOD PRODUCTS AND PAPER

Notes: This table lists the 100 industries and 11 sectors that are included in our dataset. A list of the 1,697 products included in the analysis is available on request. See text for further details.

Appendix 2. Robustness: econometrics

This appendix develops our main estimates from a sequence of specifications with increasingly demanding sets of fixed effects and controls. The objective is twofold. First, we want to explore what are the factors that may lead to potential biases in our estimates of the effects of tariffs. Second, on a related note, we trace the evolution of the changes in our estimating sample when we introduce more and more demanding specifications depending on the fixed effects used. Our results are presented in Table A3. The estimates in column (1) of Panel A in Table A3 are obtained from the following econometric model:

$$m_{gct} = \exp[\ln(1+\tau_{gct}) \times \beta_1 + \pi_c + \phi_g + \psi_t] \times \epsilon_{gct}, \tag{17}$$

which includes three sets of fixed effects – by country, product, and year. The country fixed effects (π_c) control for any time-invariant country characteristics (e.g., area) and also, given our one-country setting with Canada as the single importer, for any time-invariant bilateral trade costs between the exporter and Canada (e.g., bilateral distance). The product fixed effects (ϕ_g) control for any time-invariant product characteristics (e.g., units of measurement). Finally, the year fixed effects (ψ_t) control for any common time trends (e.g., the global depression).[44]

Turning to the estimate of the impact of tariffs ($\hat{\beta}_1$), we see that it is negative and statistically significant, as expected, i.e., on average, tariffs were an important impediment to Canada's imports during the period 1924-1936. In terms of size, the coefficient on $\ln(1+\tau_{gct})$, (-3.033, std.err. 0.287), is on the lower end of the corresponding estimates from the trade literature (e.g., Eaton and Kortum (2002), Anderson and van Wincoop (2003), and Head and Mayer (2014)) but it implies an elasticity of substitution and a correspond-

[44]The single dropped observation in column (1) of Table A3 is for U.S. exports of *"Photographs, paintings, pastels, drawings and other art work and illustrations of all kinds, n, o, p., whether originals, copies or proofs, for reproduction in periodical publications enjoying second-class mailing privileges, (From May 1, 1936)"* in 1936. The reason is that this is the only observation for which there was data on Canada's tariffs on imports of this product category from U.S.. Because this product is only exporter by the U.S., it is dropped from the estimating sample. The coverage in terms of countries and years remains the same.

ing trade elasticity which are within the established bounds, consistent with theory, and comparable to estimates from the RBC macro literature (e.g., Backus et al. (1994) and Zimmermann (1997)) and also to some recent estimates from trade papers (e.g., Anderson and Yotov (2020) and Boehm et al. (2020)).

The estimates in column (2) of Panel A are obtained after replacing the set of country fixed effects (π_c) with a set of country-time fixed effects ($\tilde{\pi}_{ct}$), i.e, from the following econometric model:

$$m_{gct} = \exp[\ln(1+\tau_{gct}) \times \beta_2 + \tilde{\pi}_{ct} + \phi_g] \times \epsilon_{gct}. \quad (18)$$

In addition to absorbing all time-invariant country-specific characteristics and trade costs with Canada, the country-time fixed effects also fully control for any time-varying country-specific and exporter-Canada-specific effects (e.g., GDP of the exporter, the exchange rate between the exporter and Canada, and all types of bilateral treaties between Canada and the exporters in our sample). Note also that the country-time fixed effects would absorb the year fixed effects from the previous specification. Once again, we obtain a sizable, negative and statistically significant estimate on $\ln(1+\tau_{gct})$, $\hat{\beta}_2 = -2.847$ (std.err. 0.292), which is not statistically different from the estimate in column (1).[45]

The estimates in column (3) of Panel A are obtained after replacing the product fixed effects (ϕ_g) from the previous specification with product-time fixed effects ($\tilde{\phi}_{gt}$), i.e, from the following econometric model:

$$m_{gct} = \exp[\ln(1+\tau_{gct}) \times \beta_3 + \tilde{\pi}_{ct} + \tilde{\phi}_{gt}] \times \epsilon_{gct}. \quad (19)$$

The idea is to control for any time-varying product changes and characteristics (e.g., global

[45]Due to the use of more detailed fixed effects, the number of observations decreases further with this specification and we see a drop in the number of countries in the estimating sample to 106. The coverage in terms of products and years remains the same as in the previous specification.

structural change).[46] Once again, we obtain a sizable, negative and statistically significant estimate on $\ln(1+\tau_{gct})$, $\hat{\beta}_3 = -3.791$ (std.err. 0.626). The new estimate is larger but less precisely estimated and, therefore, still not statistically different from the estimates in columns (1) and (2).

The estimates in column (4) of Panel A are obtained after introducing country-product fixed effects ($\tilde{\psi}_{gc}$) in addition to the fixed effects from the previous specification. The econometric model becomes:

$$m_{gct} = \exp[\ln(1+\tau_{gct}) \times \beta_4 + \tilde{\pi}_{ct} + \tilde{\psi}_{gc} + \tilde{\phi}_{gt}] \times \epsilon^{gct}. \quad (20)$$

The idea behind the introduction of the country-product fixed effects is that, for example, the new fixed effects will allow for and control for time-invariant trade cost differences per product (e.g., due to transportation costs). This is consistent with theory, cf. Anderson and van Wincoop (2004) and Costinot et al. (2012), and there is plenty of empirical evidence that trade costs vary across sectors and products.[47] Similar to the previous specifications, we obtain a sizable, negative and statistically significant estimate on $\ln(1+\tau_{gct})$, $\hat{\beta}_4 = -2.650$ (std.err. 0.787).

The estimates in column (5) of Panel A are obtained after replacing the country-time fixed effects ($\tilde{\pi}_{ct}$) from the previous specification with industry-country-time time fixed effects ($\tilde{\pi}^{ict}$), where the industries i are the 99 defined in Table A2 (other than Coin and Bullion):

$$m_{gct} = \exp[\ln(1+\tau_{gct}) \times \beta_5 + \tilde{\pi}_{ict} + \tilde{\psi}_{gc} + \tilde{\phi}_{gt}] \times \epsilon_{gct}. \quad (21)$$

From a theory perspective, the idea behind the introduction of this latest set of fixed effects

[46] Due to the use of more detailed fixed effects, the number of observations decreases further with this specification and we see a drop in the number of products in the estimating sample to 1,649. The coverage in terms of countries and years remains the same as in the previous specification.

[47] Due to the use of more detailed fixed effects, the number of observations decreases further with this specification and we see a drop in the number of products in the estimating sample to 1,639. The coverage in terms of countries and years remains the same as in the previous specification.

is to control (at least partially) for the unobservable multilateral resistances. Theory implies that to do this properly the fixed effects should be of dimension exporter-product-time. However, given the focus on the imports of a single country, it is not possible to include these theory-consistent fixed effects, as they would be of the same dimension as the dependent variable. Therefore, instead of products we use industries, i.e., our fixed effects are of dimension exporter-industry-time. As discussed in the main text, we are using 99 industries, which is quite a disaggregated classification with on average less than 17 products in each industry.[48] The estimate on $\ln(1+\tau_{gct})$ ($\hat{\beta}_4 = -3.576$, std.err. 0.899) is still sizable, negative, and statistically significant, and it is very similar to our main estimate, which we reproduce in the last column of Table A3.

We also estimate several robustness specifications. The results in Panel B of Table A3 are obtained from the same (restricted) estimating sample that we employed to obtain our main estimate in column (6) of Panel A. The idea is to check whether the differences across estimates from alternative specifications in Panel A were driven by the different number of observations vs. the use of alternative sets of fixed effects. Overall, the variation across the estimates in Panel B is rather similar to the corresponding pattern in Panel A. Thus, we conclude that the differences across the estimates from alternative specifications were mostly driven by the use of alternative sets of fixed effects. The estimates in Panel C of Table A3 are obtained with the constrained sample but with an alternative clustering of the standard errors, i.e., by country and product, and they are very similar to our previous results.

[48] Due to the use of more detailed fixed effects, the number of observations decreases further with this specification and we see a drop in the number of countries (to 94) and in the number of products (to 1634) in the estimating sample. The coverage in terms of years remains the same as in the previous specification.

Table A3: The Impact of Canada's Tariffs: Common Estimates.

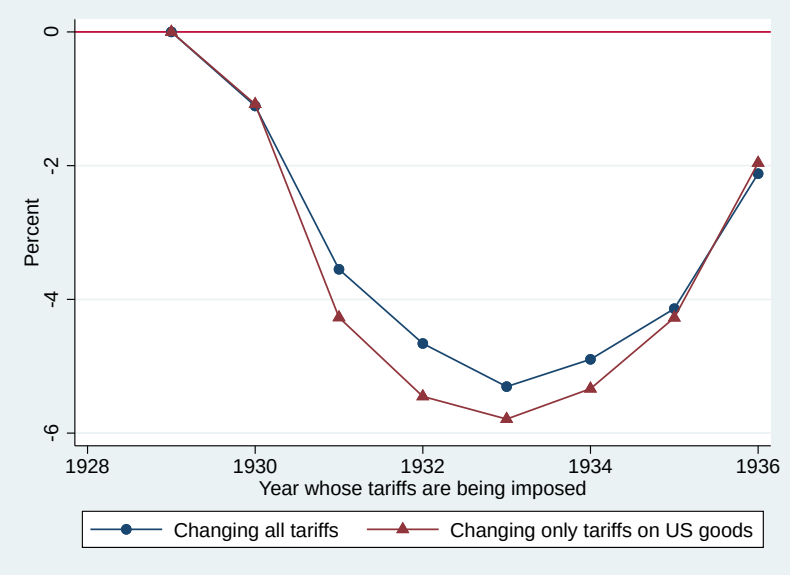
	(1)	(2)	(3)	(4)	(5)	(6)
A. Full Estimating Sample						
LN_TARIFF	-3.033	-2.847	-3.791	-2.650	-3.576	-3.671
	(0.287)**	(0.292)**	(0.626)**	(0.787)**	(0.899)**	(0.809)**
LN_OMR_STR						0.138
						(0.069)*
N	238043	236792	236269	236050	194182	179788
B. Constrained Estimating Sample						
LN_TARIFF	-3.183	-3.024	-4.112	-3.165	-3.671	-3.671
	(0.484)**	(0.461)**	(0.794)**	(0.798)**	(0.809)**	(0.809)**
LN_OMR_STR						0.138
						(0.069)*
N	179788	179788	179788	179788	179788	179788
C. Alternative (country-product) clustering						
LN_TARIFF	-3.183	-3.024	-4.112	-3.165	-3.671	-3.671
	(0.534)**	(0.511)**	(0.743)**	(0.814)**	(0.795)**	(0.795)**
LN_OMR_STR						0.138
						(0.079)+
N	179788	179788	179788	179788	179788	179788

Notes: This table reports estimates of the common effects of tariffs on Canada's imports. The dependent variable is the value of imports in levels. The estimator is always PPML. Panel A reports estimates that are obtained from an unconstrained estimating sample. All results are obtained from specification (5) but with different fixed effects. Specifically, the estimates in column (1) use country, product, and year fixed effects. The estimates in column (2) are obtained after replacing the set of country fixed effects with a set of country-time fixed effects. The estimates in column (3) are obtained after replacing the product fixed effects from the previous specification with product-time fixed effects. The estimates in column (4) are obtained after introducing country-product fixed effects in addition to the fixed effects from the previous specification. The estimates in column (5) are obtained after replacing the country-time fixed effects from the previous specification with country-industry-time time fixed effects. Finally, in column (6) we control for the multilateral resistances in addition to having all fixed effects from the previous specification. Panel B reproduces the specifications from Panel A but based on the restricted sample that was used to obtain the estimates in column (6) of Panel A. All standard errors in panels A and B are clustered three-way (i.e., by exporter, product, and time). Panel C reports results that are clustered by exporter and product only.

Appendix 3. Additional simulations

Figure A1 plots the impact on the 1929 value of Canadian imports from the United States of imposing later year's tariffs. Similar to Figure 7, it does so for two scenarios: allowing all tariffs to change as they actually did (as in Figure 6), and only varying tariffs on American goods, keeping all other tariffs constant. As can be seen, in contrast to the British case there is no great difference between the two scenarios: in neither case do tariff changes lower US exports to Canada by more than 6 percent.

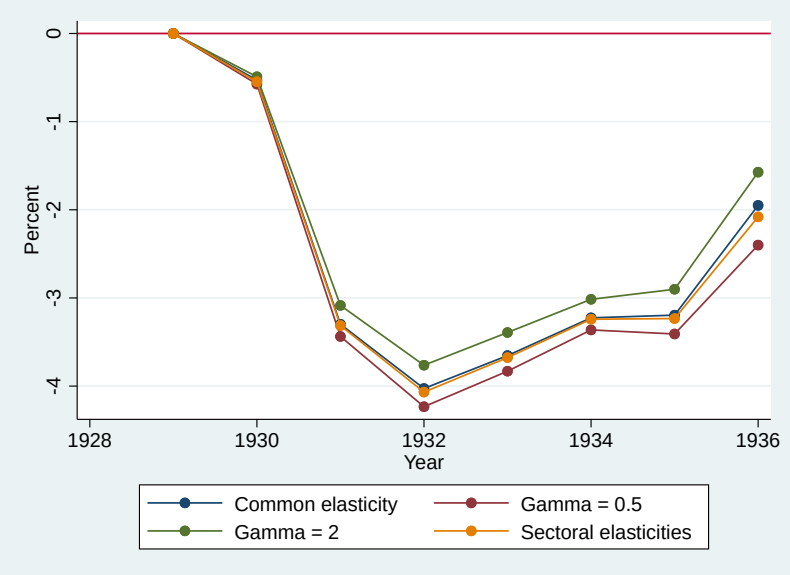
Figure A1: Impact on 1929 imports from the US of imposing later years' tariffs



Note: This figure plots the percentage impact on the total value of 1929 Canadian imports from the US of imposing later years' tariffs, rather than 1929 tariffs as actually occurred. See text for further details.

Figure A2 plots the impact on aggregate Canadian imports in 1929 of imposing the tariffs of later years. It does so for four elasticity scenarios. The sectoral elasticities scenario is the benchmark scenario plotted in Figure 6 in the main text, using the sectoral estimates of σ_g based on Figure 5. The common elasticity scenario imposes a uniform estimate of σ_g on all products, taken from column (1) in Table 3. The other two scenarios use the baseline sectoral estimates of σ_g, but allow the intermediate elasticity of substitution between goods, γ, to be either 0.5 or 2 (whereas it was set equal to one in the benchmark scenario).

Figure A2: Impact on aggregate 1929 imports of imposing later years' tariffs

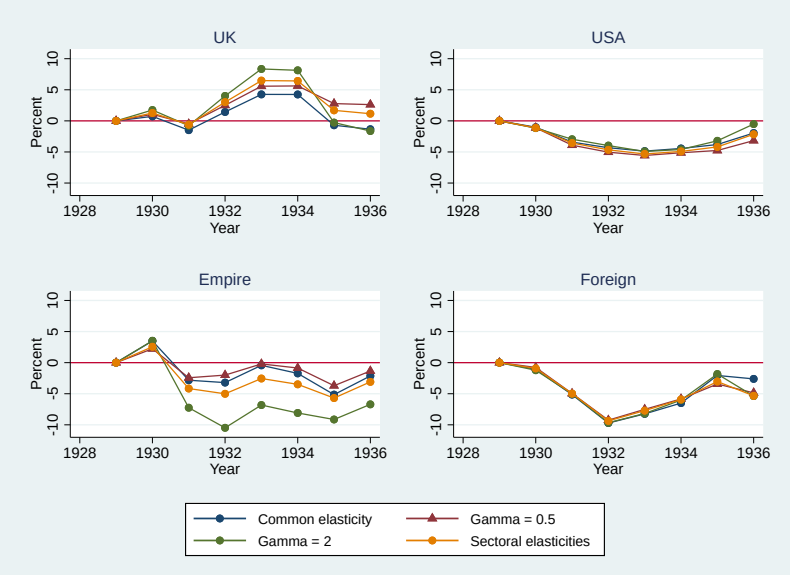


Note: This figure plots the percentage impact on the total value of 1929 Canadian imports of imposing later years' tariffs, rather than 1929 tariffs as actually occurred. See text for further details.

Figure A3 does the same, but plots exports to Canada of the four regions discussed in the text (the UK, the rest of the British Empire, the US, and the rest of the world).

Figure A4 and Figure A5 repeat the exercise, but this time look at the impact of the entire structure of protection, comparing this with a free trade counterfactual as in Figure 10. As can be seen from Figures A2-A5, our counterfactual results are not particularly sensitive to these elasticity choices, with the exception of those relating to exports from the British

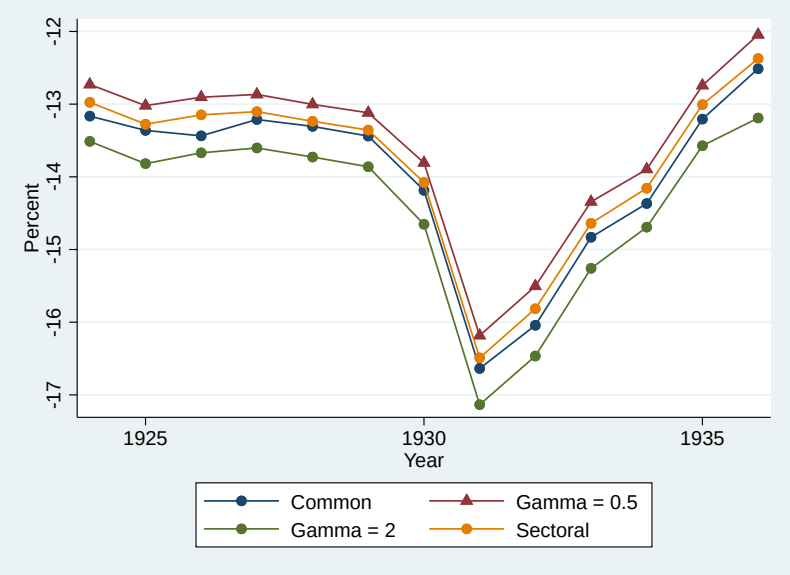
Figure A3: Impact on aggregate 1929 imports of imposing later years' tariffs



Note: This figure plots the percentage impact on the total value of 1929 Canadian imports from four regions of imposing later years' tariffs, rather than 1929 tariffs as actually occurred. See text for further details.

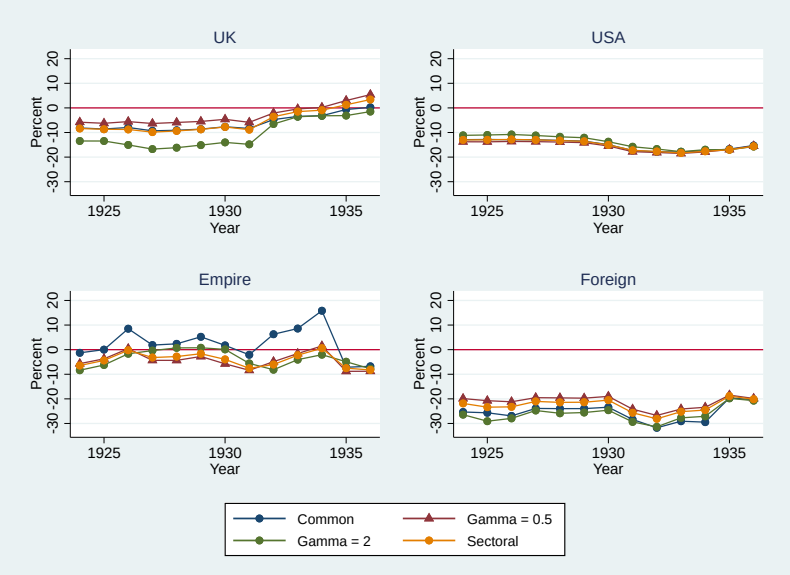
Empire (excluding the UK).

Figure A4: Impact of entire structure of protection on aggregate Canadian imports



Note: This figure plots the percentage impact on aggregate Canadian imports of imposing the actual structure of protection in each year, compared with a free trade counterfactual. See text for further details.

Figure A5: Impact of entire structure of protection on Canadian imports from 4 regions



Note: This figure plots the percentage impact on Canadian imports from 4 regions of imposing the actual structure of protection in each year, compared with a free trade counterfactual. See text for further details.