Discussion Paper No. 519

Merger Policy in a Quantitative Model of International Trade

Holger Breinlich*
Volker Nocke**
Nicolas Schutz***

* University of Nottingham, CEP, CERP
** University of Mannheim, CERP
*** University of Mannheim

September 2015

Merger Policy in a Quantitative Model of International Trade[*]

Holger Breinlich[†]   Volker Nocke[‡]   Nicolas Schutz[§]

September 14, 2015

Abstract

In a two-country international trade model with oligopolistic competition, we study the conditions on market structure and trade costs under which a merger policy designed to benefit domestic consumers is too tough or too lenient from the viewpoint of the foreign country. Calibrating the model to match industry-level data in the U.S. and Canada, we show that at present levels of trade costs merger policy is too tough in the vast majority of sectors. We also quantify the resulting externalities and study the impact of different regimes of coordinating merger policies at varying levels of trade costs.

Keywords: Mergers and Acquisitions, Merger Policy, Trade Policy, Oligopoly, International Trade

Journal of Economic Literature Classification: F12, F13, L13, L44

1   Introduction

Because of cross-border demand and supply linkages, merger approval decisions of national antitrust authorities have important effects on other jurisdictions. This implies that for a

given objective function (such as domestic consumer surplus, which is by and large current practice in the United States, the EU, and many other jurisdictions), conflicts between national authorities can arise. In particular, the efficiency gains induced by a merger might be sufficient to outweigh its anti-competitive effect in one country but not in another country, leading to diverging decisions of national merger authorities.

The past two decades have indeed seen a number of high-profile competition cases which illustrate this potential for conflict. Two prominent examples are the proposed mergers between the two U.S.-based firms General Electric and Honeywell in 2001, and the proposed merger in 1996 of the South African platinum interests of Gencor and Lonrho. In both cases, the merger was cleared by the firms' domestic antitrust authority but blocked by the EU Commission due to concerns about the mergers' anticompetitive effect in Europe. A more recent example is the planned acquisition of the Italian company Metlac by the Dutch company Akzo Nobel, which was cleared by several antitrust authorities, including the German Bundeskartellamt. However, in 2012, the UK Competition Commission blocked the merger on grounds that it would be expected to lead to a substantial lessening of competition in the UK market for the supply of metal packaging coatings.

In this paper, we propose a quantitative framework which can be used to understand the determinants of conflict between merger authorities, to analyze which types of conflicts are likely to arise in practice, and to provide a sense of the economic importance of these conflicts. We use these insights to derive implications for the coordination of national merger and trade policies. As we explain in detail below, trade policy, and trade costs more generally, play an important role in determining the type and scope of conflicts between antitrust authorities, and are a key part of our framework and analysis.

In the first part of the paper, we develop a two-country model of international trade, where in each country there is a population of heterogeneous firms which produce a homogeneous good and compete in a Cournot fashion. While all firms produce in their home country, they can sell not only at home but also export to the other country. Exports do incur standard iceberg-type variable trade costs, however, implying that the sets of firms active in the two countries will in general be different.

A merger between two firms has opposing effects on consumer surplus in each ountry: on the one hand, the merger gives rise to a market power effect (which is due to the internalization of competitive externalities post merger); on the other hand, the merger gives rise to an efficiency effect (which is due to merger-specific synergies). The resulting net effect depends on the characteristics of the merger, market conditions and trade costs. As the merger may

raise consumer surplus in one country but reduce it in the other, the approval incentives of the national authorities are not fully aligned. Whether merger control based on domestic consumer surplus is too tough or too lenient from the viewpoint of foreign consumers is shown to depend solely on an industry-level 'conflict statistic.' That conflict statistic for mergers among firms in a given industry and country is equal to the ratio of domestic to foreign pre-merger prices, adjusted for trade costs from the home to the foreign country. If the value of the statistic is more than one, any pair of merger partners has more market power at home than abroad, no matter what their pre-merger marginal costs. This implies that if the merger benefits domestic consumers it must also benefit foreign consumers, while the reverse is not true. In this case, merger control based on domestic consumer surplus is a *too-tough-for-thy-neighbor policy* as it involves blocking some mergers that would benefit consumers in the foreign country. Conversely, if the value of the statistic is less than one, merger control based on domestic consumer surplus is a *too-lenient-for-thy-neighbor policy* as it involves approving some mergers that hurt consumers in the foreign country. Generically, the value of the statistic is not equal to one, so there will always be one of these two types of conflict. We also show that any (unilateral or multilateral) reduction in trade costs reduces the value of the conflict statistic in both countries.

Our theoretical results are derived under mild assumptions on demand and cost structures. In order to be able to say more about which types of conflict are likely to be relevant in practice, we impose more structure and take the model to the data. In the second part of the paper, we calibrate a version of our model based on linear demand and Pareto-distributed firm productivity levels, choosing parameter values to match a number of sector-level moments such as sales, imports, relative prices and concentration ratios. We do so using industry-level data for the year 2002 from 160 sectors in the United States and Canada.

Our results show that at the present levels of trade costs (i.e., the levels obtained in the calibration), domestic merger policy is of the too-tough-for-thy-neighbor type in the vast majority of sectors. This is particularly true for Canadian mergers, where too-tough-for-thy-neighbor policies are the *only* type of conflict. The picture is more nuanced in the U.S. While U.S. merger authorities are also mostly too tough on domestic mergers from the viewpoint of Canadian consumers, there is a significant minority of sectors where permitted U.S. mergers have the potential to hurt Canadian consumers. The intuition for this difference is that Canada is the smaller and less competitive market in our calibration, in the sense of a higher equilibrium price in a large majority of sectors. Given the presence of positive trade costs, any domestic merger cleared in Canada will always be even less anti-competitive in the U.S.

and will thus benefit consumers there. The opposite is not necessarily true: given that the U.S. market is more competitive in most sectors, some mergers cleared there might have anti-competitive effects in Canada despite the presence of trade costs.

When we reduce the trade cost parameters in our calibrated model, this picture changes dramatically. Lower trade costs imply lower prices so that domestic authorities are more likely to approve domestic mergers. At the same time, lower trade costs mean higher market shares and market power of domestic firms in the foreign market and greater anticompetitive effects there. As trade costs fall, we thus see a switch from conflicts where the domestic authority wants to block a given domestic merger and the foreign authority wants to clear it, to conflicts in which the domestic authority wants to clear the merger and the foreign authority wants to block it. In our counterfactual simulations, this switch occurs for trade cost reductions which seem relatively small from a historical perspective (around 25-30%).

Our results are robust to a number of alternative modeling assumptions and data sources used for the calibration. For example, we show that our findings are qualitatively similar if we explicitly model a competitive fringe or if we assume differentiated products and Bertrand competition. The general intuition that trade costs and initial market structures create cross-country differences in the market power enjoyed by the merging firms carries through in all of these settings; it is these differences that are the driving force behind our findings.

In the paper's third and final part, we extend our calibration by incorporating an endogenous merger formation process and an explicit modeling of the antitrust authorities' objective functions (which we take to be domestic consumer surplus). This allows us to analyze the quantitative importance of conflicts between authorities and to analyze counterfactual scenarios in which we change the antitrust authorities' objective functions.

We consider two ways of coordinating national merger policies. We first introduce veto rights over foreign mergers by allowing domestic authorities to block mergers taking part in the other country.[1] Given that domestic merger policy is mostly too tough at present levels of trade costs, this policy change only has minor effects. The U.S. does not benefit at all from gaining veto rights; Canada sees small increases in domestic consumer surplus but this comes

---

[1]We believe that a situation where countries do not have veto rights is the most plausible baseline scenario. It is true that *de jure*, many countries have adopted the 'effects doctrine' in international competition law, according to which national authorities may assert jurisdiction over any foreign firm whose activity affects the domestic market (see, e.g., Griffin (1999)). In practice, however, the degree to which the effects doctrine is implemented varies substantially across countries, with most antitrust authorities not exercising the implied veto rights over foreign mergers. For example, we are not aware of any U.S. merger authorized by the U.S. but blocked by Canadian antitrust authorities. The European Commission generally tends to be more assertive but is not part of our empirical implementation. For completeness, we do however consider the opposite baseline case in our robustness checks, where we start from a situation where countries exercise veto power to begin with (see Section 5.4).

at the cost of reducing U.S. consumer surplus as Canada now blocks a significant number of U.S. mergers which increase prices in Canada but reduce them in the U.S.

In the second counterfactual, we introduce a North-American merger authority which maximizes the sum of Canadian and U.S. consumer surplus. This authority internalizes cross-border effects of mergers and is thus also able to eliminate consumer surplus losses arising from domestic merger policies which are too restrictive from the point of view of foreign consumers. As a consequence, we find much larger gains from this second policy change. Interestingly, however, this comes at the price of hurting Canadian consumers whose average consumer surplus change is negative. Put simply, the new merger authority gives much more weight to the larger U.S. market and tends to 'ignore' Canada.

Changes in trade costs again modify the gains from national merger policy coordination in important ways. As trade costs increase from current levels, gains from coordination rapidly dissipate. With lower trade costs, however, more complex effects arise. Obtaining veto rights becomes now much more valuable for national antitrust authorities, especially for Canada as the smaller, less competitive market. As trade costs fall from current levels, the focus of a North American antitrust authority also shifts from preventing domestic policies which are too tough to preventing policies which are too lenient. Thus, the effects of introducing such an authority increasingly comes to resemble those of introducing veto rights and Canada also starts to benefit from this form of coordination.

Again, we carry out a number of modifications to this second calibration to examine the robustness of our findings. For example, we experiment with different levels of cost synergies, allow for cross-border mergers in addition to purely domestic mergers, and carry out the baseline calibration under the assumption that merger authorities have veto rights over foreign mergers to begin with. We show that the qualitative pattern of our results remains intact throughout.

Our paper relates to several strands in the literature. First, we contribute to the theoretical literature on optimal horizontal merger policy (e.g., Williamson (1968), Farrell and Shapiro (1990), Nocke and Whinston (2010; 2013)). While we study the conditions under which different national merger authorities would come to different conclusions regarding the desirability of a given merger, this literature focuses almost exclusively on closed economy settings.[2]

Second, we contribute to a relatively small literature that looks at aspects of merger policy

---

[2]An exception is Barros and Cabral (1994). That paper extends the analysis in Farrell and Shapiro (1990) on the 'external effect' of a merger (defined as the merger's effect on the sum of consumer surplus and non-participant firms' profits) by allowing some of the firms to be foreign-owned.

in open economy settings (e.g., Head and Ries (1997) and Horn and Levinsohn (2001)).[3] Head and Ries (1997) study the potential for conflict between different national merger authorities with a total surplus standard. They focus on price-increasing (and thus anticompetitive) mergers in a stylized model without trade costs. Horn and Levinsohn (2001) analyze the interactions of merger and trade policies in a two-country model. In their analysis, merger policy amounts to setting the number of symmetric firms.[4] Compared to this literature, we consider a richer and more general framework, and provide necessary and sufficient conditions on primitives under which different types of conflicts between national antitrust authorities arise. Moreover, we operationalize our framework for the quantitative analysis of such issues, provide a sense of the magnitude of cross-border externalities, and conduct counterfactual policy experiments.

We also contribute to the international trade literature concerned with the causes and consequences of domestic and cross-border mergers (e.g., Neary (2007), Nocke and Yeaple (2007, 2008), di Giovanni (2005), Breinlich (2008)) and with strategic aspects of firm behavior and trade policy in open economy settings (e.g., Brander and Spencer (1985), Brander (1995); Bagwell, Bown and Staiger (2015)). While competition policy is not the focus of this literature, we use comparable modeling frameworks. We also share common interests such as the consequences of introducing mergers and strategic interactions into models of international trade, or the interaction between trade and domestic policies. As only a few papers in this literature use quantitative frameworks (Ossa (2014) is a recent exception), the techniques we introduce to calibrate our model should also be helpful with a quantification of some of the insights from this earlier literature.

The rest of this paper is organized as follows. In Section 2, we introduce a simple two-country model of oligopolistic competition. In Section 3, we use this model to analyze the domestic and foreign price effects of mergers and to characterize the types of conflict which can arise between national antitrust authorities. In Section 4, we calibrate this model on data for the year 2002 for 160 manufacturing sectors in the U.S. and Canada. We analyze the prevalent types of conflicts for the calibrated parameter values and for counterfactual scenarios in which we lower or raise trade costs. In Section 5, we extend the calibration by incorporating an endogenous merger formation process, and look at counterfactual scenarios in which we change the antitrust authorities' objective functions at different levels of trade

---

[3]See also Falvey (1998) for an informal discussion of some of the issues.

[4]In a two-country Cournot model in which all firms but two are symmetric and demand is linear, Long and Vousden (1995) study the effect of trade liberalization on the private profitability of a horizontal merger. By assumption, the merger does not involve synergies (in the sense of Farrell and Shapiro (1990)), implying that the merger is necessarily anticompetitive.

costs. Finally, Section 6 concludes. All the proofs are contained in an Online Appendix, as are the details of our extensions and robustness checks.[5]

2   The Baseline Model

We consider a setting with two possibly asymmetric countries $(i, j = 1, 2)$, S manufacturing sectors and an outside sector. Country i is endowed with L^i units of labor. Labor markets are perfectly competitive; there is perfect labor mobility across sectors and no labor mobility across countries.

In country i, the representative consumer's utility function is given by:

$$U^i(Q_0^i, \boldsymbol{Q}^i) = Q_0^i + \sum_{s=1}^{S} u_s^i(Q_s^i),$$

where Q_0^i is the consumption of the outside good, u_s^i is a well-behaved sub-utility function, and Q_s^i is the consumption of manufacturing good s. The consumer's budget constraint is: $P_0^i Q_0^i + \sum_{s=1}^{S} P_s^i Q_s^i \leq I^i$, where P_0^i is the price of the outside good and P_s^i the price of good s in country i. We assume that parameter values are such that consumer income I^i (which is equal to the sum of wage income $w^i L^i$ and profits) is sufficiently large so that a positive quantity of the outside good is consumed.[6]

The outside good is produced under perfect competition using a constant-returns-to-scale technology with labor as the only factor of production. One unit of labor generates α^i units of output. We also assume that the outside good is freely traded, and that parameters are such that the outside sector produces positive amounts in both countries. We further use the price of the outside good as the *numéraire* $(P_0^1 = P_0^2 = 1)$. This pins down the wage rate in country i at $w^i = \alpha^i$. Given these assumptions, the inverse demand function for good s in country i is given by $P_s^i(Q_s^i) = \max\{u_s^{i\prime}(Q_s^i), 0\}$.

In each country i, there is a set $\mathcal{N}_s^i$ of firms manufacturing good s. Each firm $k \in \mathcal{N}_s^i$ produces only in its home country i, so that $\mathcal{N}_s^1 \cap \mathcal{N}_s^2 = \emptyset$, but can sell at home and also export to the foreign country j. Exports are subject to iceberg-type trade costs: For one unit of good s to arrive in country j, a firm located in country i has to ship τ_s^{ij} units of the good, where $\tau_s^{ij} = 1$ if $i = j$.

In each country and manufacturing sector, firms compete *à la* Cournot, being able to

---

[5]The Online Appendix can be found at `http://nocke.vwl.uni-mannheim.de/2214.0.html`.

[6]Since we are focusing on consumer surplus, and income effects are absent (due to quasi-linear preferences), the ownership structure of domestic and foreign firms is irrelevant for the subsequent analysis.

segment markets perfectly. Manufacturing firms combine labor and the outside good (as an intermediate input), using a constant-returns-to-scale technology. The production function is specified further in Section 4.1 below. For now, we simply denote c_k the firm's marginal (and unit) cost of *producing* one unit of good s. Because of trade costs, this is different from the firm's marginal cost of *selling* one unit of the good in country j, $c_k^j \equiv \tau_s^{ij} c_k$.

Let $N_s^i \equiv |\mathcal{N}_s^i|$ denote the number of (potentially active) manufacturing firms in sector s that are located in country i. Denoting q_k^j firm k's output in country j, we say that firm k is *active* in country j and sector s if $q_k^j > 0$ in equilibrium.

As is well known (see, e.g., Vives (2000)) the following standard assumption on demands and thus, implicitly, on the sub-utility functions u_s^i, implies that there exists a unique and stable Nash equilibrium in each sector and country:

Assumption 1. *For any country i and sector s, $\lim_{Q \to \infty} P_s^i(Q) = 0$ and $P_s^i(Q) > \min_{k \in \mathcal{N}_s^i} c_k$ for $Q > 0$ sufficiently small. Moreover, for any aggregate output $Q > 0$ such that $P_s^i(Q) > 0$, $P_s^{i\prime}(Q) < 0$ and $P_s^{i\prime}(Q) + Q P_s^{i\prime\prime}(Q) < 0$.*

Lemma 1. *There exists a unique Nash equilibrium. The Cournot equilibrium price in each country i and sector s, P_s^{i*}, is weakly increasing in firm k's marginal cost of selling in country i, c_k^i, and strictly so if the firm is active in that country.*

3 Domestic and Foreign Price Effects of Mergers

In this section, we study the effects of a merger between two domestic firms on domestic and foreign prices and, thus, on domestic and foreign consumer surplus. The focus on consumer surplus rather than total surplus is in line with antitrust laws and practice in the U.S., the EU and many other jurisdictions.[7] In the following, we characterize what types of conflicts may arise (and when) between national authorities.

Consider merger $M_s = \{k, l\}$ between firms $k \in \mathcal{N}_s^j$ and $l \in \mathcal{N}_s^j$, both of which produce good s in country j. Dropping the subscript s from now on for notational ease, let $\bar{c}_M$ denote the merged entity's post-merger marginal cost. Denote the Cournot equilibrium price in

---

[7]For instance, Whinston (2007) summarizes the perceived wisdom on merger authorities' objective function as follows: "[...] enforcement practice in most countries (including the U.S. and the E.U.) is closest to a consumer surplus standard." Indeed, the U.S. Horizontal Merger Guidelines state: "the Agencies normally evaluate mergers based on their impact on customers [...] the Agencies consider whether cognizable efficiencies likely would be sufficient to reverse the mergers potential to harm customers in the relevant market, e.g., by preventing price increases in that market." Similarly, the EU Horizontal Merger Guidelines state: "The relevant benchmark in assessing efficiency claims is that consumers will not be worse off as a result of the merger."

country i (which may or may not be equal to j) before the merger by P^{i*}, and after the merger by $\overline{P}^{i*}$. We say that merger M is *CS-neutral* in country i if $\overline{P}^{i*} = P^{i*}$, *CS-decreasing* if $\overline{P}^{i*} > P^{i*}$, and *CS-increasing* if $\overline{P}^{i*} < P^{i*}$.

From Lemma 1 it follows that the CS-effect of a merger is the larger (i.e., the more positive or the less negative), the lower is the merged firm's post-merger marginal cost. The following lemma, which is an extension of the results in Farrell and Shapiro (1990) to a two-country world, fully characterizes the effect of merger M on consumer surplus in country i:

Lemma 2. *Consider merger* $M = \{k, l\}$ *between firms* $k \in N^j$ *and* $l \in N^j$, *both of which are located in country* j. *Assume that both firms are active in country* i *pre-merger, and let*

$$\widehat{c}_M^i \equiv c_k + c_l - \frac{P^{i*}}{\tau^{ji}}.$$

Then, the merger is CS-neutral in country i *if* $\overline{c}_M = \widehat{c}_M^i$, *CS-decreasing if* $\overline{c}_M > \widehat{c}_M^i$ *and CS-increasing if* $\overline{c}_M < \widehat{c}_M^i$.[8]

Lemma 2 shows that the threshold value of post-merger marginal cost, $\widehat{c}_M^i$, below which merger M is CS-increasing in country i, is decreasing in the pre-merger equilibrium price in country i. Intuitively, this is because a reduction in the pre-merger equilibrium price does not affect the efficiency effect of the merger (which can be thought of as the merger-induced reduction in the cost of producing the marginal unit of output) but reduces the market power effect of the merger (which is due to the internalization of the competitive externality post merger) as each merger partner's pre-merger output is decreasing in the pre-merger price.

According to Lemma 2, both the domestic and the foreign antitrust authority would want to block the merger if $\overline{c}_M > \max\{\widehat{c}_M^1, \widehat{c}_M^2\}$ and approve the merger if $\overline{c}_M < \min\{\widehat{c}_M^1, \widehat{c}_M^2\}$. If $\min\{\widehat{c}_M^1, \widehat{c}_M^2\} < \overline{c}_M < \max\{\widehat{c}_M^1, \widehat{c}_M^2\}$, however, the interests of the two authorities conflict with each other as the consumers in one country would be better off with the merger and the consumers in the other country without. Generically, $\widehat{c}_M^1 \neq \widehat{c}_M^2$, implying that there is always the potential of such conflicts of interest.

The exact nature of the conflict between CS-focused authorities depends on whether merger M can be blocked not only by the domestic (here, country j's) authority but also by the foreign (here, country i's, $i \neq j$) authority. As discussed in the introduction (see Footnote 1), two views are possible here. *De jure*, antitrust authorities and courts in many countries have adopted the 'effects doctrine' according to which domestic competition laws

---

[8]In addition, it follows immediately from Lemma 1 in Nocke and Whinston (2010) that if the merger is CS-nondecreasing (i.e., either CS-neutral or CS-increasing) in country i, then it raises the merger partners' joint profit from selling in that country. See Online Appendix Section A.2.

apply also to foreign firms insofar as the actions of these firms have significant effects on the domestic market (see, e.g., Griffin (1999)). *De facto*, however, in many countries such extra-territorial jurisdiction seems to be applied only to a very limited extent.

In light of this discussion, we propose the following taxonomy of conflicts which accommodates both a 'veto-rights' case (foreign mergers can be blocked) and a 'no-veto-rights' case (foreign mergers cannot be blocked). For merger M taking place in country j, country j's CS-standard is a *too-tough-for-thy-neighbor policy* if $\widehat{c}_M^j < \widehat{c}_M^i$, and, provided country i does not have jurisdiction over country-j mergers, a *too-lenient-for-thy-neighbor policy* if $\widehat{c}_M^j > \widehat{c}_M^i$. If country i does have veto power over country-j mergers, then the latter type of conflict cannot arise. In that case, however, country i may end up blocking a merger that country j would have wanted to go through, a *too-tough-for-thy-neighbor policy on foreign mergers*. In the following, we state our results within the 'no-veto-rights' framework to ease the exposition. Results in the 'veto-rights' framework can be obtained by simply replacing *too-lenient-for-thy-neighbor policy* by *too-tough-for-thy-neighbor policy on foreign mergers*.

While the cost thresholds $\widehat{c}_M^j$ are specific to the characteristics of the merger M under consideration, the following proposition, which follows immediately from Lemma 2, shows that the type of potential conflict depends only on pre-merger market conditions and trade costs:

Proposition 1. *Consider a merger M between firms located in country j. The domestic CS-standard for merger approval in the home country j is a too-tough-for-thy-neighbor policy if $\rho^{j*} > 1$ and a too-lenient-for-thy-neighbor policy if $\rho^{j*} < 1$, where*[9]

$$\rho^{j*} \equiv \tau^{ji} \frac{P^{j*}}{P^{i*}}, \ i \neq j.$$

Proposition 1 shows that the potential for conflict in merger policy depends on a market-level "sufficient statistic", ρ^{j*}, which is independent of the merger under consideration, and summarizes the relative competitiveness of the two markets, adjusting for trade costs faced by the merging firms. We call ρ^j the "conflict statistic" for country-j mergers. If $\rho^{j*} > 1$, then whenever consumers in the home country j would benefit from a domestic merger, so would consumers in the foreign country, but not the reverse. If $\rho^{j*} < 1$, then some domestic mergers that benefit consumers in the home country j would hurt consumers in the foreign

---

[9]If iceberg-type trade costs are replaced by additive trade costs, then conflict statistics can be defined as follows: $\rho^{j*} = P^{j*} - P^{i*} + \tau^{ji}$. In this case, country j is too tough (resp. too lenient) if $\rho^{j*} > 0$ (resp. $\rho^{j*} < 0$). Similar formulas can be derived when trade frictions are due to demand-side factors, such as home-biased consumers.

country (whereas any merger that is CS-increasing in the foreign country is necessarily also CS-increasing in the firms' home country).[10,11] Intuitively, if trade costs are high ($\tau^{ji} > 1$) or if the foreign market is more competitive than the domestic market ($P^{i*} < P^{j*}$), so that $\rho^{j*} > 1$, domestic firms tend to have lower market shares abroad than they do at home. The market power effect of the merger is therefore more likely to dominate the efficiency effect at home than abroad, and the nature of the potential conflict on domestic mergers tends to be of the too-tough-for-thy-neighbor type.

These conflict statistics involve endogenous prices. This raises the question: Under what conditions on primitives is one type more likely to arise than the other? In the simple case where the two countries are identical, $\tau^{12} = \tau^{21} \equiv \tau$ and $P^{1*} = P^{2*}$, both conflict statistics are equal to τ, and the domestic CS-standard for merger approval is a too-tough-for-thy-neighbor policy if $\tau > 1$, and a too-lenient-for-thy-neighbor policy if $\tau < 1$. To the extent that one would expect the iceberg-type trade cost τ to be larger than one, this suggests that conflict is likely to be of the too-tough-for-thy-neighbor type when countries are similar.

When countries are not identical, conflict statistics depend both on trade costs and on the ratio of pre-merger equilibrium prices. The following proposition shows that the general idea that conflict is more likely to be of the too-tough-for-thy-neighbor type when trade costs are high extends to the case of asymmetric countries:[12]

Proposition 2. *An increase in the trade cost from country j to country $i \neq j$, τ^{ji}, induces an increase in the conflict statistics for mergers in both countries, ρ^{1*} and ρ^{2*}.*

---

[10]By construction, $\rho^{1*}\rho^{2*} = \tau^{12}\tau^{21}$. So, while one type of conflict may prevail for mergers taking place in one country, the same or another type of conflict may prevail for mergers in the other country (in particular, $\rho^{j*} > 1$ is consistent with both $\rho^{i*} < 1$ and $\rho^{i*} > 1$).

[11]Following the 'reciprocal dumping' literature (e.g., Brander and Krugman (1983)), and much of the subsequent literature on oligopolies in international trade, we have assumed that manufacturers can perfectly segment domestic and foreign markets. If we were to make the polar opposite assumption that perfectly competitive arbitrageurs were subject to the same trade costs as manufacturers, then this would impose the following constraints on relative prices: $1 \leq \rho^{j*} \leq \tau^{12}\tau^{21}$. In that extreme case, only one type of conflict can arise, namely that the home country is too tough. As at most one of the no-arbitrage inequalities can generically be binding, at least one of the two countries must be too tough (from the viewpoint of foreign consumers) on domestic mergers in each industry. Whenever there is imperfect competition among arbitrageurs, or arbitrageurs are subject to larger trade costs than manufacturers, both types of conflict can arise.

[12]In the Online Appendix (Section A.4), we also study the impact of demand and supply conditions on our conflict statistics.

4 Model Calibration without Mergers

In this section, we put more structure on preferences and technologies and calibrate the model to sector-level data from the U.S. and Canada for 2002. The goal of this first calibration is to evaluate which types of conflicts are likely to be relevant in practice, and how this changes as trade costs evolve. A calibration approach is helpful in this context because it imposes some discipline on the parameter values governing the prevalence of the two types of conflict. In particular, it allows us to obtain model-consistent estimates of bilateral trade costs and permits the analysis of counterfactual changes in these costs.[13]

4.1 Model Operationalization: Preferences and Technologies

We assume that the sub-utility $u_s^i(\cdot)$ introduced in Section 2 is now given by $u_s^i(Q_s^i) = a_s^i Q_s^i - \frac{1}{2} b_s^i (Q_s^i)^2$, where s indexes sectors and i countries. This quadratic functional form generates a linear inverse demand function: $P_s^i(Q_s^i) = \max(a_s^i - b_s^i Q_s^i, 0)$. The production function of firm k in sector s and country i is given by

$$q_k = \frac{1}{(\eta_s^i)^{\eta_s^i}(1-\eta_s^i)^{1-\eta_s^i}} z_k l_k^{\eta_s^i} q_{0,k}^{1-\eta_s^i},$$

where l_k and $q_{0,k}$ denote firm k's consumption of labor and intermediate goods (i.e., the outside good), η_s^i is the labor input share in sector s and country i, and z_k is the productivity of firm k. Firm k's productivity in sector s and country i, z_k, is drawn from a Pareto distribution with scale parameter x_s^i and shape parameter ζ_s^i. The implied marginal and unit cost of firm k is given by

$$c_k = \frac{1}{z_k}(w^i)^{\eta_s^i}(P_0^i)^{(1-\eta_s^i)} = \frac{1}{z_k}(\alpha^i)^{\eta_s^i},$$

where the last step follows from our choice of the outside good as *numéraire* and the resulting wage rate of $w^i = \alpha^i$.

There are initially N_s^i potentially active manufacturing firms in sector s and country i. We solve the Cournot competition game with linear demand in the Online Appendix. With the equilibrium price and number of firms at hand, we can compute the theoretical moments

---

[13]Note that our conflict statistic, ρ^{j*}, depends on prices and trade costs only. While the former are in principle observable, the latter are not. This is because we require a wide definition of trade costs which includes any factor making selling abroad more costly than at home. Backing out trade costs as a residual from a theoretical model is the preferred way of doing this in the trade literature (e.g., Anderson and van Wincoop, (2004)). When we vary trade costs, we also need to compute counterfactual price changes which will depend on all model parameters, requiring a full-scale calibration in the first place.

of interest which will be matched to our data (see below).

4.2 Calibration

Parameters to be Calibrated. We calibrate our model by matching key features of U.S. and Canadian data at the industry level. From now on, we relabel country 1 as the U.S. and country 2 as Canada. We calibrate our model separately for each sector. The calibration requires, for each sector, parameter values for a^{US} and a^{CAN} (the intercepts of the inverse demand functions), b^{US} and b^{CAN} (the slopes of the inverse demand functions), N^{US} and N^{CAN} (the numbers of potentially active firms), $\tau^{US,CAN}$ and $\tau^{CAN,US}$ (the trade costs), x^{US} and x^{CAN} (the scale parameters of the productivity distributions), ζ^{US} and ζ^{CAN} (the shape parameters of the productivity distributions), and η^{US} and η^{CAN} (the labor shares). We also require parameter values for α^{US} and α^{CAN} (the productivities of the outside sectors).

We choose units of the numéraire so that $\alpha^{US} = 1$, and set α^{CAN} equal to the ratio of Canadian to U.S. wages in the data. Consistent with our Cobb-Douglas specification of firms' production functions and our assumption of perfectly competitive labor and outside good markets, η^{US} and η^{CAN} are set equal to the ratio of the wage bill to total costs in each sector. In every sector, we set a^{US} equal to 25, which also amounts to a choice of units.

We set N^{US} and N^{CAN} equal to the number of firms in each sector which we observe in the data. Note, however, that not all of these firms will end up being active due to homogeneous-goods Cournot competition with heterogeneous firms.[14] In Section 4.4, we address this issue in two extensions. First, we introduce a competitive fringe of price-taking firms which co-exist with a small number of oligopolists. Second, we analyze a differentiated-goods Bertrand model where, due to CES demand, all firms remain active.

We are left with a nine-dimensional vector of parameters to calibrate in every sector:

$$\Gamma = \left(a^{CAN}, b^{US}, b^{CAN}, \tau^{US,CAN}, \tau^{CAN,US}, x^{US}, x^{CAN}, \zeta^{US}, \zeta^{CAN}\right).$$

The value of Γ is chosen so as to match the following nine empirical moments in each sector: the ratio of U.S. to Canadian prices, domestic sales, the value of U.S. and Canadian bilateral exports, production-based Herfindahl-Hirschman concentration indices (HHI), and total costs in both countries. Note that the number of elements in Γ equals the number of empirical moments, so that the parameters are exactly identified.

---

[14]In the real world, most firms are likely to have little market power. To generate this in a homogeneous-goods Cournot model would require having little dispersion in productivity, and many firms having marginal costs just below the equilibrium market price.

Table 1: Empirical Moments - Summary Statistics

Empirical Moment	Mean	Median	Standard Deviation	Minimum	Maximum
# M&As US	2.18	1.09	4	0	25.55
# M&As CAN	0.16	0.06	0.26	0	1.73
P^{CAN}/P^{US}	1.07	1.11	0.15	0.73	1.59
Shipments US	22205621	12473479	31082770	979709	2.18E+08
Shipments CAN	1593020	877455	2541084	23255	19169792
Exports US	527450	201771	1065915	2317	10007335
Exports CAN	758595	190372	2631997	104	31126106
HHI US	601	417	561	19	2758
HHI CAN	1281	859	1184	77	6204
Total Cost	16132940	9140820	23804465	664830	1.76E+08
Total Cost	1784190	854798	3628505	40338	36910822
Observations	160	160	160	160	160

All data are at the 5-digit NAICS level for the year 2002. All value entries (shipments, exports, costs) are in 000s of current USD.

Data Sources. Data on U.S. and Canadian industry-level sales, total costs, labor cost shares, number of firms and Herfindahl indices are from the U.S. Census Bureau and Statistics Canada. Data on bilateral trade between the U.S. and Canada are from the NBER website (see Feenstra, Romalis and Schott (2002)), and relative prices are constructed from purchasing power parity data from Inklaar and Timmer (2014). Throughout, we work at the five-digit level of the North American Industry Classification System (NAICS) which is the most disaggregated level at which Canadian and U.S. industry definitions are identical. This yields a total of 160 manufacturing industries in the year 2002 for which we have data for all required variables. Appendix A provides more details on the construction of our dataset.

Table 1 shows descriptive statistics for our empirical moments. On average, U.S. industries are over ten times larger in terms of total sales. They are also significantly less concentrated in terms of production, as can be seen from the average HHIs (1281 in Canada vs. 601 in the U.S.). In the average sector, the Canadian prices are 7% higher than U.S. prices (11% in the median sector). Finally, we note that, in 2002, Canada ran a substantial trade surplus in manufactured goods with the U.S.

Calibration Algorithm and Identification. We approximate our theoretical moments using Monte Carlo integration. For a given vector of parameter values Γ, we draw R realizations of the productivity vectors, where $R = 1000$. For each realization, we compute the model's equilibrium and calculate our nine theoretical moments. We take the simple averages of each theoretical moment across the R realizations and compare it to the corresponding

empirical moments. We iterate over parameter values Γ using standard derivative-based methods until we achieve a perfect fit.

Each of our empirical moments has a natural parameter counterpart which allows a straightforward illustration of how the parameters in Γ are identified. Parameter a^{CAN} governs the price elasticity of demand in Canada, which pins down the ratio of Canadian to U.S. prices, P^{CAN}/P^{US}. The ratio of country i's imports (Export^{ji}) to country i's domestic sales (Sales^i) is monotonically decreasing in τ^{ji}, and Export^{ji} and Sales^i are both proportional to $1/b^i$. This pins down b^i and τ^{ji}. The Herfindahl-Hirschman indices we are targeting are based on the value of production of domestic firms destined for both the domestic and foreign export markets (rather than on the sales by domestic firms and foreign exporters in the domestic market). Thus, ζ^i has a strong and positive impact on country i's HHI, and a much weaker one on country j's HHI. Total costs in country i are pinned down by x^i.

Goodness-of-Fit and Parameter Values. Figure 1 plots the model fit for our nine targeted moments in all 160 sectors. As can be seen graphically, we match our empirical moments almost perfectly in all sectors. As a cross-validation check, Figure 2 plots the model fit for six moments that were not directly targeted in the calibration: the 4-, 8- and 20-firm concentration ratios in both countries. Our calibrated model does a reasonably good job at predicting these moments as well.
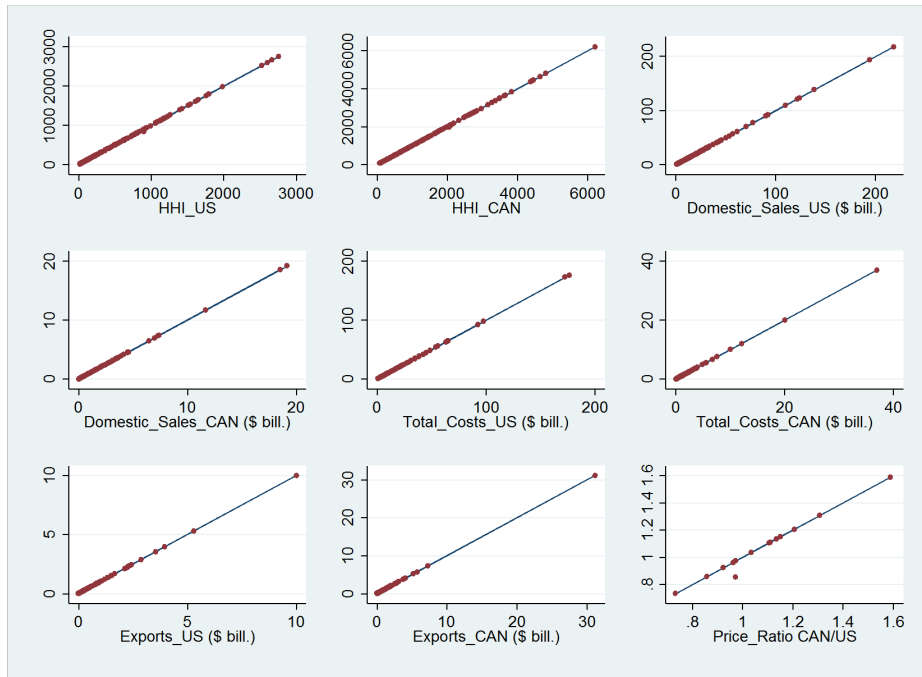
Panel A of Table 2 reports summary statistics on the parameters we take directly from the data. The U.S. is about one third more productive than Canada in the outside sector, and the average manufacturing sector in the U.S. has about six times as many firms as in Canada.

Panel B of Table 2 reports summary statistics on the calibrated parameters. Trade costs (τ) from the U.S. to Canada are about 5% higher than trade costs from Canada to the U.S. in both the average and the median sector. This is driven by the fact that the U.S. was running a trade deficit with Canada in 2002.[15] In the median sector, a^{CAN} is very close to a^{US}, meaning that demand elasticities in the U.S. and Canada are quite similar.[16] In

---

[15] While the τ's are larger than one in most sectors, there are a few sectors in which they are smaller than one, which seems to be at odds with the conventional interpretation of iceberg trade costs. One possible explanation is that, in a given sector, products sold in the U.S. market are not the same as those sold in the Canadian market. This could explain why it could be cheaper for a U.S. firm to serve the Canadian market than its own domestic market. One could also imagine that, in some sectors, a significant fraction of the U.S. industry is located close to the Canadian border. When this is the case, it can be more costly for a U.S. firm to supply the average American consumer than it is to supply the average Canadian consumer.
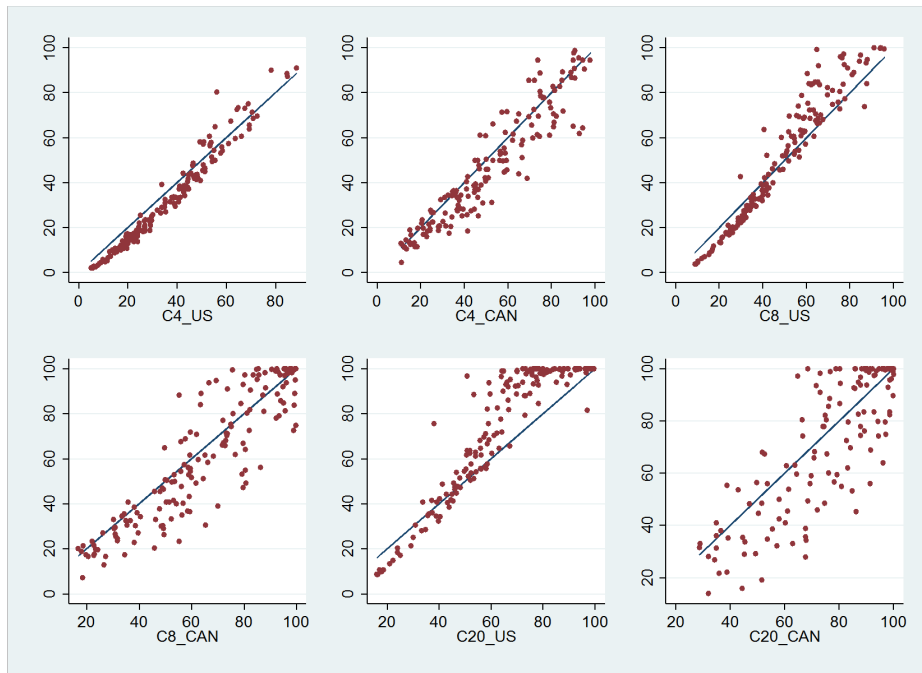
[16] Things appear to be different in the average sector, where a^{CAN} is almost three times as high as in the U.S. We interpret these findings as follows. As we discuss in Appendix A, Canadian prices are higher than U.S. prices in the average and median sectors. Part of the reason for this is that Canada has fewer firms

Figure 1: Theoretical vs. Empirical Moments (targeted moments)

Figures plot theoretical moments (vertical axis) against empirical moments (horizontal axis). Each dot represents a sector. The straight line is the 45-degree line.

Figure 2: Theoretical vs. Empirical Moments (moments not targeted)

Figures plot theoretical moments (vertical axis) against empirical moments (horizontal axis). Each dot represents a sector. The straight line is the 45-degree line.

Table 2: Parameter Values - Summary Statistics (Calibration without Mergers)

A) Parameters from Data	Mean	Median	Standard Deviation	Minimum	Maximum
α^{US}	1	1	1	1	1
α^{CAN}	0.750	0.750	0.750	0.750	0.750
N^{US}	1605.825	705	3147.181	21	32805
N^{CAN}	269.788	131.5	423.494	10	3840
η^{US}	0.288	0.277	0.099	0.034	0.530
η^{CAN}	0.260	0.259	0.096	0.017	0.488
B) Calibrated Parameters	Mean	Median	Standard Deviation	Minimum	Maximum
a^{US}	25	25	0	25	25
a^{CAN}	69.279	23.699	122.487	1.585	777.076
$1/b^{US}$	18490.71	6343.944	46070.99	219.206	458266.6
$1/b^{CAN}$	4992.182	475.525	28828.76	3.668	351190.9
$\tau^{CAN,US}$	1.758	1.453	1.149	0.843	12.804
$\tau^{US,CAN}$	1.854	1.506	1.341	0.04	8.564
ζ^{US}	5.414	4.987	2.958	0.488	25.24
ζ^{CAN}	11.585	8.328	9.545	2.445	70.784
x^{US}	0.376	0.183	0.635	0	3.8
x^{CAN}	0.488	0.27	0.699	0.037	4.775
Observations	160	160	160	160	160

We compute all parameters reported in the Table separately for each 5-digit NAICS industry. The Table reports summary statistics calculated across all industries.

the median sector, $1/b^{US}$ is about 13 times higher than $1/b^{CAN}$, which, if we interpret $1/b$ as a market size parameter, is roughly consistent with the ratio of median U.S. to median Canadian industry sales (see Table 1).[17,18]

than the U.S., which suffices to rationalize the U.S.-Canada price ratio in the median sector. However, in a significant number of sectors, this price ratio is so high that differences in numbers of firms alone do not suffice, and the model needs to make Canadian consumers much less price-elastic than U.S. ones. This seems to be driving the average a^{CAN}.

[17]Again, things look different in the average sector, where the gap between $1/b^{US}$ and $1/b^{CAN}$ shrinks significantly, but one should keep in mind that it is more difficult to think of $1/b$ as a market size parameter when the a's are allowed to vary (recall that $a^{CAN} \simeq a^{US}$ in the median sector but $a^{CAN} >> a^{US}$ in the average sector).

[18]We obtain that $x^{US} < x^{CAN}$ in the average and median sectors. At the same time, there is more dispersion in productivity in the U.S. than in Canada ($\zeta^{US} < \zeta^{CAN}$). This result is driven by the fact that the U.S. has many more firms, which, for a given level of productivity dispersion, should imply much lower U.S. HHIs. While U.S. HHIs are indeed lower than Canadian ones in our data, the model still requires more productivity dispersion in the U.S. in order not to underpredict U.S. HHIs.

4.3   Counterfactual Experiments

Using our calibrated model, we now compute our conflict statistics ρ^{US} and ρ^{CAN} to look at which types of conflicts are most frequent, both at current trade costs (i.e., at our calibrated values for $\tau^{US,CAN}$ and $\tau^{CAN,US}$) and at higher and lower levels of trade costs. Figures 3 and 4 show how ρ^{US} and ρ^{CAN} change as trade costs vary. We consider uniform percentage changes in both $\tau^{US,CAN}$ and $\tau^{CAN,US}$ by multiplying the originally calibrated τ's by the same factor in all sectors. We recompute the model equilibrium with the new trade cost parameters but keep all other calibrated parameters constant. This leads to new equilibrium prices (P^{US}, P^{CAN}) which we use to compute ρ^{US} and ρ^{CAN} for each sector. Figure 3 plots percentiles of the distribution of ρ^{US} across sectors for different percentage trade cost changes, and Figure 4 does the same for ρ^{CAN}.

At the original level of trade costs (0% change), U.S. merger policy is too tough on Canada in the majority of sectors. However, in a significant minority of sectors (around 20%) we have $\rho^{US} < 1$, meaning that U.S. merger policy is too lenient. As Figure 4 shows, the situation is different in Canada. There are no sectors in which Canadian policy is too lenient according to our potential conflict statistic (ρ). Instead, Canada is always too tough on its own domestic mergers from the point of view of U.S. consumers. The intuition behind this difference is straightforward. The U.S. market is more competitive than the Canadian market, which is reflected in a lower relative price P^{US}/P^{CAN}. Even though iceberg trade costs are larger than one on average and in the vast majority of sectors, this sometimes leads to $\rho^{US} < 1$. By contrast, both $\tau^{CAN,US}$ and P^{CAN}/P^{US} are usually larger than unity, leading to $\rho^{CAN} > 1$ in all sectors in our data.

As implied by Proposition 2, the quantiles of ρ^{US} and ρ^{CAN} are increasing in trade costs. In addition, we find that for trade cost reductions of 30% or more, ρ^{US} and ρ^{CAN} decrease below one in the median sector, meaning that conflict of the too-lenient-for-thy-neighbor type becomes the most prevalent form of conflict.

4.4   Robustness Checks

We now present a number of robustness checks which investigate how sensitive our findings are to changes in the data and modeling frameworks used. For conciseness, we only provide a brief discussion in this section and refer the reader to the Online Appendix for additional details.

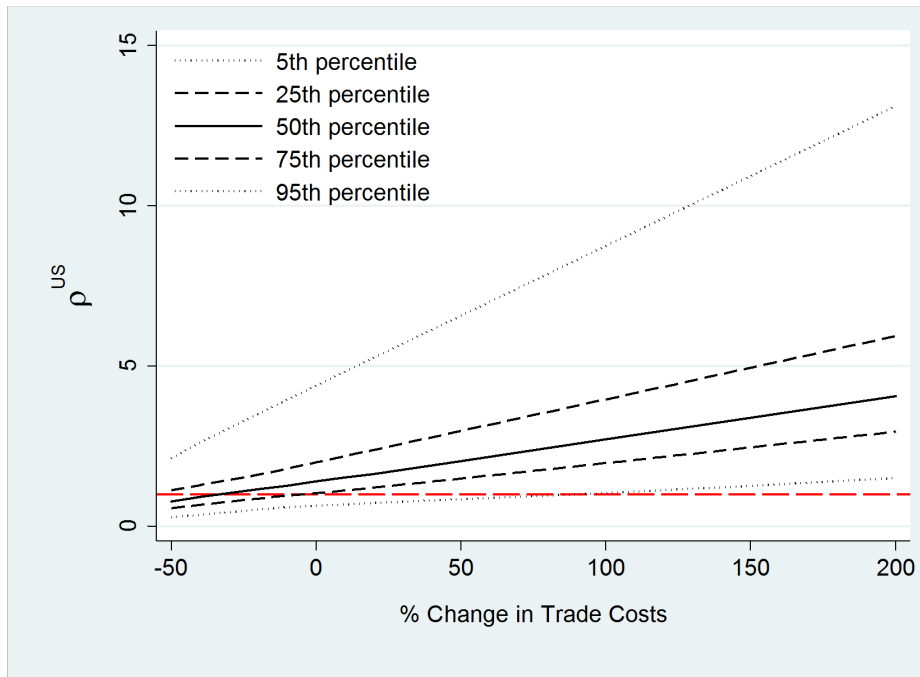Figure 3: Potential Conflicts Arising from U.S. Mergers

Figure shows percentiles of the distribution of ρ^{US} across sectors for different trade cost changes.

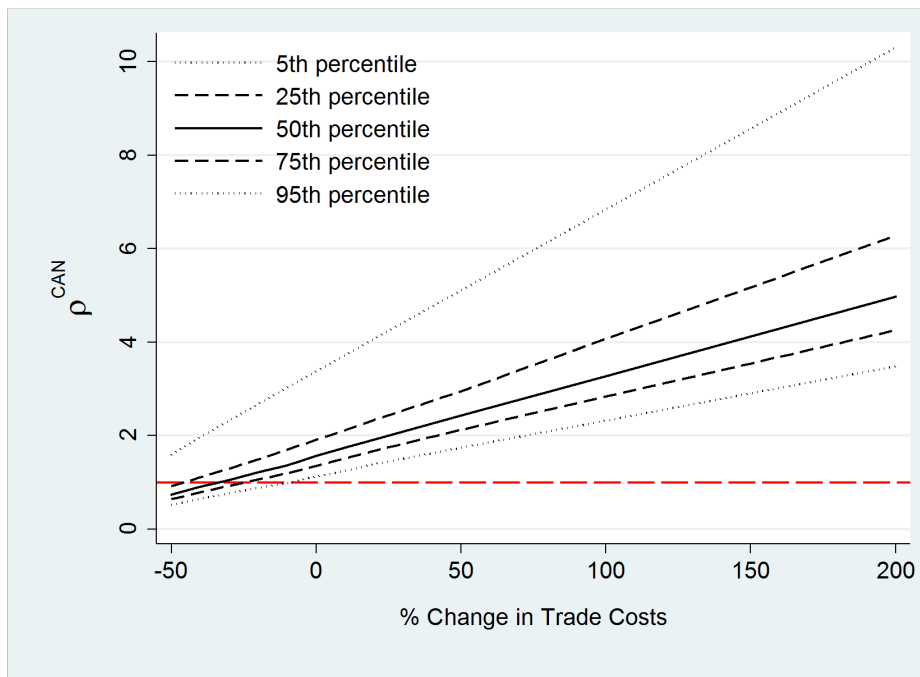Figure 4: Potential Conflicts Arising from Canadian Mergers

Figure shows percentiles of the distribution of ρ^{CAN} across sectors for different trade cost changes.

Unit-Value-Based Relative Price Data. As a first robustness check, we compute relative prices using unit values constructed from our sector-level trade data. While unit values tend to be imprecisely measured and sometimes result in implausibly large price differences between the U.S. and Canada, they have the advantage of allowing the computation of relative prices at a finer level of aggregation than the PPP data (see Appendix A for details). Using unit-value-based relative price data leads to more dispersion in relative prices and slightly changes parameter values. However, the calibrated levels of trade costs are very similar to before and the U.S. continues to be the more competitive market in the sense of having a lower price. Our conflict statistics, ρ^{US} and ρ^{CAN}, are also very similar to before, both at the current level and at lower and higher values of trade costs.[19]

Competitive Fringe. For our second robustness check, we explicitly model a competitive fringe. We assume that out of the total N domestic firms in each sector, N_o behave oligopolistically whereas the remaining $N - N_o$ firms belong to a competitive fringe that takes the market price as given. In the absence of detailed information about the likely number of oligopolists in each sector, we set N_o to the number of the largest firms which jointly account for 80% of total sectoral sales in the data. The parameter values for this competitive fringe extension are broadly similar to the baseline calibration and the evolution of our conflict statistics is almost identical to the one reported in Figures 3 and 4.[20]

CES-Differentiated Bertrand Competition. Our last robustness check undertakes a more substantial modification of our baseline model. We now work with a CES demand system and assume that firms produce differentiated products and compete *à la* Bertrand. We first show that Proposition 1 extends word for word to the case of price competition with CES demands if we replace P^{i*} and P^{j*} by the equilibrium CES price indices in countries i and j in the definition of conflict statistic ρ^{j*}. Next, we calibrate the model and show that, at current trade costs levels, ρ^{US} and ρ^{CAN} are larger than one in all sectors, which is consistent with the results obtained in the baseline. As trade costs decrease, some of the ρ's decrease below one, which indicates that domestic merger policies are likely to become too lenient for foreign consumers in a number of sectors.[21]

---

[19]See Online Appendix Tables G.1.1 and G.1.2, and Figures G.1.1–G.1.4.
[20]See Online Appendix Section C.
[21]See Online Appendix Section D.

5 Model Calibration with Mergers

We now extend our calibration by incorporating an endogenous merger formation process and an explicit modeling of the antitrust authorities' objective functions. This is done in the following way. We again start out with N_s^i potentially active manufacturing firms in sector s and country i. Firms are then allowed to merge, leading to a new market structure in each country. We compute our theoretical moments at the end of the merger process and compare them to the same empirical moments described above. In addition, we also keep track of the number of mergers taking place during the merger process and match them to the actual number of mergers observed in the data in a given sector (see below for details).

5.1 Merger Formation Process

We take a simple and tractable dynamic random matching approach to operationalize the merger formation process. In sector s, firms play a dynamic game with $T_s^1 + T_s^2 + 1$ periods, where $T_s^1 \geq 0$ and $T_s^2 \geq 0$ are parameters. Nature randomly and uniformly draws T_s^1 periods in $\{1, \ldots, T_s^1 + T_s^2\}$ in which country 1 will receive merger opportunities, and the complementary T_s^2 periods in $\{1, \ldots, T_s^1 + T_s^2\}$ in which country 2 will receive merger opportunities.[22] From now on, we drop sector subscripts for ease of notation.

Whenever two firms merge, the productivity of the merged entity becomes:

$$\overline{z}_M = \left(z_1^\delta + z_2^\delta \right)^{\frac{1}{\delta}}, \tag{1}$$

where parameter δ governs the strength of synergies. Note that $\overline{z}_M > \max(z_1, z_2)$ for any $\delta \in (0, \infty)$, and that $\overline{z}_M$ is decreasing in δ. In the limit as $\delta \to \infty$, we have $\overline{z}_M = \max(z_1, z_2)$, which corresponds to the case of no synergies in the sense of Farrell and Shapiro (1990).[23] In the following, we assume that synergies are random and merger-specific, i.e., the δ associated with a merger between firms k and l is drawn from a log-normal distribution with mean

---

[22]We view T^1 and T^2 as parameters capturing frictions in the market for firm ownership. A low T^i means that these frictions are strong, so that few mergers are feasible. Conversely, a high T^i means that almost every merger is feasible, albeit not necessarily profitable or approvable. To improve the model's fit to the data, it is useful to allow T^1 and T^2 to take non-integer values. This is done as follows: the number of merger opportunities received by country i is equal to the integer part of T^i plus a Bernoulli random variable, which takes value 1 with a probability equal to the fractional part of T^i. These random variables are realized in period 0, before the game starts.

[23]Also note the following two properties of $\overline{z}_M$. For a merger between two symmetric firms with pre-merger productivity z, equation (1) implies that the merger-induced fractional change in productivity is independent of z. Moreover, a mean-preserving spread of the merger partners' pre-merger productivities induces a larger post-merger productivity: for $\Delta > 0$, $((z + \Delta)^\delta + (z - \Delta)^\delta)^{1/\delta}$ is increasing in Δ.

parameter $\ln(\beta_s^i) - \frac{1}{2}$ and variance parameter 1, where β_s^i is a parameter of the model.

Now consider period $t \in \{1, \ldots, T^1 + T^2\}$, and suppose country i receives a merger opportunity in this period. The timing within period t is as follows. 1) Nature randomly and uniformly draws two merger partners in country i: the acquirer and the target. Nature also draws a synergy parameter δ for this merger. 2) The acquirer can make a take-it-or-leave-it offer to the target. 3) If an offer has been made, then the target accepts or rejects it. 4) If a merger proposal has been made and accepted, then the antitrust authority in the country where the merger is proposed decides whether to approve it. 5) Firms decide whether to stay in the industry. If a firm exits, then it receives a positive but arbitrarily small scrap value. 6) Firms compete in quantities in both manufacturing markets.

Period $t = 0$ is special in that no country receives a merger opportunity in that period. This allows us to accommodate sectors in which there are no mergers. The timing within period 0 is the same as within period $t > 0$, except that sub-stages 1 through 4 are dropped.

We assume that all players have discount factors equal to zero. This means that firms evaluate the profitability of mergers and make their exit decisions given the current market structure. This assumption is necessary to make our approach tractable, given the potentially large numbers of firms and periods we have to deal with. In conjunction with our earlier assumptions, it implies that only those mergers will be proposed to the antitrust authority where the profit of the merged entity at the current post-merger market structure is strictly larger than the sum of the pre-merger profits of the merger partners. Similarly, due to the strictly positive scrap value, firms that do not produce in the current period will exit the market, ensuring that mergers will take place only between active firms (which is what we observe in our data).

We also need to take a stance on the merger authorities' objective functions. While the U.S., the EU and most other important jurisdictions have adopted something close to a consumer surplus standard in merger control, Canada has long been thought as having adopted a total surplus standard. However, in the last twenty years or so, the Canadian merger authority has been pushed towards putting a greater weight on consumer surplus: "As a result of [...] extensive litigation, it appears that the total surplus standard no longer serves as the basis for merger evaluation in Canada" (Gifford and Kudrle (2005)). For simplicity, we assume here that both the U.S. and Canadian authorities have a consumer surplus standard. In conjunction with the impatience assumption, this implies that antitrust authorities follow a simple rule, whereby they block a merger if and only if this merger lowers domestic consumer

surplus given the current market structure.[24] Under these assumptions, it is straightforward to show that our merger game has a unique subgame-perfect equilibrium. Given equilibrium strategies, we compute our theoretical moments at the end of stage $T^1 + T^2 + 1$.

5.2 Calibration Procedure and Results

Introducing a merger formation process into our calibration necessitates a number of changes. First, we now also have to calibrate T^1 and T^2. We choose T^1 and T^2 such that the number of mergers taking place during the merger formation process equals the actual average annual number of mergers in each sector over the period 1993-2002.[25] Second, we need to take a stance on the strength of synergies as captured by the β-parameters. In the absence of reliable estimates for a broad range of industries, we simply set β^{US} and β^{CAN} equal to 50 in all sectors. As we show below, these parameter values (along with the other calibrated parameters we obtain) imply that, on average, an approved merger reduces the marginal costs of the merging parties by about 7% in the median sector.[26] Finally, we now calculate the theoretical moments at the end of the merger game, which means that the calibrated values of our other parameters will also change.

The fit of the new calibration remains very good.[27] There are only four out of 160 sectors in which we are unable to match merger activity in the data. We drop these sectors in the following although the results are similar if we include them.[28]

For each sector, the augmented calibration procedure also yields average price and marginal cost reductions induced by mergers during the merger formation process. Tables 3 and 4 show summary statistics on the distribution across sectors of these price and costs effects. For each sector, we calculate average price and marginal cost reductions as follows. Using our calibrated parameter values, we recompute the model's equilibrium R times (where R is the number of iterations used in our Monte Carlo integration). For each iteration, we observe a number of mergers of which each will entail marginal cost reductions as well as price changes

---

[24]Given the current legal frameworks in most countries, it would be difficult for an antitrust authority to clear (or block) a merger on the grounds that this merger is likely to lead to more (or fewer) mergers in the future.

[25]The source of our merger data is Thomson SDC Platinum. See Appendix A for details.

[26]Below, we present robustness checks assuming different values for β.

[27]See Online Appendix Figures G.4.1 and G.4.2 which replicate Figures 1 and 2, augmented with plots for predicted and actual merger activity.

[28]Table G.4.2 in the Online Appendix shows the new parameter values for the remaining 156 sectors. The estimates of our parameters already present in the first calibration are broadly similar to before, so we do not comment on these further. Regarding our new merger opportunities parameters, we find that T^{US} is significantly higher than T^{CAN} in the median and average sectors. This is consistent with the fact that the number of domestic U.S. mergers is over ten times as high as in Canada in the data (see Table 1).

Table 3: Simulated Domestic and Cross-Border Price Effects of Mergers

Price Effect	Mean	Median	Standard Deviation	Minimum	Maximum
US merger, US price	-0.11%	-0.06%	0.12%	-0.78%	0.00%
US merger, CAN price	-0.03%	-0.01%	0.09%	-0.77%	0.32%
CAN merger, CAN price	-0.14%	-0.07%	0.18%	-1.00%	0.00%
CAN merger, US price	-0.08%	-0.01%	0.22%	-1.74%	0.00%

We compute the domestic and cross-border price effects of mergers separately for each 5-digit industry. The Table reports summary statistics calculated across all industries. Industries without merger opportunities are dropped.

Table 4: Synergy Effects

MC Reduction	Mean	Median	Standard Deviation	Minimum	Maximum
US mergers	-7.1%	-6.8%	2.8%	-19.6%	-1.8%
Canadian mergers	-11.1%	-7.2%	9.6%	-52.2%	-3.5%

We compute the synergy effects of mergers separately for each 5-digit industry. The Table reports summary statistics calculated across all industries. Industries without merger opportunities are dropped.

in the domestic and/or the foreign market. We compute marginal cost reductions (synergies) as the percentage decline in marginal costs of the merged entity as compared to the most efficient of the two merging firms.[29] We compute the average cost and price reductions over all mergers for a given iteration, and then take the mean of these averages across all R iterations.

As seen in Table 3, mergers have larger effects on domestic prices than on foreign prices in both the mean and the median sector. There is also a large degree of heterogeneity in terms of the magnitude of effects, with price reductions reaching from 0% to close to -2% in a few sectors. Because each country has a veto right over domestic mergers, domestic price effects are all non-positive by construction. While cross-border price effects are also negative on average, U.S. mergers lead to price increases in a few Canadian sectors. Table 4 shows that the average cost reductions implied by mergers is around 7% in the median sectors in both countries (9% in the average sector). While we are not aware of comparable estimates of synergies in the literature, cost reductions of this magnitude do not seem unreasonably large.

---

[29]This is consistent with the notion of synergies in Farrell and Shapiro (1990).

5.3 Counterfactual Policy Regimes

Trade Costs and the Scope for Conflicts. The evolution of our conflict statistics with changes in trade cost is nearly identical to that shown earlier in Figures 3 and 4.[30] As before, these results inform us only about the *potential* for conflicts. For a given realization of synergies, no merger might fall in the zone between $\hat{c}_M^{US}$ and $\hat{c}_M^{CAN}$, so that no *actual* conflict may arise. The new calibration now also allows us to look at *actual* conflicts, i.e., the fraction of profitable mergers for which the two antitrust authorities reach conflicting decisions, as shown in Figures 5 and 6.

These figures show that actual conflicts track potential conflicts closely. Again, the dominant conflict is that merger authorities block too many domestic mergers from the point of view of foreign consumers.[31] At the present level of trade cost, there are no merger opportunities for which the Canadian authorities are too lenient and only a minority of cases (14% of all profitable merger opportunities) where the U.S. authorities approve mergers leading to consumer surplus losses in Canada. As trade costs fall, changes in actual conflict patterns again closely resemble changes in potential conflict patterns, with anti-competitive effects of foreign mergers becoming the most important source of conflict at trade cost declines of about 30%.

Introducing Veto Rights. One possible way of eliminating too-lenient-for-thy-neighbor policies involves granting veto rights over foreign mergers. Each country can only benefit from having such veto rights. However, the effects from the introduction of bilateral veto rights are, in general, ambiguous. On the one hand, country i benefits from its antitrust authority being able to block CS-decreasing mergers taking place among country-j firms. On the other hand, however, country i suffers from the antitrust authority in country j being able to block CS-increasing mergers among country-i firms.

We use our augmented calibration to quantify the costs and benefits for consumers of granting such bilateral veto rights. To do this, we modify stage 4 in the merger game by assuming that a proposed merger must receive approval from both the U.S. *and* Canadian authorities.[32] As before, we compute the model's equilibrium after the merger game, using

---

[30]See Online Appendix Figures G.4.3 and G.4.4.

[31]Note that the fact that a merger is blocked by a merger authority in our model does not necessarily imply that we would observe the same merger getting blocked in the real world. If the merging parties are reasonably confident that their merger will not be allowed to go through by competition authorities, then they will simply not propose it in the first place.

[32]Under veto rights, we assume that the domestic antitrust authority makes its approval decision before the foreign one. Sequentiality eliminates undesirable equilibria which rely on a coordination problem between antitrust authorities. Under simultaneous timing, there always exists an equilibrium in which country i

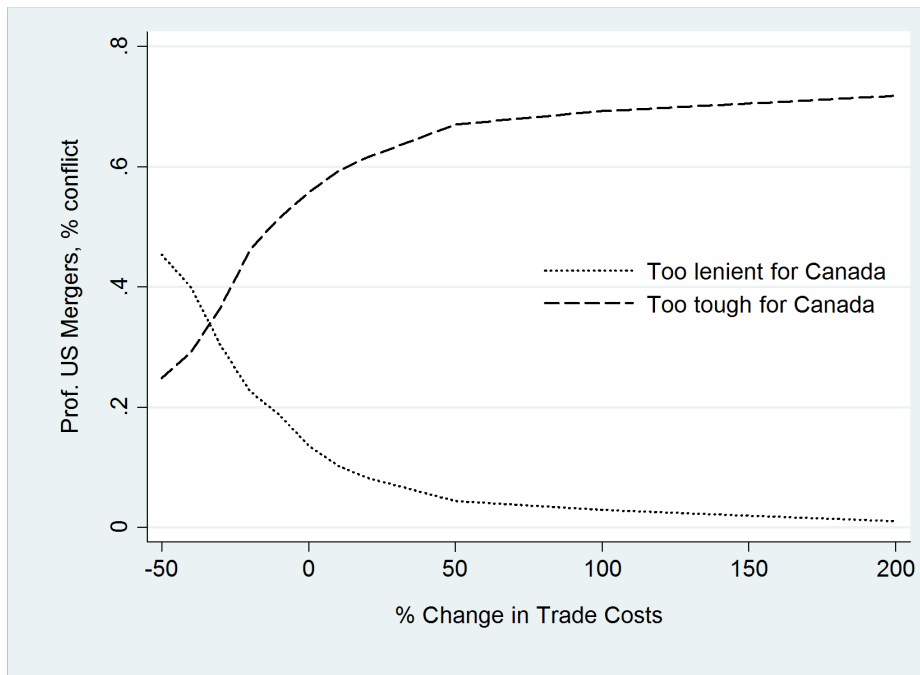Figure 5: Actual Conflicts, % of all profitable merger opportunities (U.S. mergers)

Figure shows means across sectors of the fraction of profitable mergers where a conflict arose. "Too lenient for Canada" means that the U.S. authorized a merger which lowered consumer surplus in Canada; "Too tough for Canada" means that the U.S. blocked a merger which would have increased Canadian consumer surplus. If there are no merger opportunities in a sector, the sector is dropped.

Figure 6: Actual Conflicts, % of all profitable merger opportunities (Canadian mergers)
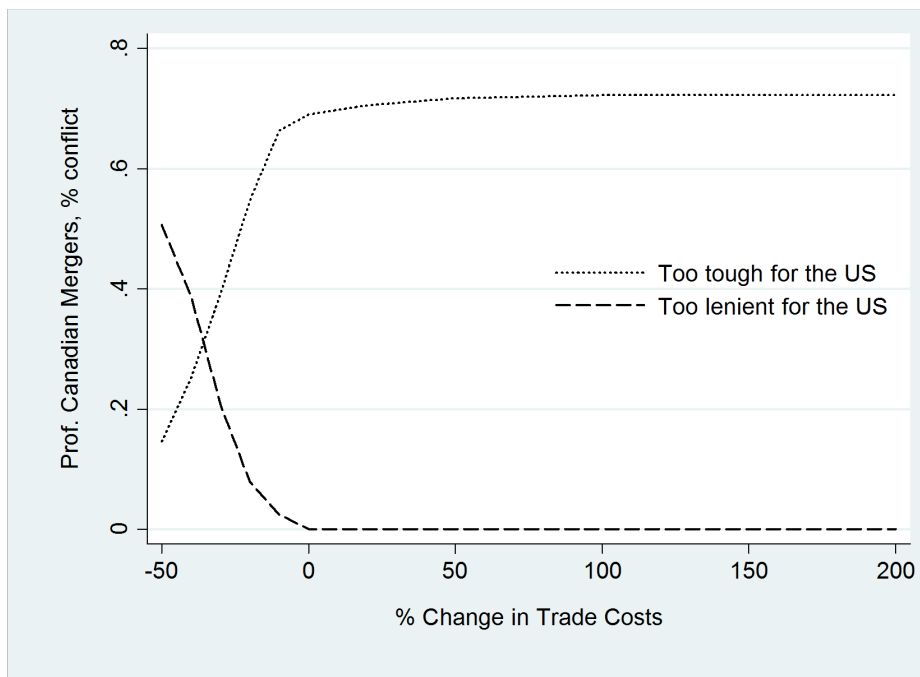

Figure shows means across sectors of the fraction of profitable mergers where a conflict arose. "Too lenient for the U.S." means that Canada authorized a merger which lowered consumer surplus in the U.S.; "Too tough for the U.S." means that Canada blocked a merger which would have increased U.S. consumer surplus. If there are no merger opportunities in a sector, the sector is dropped.

Table 5: Introducing Veto Rights

Change in Outcome (000s USD)	Mean	Median	Standard Deviation	Minimum	Maximum
Total Consumer Surplus US+Canada	-1486.5	0	8505.5	-75872.5	185
Consumer Surplus US	-1618.7	0	9221	-80714.2	163.4
Consumer Surplus Canada	132.3	0	746.2	0	5788.2

We compute the consumer surplus effects of introducing veto rights separately for each 5-digit industry. The Table reports summary statistics calculated across all industries.

the parameter values from our calibration with mergers described above.[33]

Table 5 shows that, at the present level of trade costs, the introduction of bilateral veto rights reduces consumer surplus in the U.S. by USD 1.6 million in the average sector, and slightly increases Canadian consumer surplus, resulting in a reduction in total North American consumer surplus of USD 230 million across all 156 manufacturing sectors. In the median sector, this policy change has no effect on consumer surplus in either country. These findings are in line with our previous results. At the present level of trade costs, merger policy in Canada is of the too-tough-for-thy-neighbor type in all sectors, implying that U.S. consumers can only lose from the introduction of bilateral veto rights.[34] Moreover, merger policy in the U.S. is of the too-lenient-for-thy-neighbor type in a minority of sectors, implying that Canadian consumers in those sectors, and only in those sectors, benefit from their authority being able to block U.S. mergers.

Next, we explore how the effects on Canadian, U.S. and total North-American consumer surplus from the introduction of bilateral veto rights change with trade costs. As Figure 7 shows, as trade costs fall from current levels, Canadian consumers gain increasingly while the effects on U.S. consumers are non-monotonic. To understand these findings, recall that as trade costs fall, conflicts increasingly turn into the too-lenient-for-thy-neighbor type, implying that countries tend to gain more from being able to block foreign mergers. This is exactly what is happening for Canada, which remains the less competitive market and thus has more

blocks a CS-increasing merger because it expects country j to block it, and vice versa. It does not matter who moves first: we could assume that the foreign antitrust authority makes its decision before the domestic one, or that the first mover is drawn randomly, and obtain the same results.

[33]Note that we reset the seed values of our random number generator ahead of each counterfactual, so that we obtain the same realizations of all random variables.

[34]There are three sectors in which U.S. consumer surplus increases slightly which might seem puzzling at first. The explanation is that the introduction of bilateral veto rights prevents some U.S. mergers from taking place which would have increased prices in Canada. As a consequence of the lower equilibrium price, additional mergers can now take place in Canada which increase consumer surplus in both Canada and the United States. The consumer surplus effects of these additional mergers overcompensate the negative effects on the U.S. of the merger initially blocked by Canada.

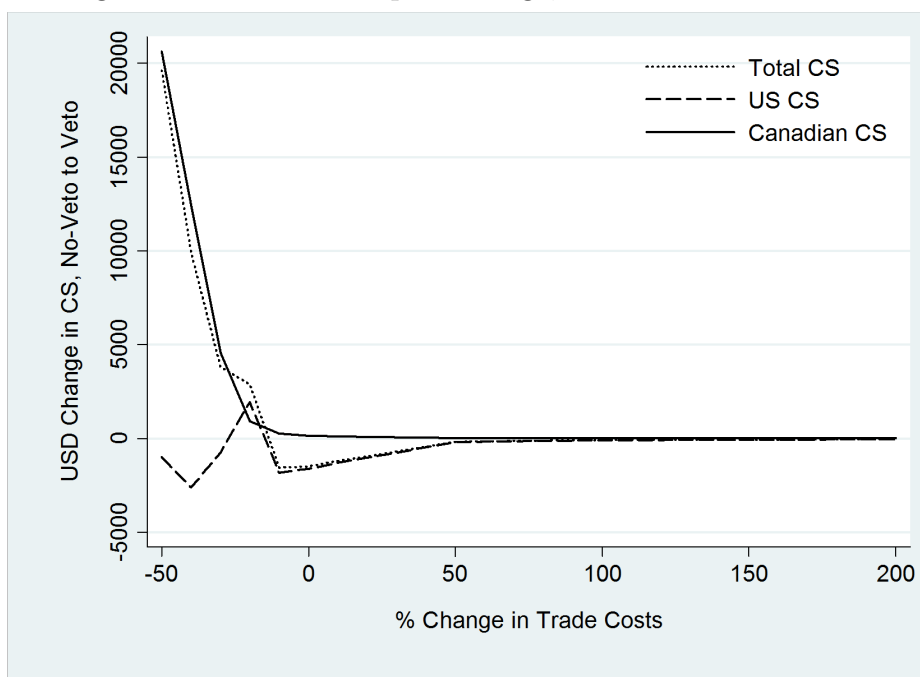Figure 7: Consumer surplus change, No-Veto to Veto Case

Figure shows the mean USD change in consumer surplus (in 000s of USD) induced by a move from no-veto rights to veto rights for different levels of trade cost changes.

to gain from the introduction of bilateral veto rights than the U.S. The flip side of Canada remaining the less competitive market is, however, that it blocks many U.S. mergers that would have benefited U.S. consumers. The interaction of these countervailing effects results in the non-monotonic impact in the U.S.

For trade cost reductions of 50%, the total Canadian consumer surplus gain from introducing bilateral veto rights increases to over USD 3 billion, while the total U.S. consumer surplus loss is less than USD 160 million. Overall, these results suggest that veto rights become more important as an "insurance" against price-increasing foreign mergers as trade costs fall, especially for smaller, less competitive countries.

Introducing a North-American Merger Authority An alternative way of coordinating merger policies involves the creation of a supra-national merger authority that blocks a merger if and only if it decreases the sum of U.S. and Canadian consumer surplus. Like bilateral veto rights, such a supra-national authority mitigates the problem of too-lenient-for-thy-neighbor policies. In contrast to bilateral veto rights, however, it also addresses the problem of too-tough-for-thy-neighbor policies. We use our augmented calibration to quantify the consumer surplus effects of such a North-American merger authority.

Table 6: North-American Competition Authority

Change in Outcome (000s USD)	Mean	Median	Standard Deviation	Minimum	Maximum
Total Consumer Surplus US+Canada	7043	11.6	39422.8	-14953.9	304897.9
Consumer Surplus US	7593.2	0	44433.4	-15664.1	363737.2
Consumer Surplus Canada	-550.3	2.4	5626.6	-58839.3	13790.6

We compute the consumer surplus effects of creating a North-American competition authority separately for each 5-digit industry. The Table reports summary statistics calculated across all industries.

As can be seen in Table 6, we find a large positive impact on aggregate North American consumer surplus of around USD one billion.[35] This overall gain comes at the expense of Canada which sees a total drop in consumer surplus of USD 86 million. To understand why, note that the total North American consumer surplus effects of a given merger tend to be dominated by changes in U.S. consumer surplus because of the substantial market size advantage of the U.S. Accordingly, the new antitrust authority bases its decision mainly on U.S. consumer surplus effects. This is detrimental to Canadian consumer surplus because Canadian merger policy was initially too tough on domestic mergers from the point of view of U.S. consumers. The new authority now authorizes a number of domestic Canadian mergers which increase North-American consumer surplus but were previously blocked by Canada because they would have increased prices there.

Figure 8 looks at the consumer surplus changes induced by a supra-national authority at different levels of trade costs. Recall that as trade costs fall from current levels, the dominant type of conflict changes and domestic merger authorities tend to become too lenient on domestic mergers. Because it maximizes total consumer surplus, a North American merger authority needs to address this too-lenient-for-thy-neighbor conflict. As we saw previously, it is now Canada which benefits more from its resolution. This explains why the consumer surplus change in Canada (compared to the baseline scenario of no veto rights) becomes increasingly positive and starts to resemble the one from the introduction of bilateral veto rights (see Figure 7). The same effects again have more ambiguous consequences for the U.S., where the gains from preventing CS-decreasing Canadian mergers are balanced by a decrease in CS-increasing domestic merger activity. However, even for large trade cost reductions

---

[35]There are a few sectors where total North American consumer surplus goes down. This is a consequence of the myopic behavior of the antitrust authority. By authorizing a number of U.S. mergers which increase total consumer surplus but lower consumer surplus in Canada, the joint authority changes the set of future permissible mergers in Canada, some of which would have increased North American consumer surplus. While such dynamic effects are usually dominated by the first-order effects of maximizing joint consumer surplus, there are a few sectors where the total consumer surplus change is negative.

Figure 8: Consumer surplus change, No-Veto to North-American Competition Authority
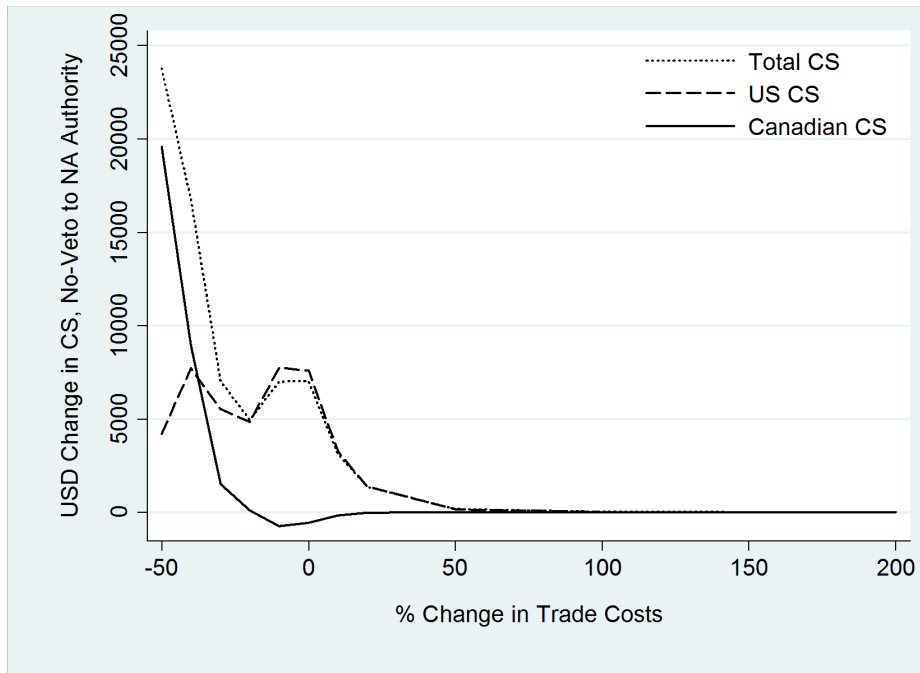

Figure shows the mean USD change in consumer surplus (in 000s of USD) induced by a move from the no-veto-rights case to a North-American merger authority for different trade cost changes.

there remains a substantial fraction of Canadian mergers on which the Canadian authority would be too tough (see Figure 6). The joint merger authority will continue to authorize some of these mergers, so that overall U.S. gains from its introduction remain positive.

These results demonstrate a couple of additional important results about the interconnection of trade and merger policy. First, the level of trade costs determines the predominant type of conflict arising from domestic mergers and thus the distribution of gains from the introduction of a supranational merger authority. Second, at least in our calibration, the overall gains for the larger country remain positive throughout but change signs for the smaller country. This raises the possibility that the political feasibility of merger policy coordination may depend crucially on the level of trade costs between countries and thus on trade policy. Only if trade costs are sufficiently low does it become worthwhile for the smaller country to agree to a merger approval standard aiming at maximizing joint consumer surplus.

5.4 Robustness Checks

In this section, we consider a number of additional robustness checks which are relevant for the calibration procedure with mergers, but not for our earlier baseline calibration without mergers. To preserve space, we again only briefly discuss our findings here and present more

detailed results in the Online Appendix.

Different Strength of Synergies. We start by varying the strength of merger-induced synergies, considering both stronger ($\beta = 30$) and weaker synergies ($\beta = 70$). In both cases, the fit of the calibration continues to be very good. Allowing for stronger synergies generates more mergers which are profitable and permitted by the antitrust authorities, resulting in lower values for the merger opportunity parameters T^{US} and T^{CAN}. Conversely, weakening the strength of synergies increases the calibrated values for T^{US} and T^{CAN} as more opportunities are needed to match the number of mergers observed in the data. This adjustment of T to the strength of synergies explains why our counterfactual policy changes lead to *stronger* quantitative consumer surplus effects as we increase β (weaker synergies). While each individual merger now has smaller consumer surplus effects, the change in the number of merger opportunities is now larger as we start from a higher base value for T. The latter effect overcompensates the former, leading to slightly stronger consumer surplus effects in the case of weaker synergies, and less pronounced consumer surplus effects in the case of stronger synergies. Qualitatively, however, all results are similar to before and our previous conclusions are not affected by varying the strength of synergies.[36]

Cross-Border Mergers. The second modification we consider is to allow for cross-border mergers in addition to domestic mergers. Cross-border mergers are not directly relevant for this paper's central question as by choice our interest is in the conflicts resulting from domestic mergers only. But given that cross-border mergers are an important feature of overall North American merger activity, incorporating them into our calibration might change parameter values and thus indirectly affect our results.[37]

We model cross-border mergers by introducing a third merger opportunity parameter (T^{Cross}). Initially, there are only domestic firms. A share $T^{Cross} / \left(T^{Cross} + T^{US} + T^{CAN} \right)$ of merger opportunities is now of the cross-border type, i.e., one of the merger partners is a U.S. firm while the other is a Canadian firm. A merger thus results in a multinational enterprise (MNE) with production facilities in both countries. This MNE chooses the location of production for serving each market such that the costs of doing so are minimized. This triggers changes in production and trade patterns compared to the baseline calibration with domestic mergers only, which in turn affects other parameter values. However, the resulting

---

[36]See Online Appendix Sections G.5 and G.6.

[37]Between 1993 and 2002, we observe an annual average of approximately 0.15 U.S.-Canada cross-border mergers per sector in our data, which is similar to the number of domestic Canadian mergers (see Appendix Table G.7.1).

changes are relatively minor and our counterfactual experiments lead to qualitatively similar results to before.[38]

Veto-Rights Baseline.   In our final robustness check, we start from an initial situation in which countries have veto rights over foreign mergers. That is, we match the same moments using the same set of parameters as before, but now we assume from the beginning that antitrust authorities have the power to block foreign mergers if they decrease consumer surplus in the authority's domestic market.

All of the results and all parameters values, except T^{US}, are very similar to the no-veto-rights baseline, as discussed in more detail in the Online Appendix. The one more substantial difference is that the overall effect of having a North-American merger authority on Canada is negative not only at present levels of trade costs but throughout the range of trade cost we analyze. While exactly the same forces are at work as before, Canada is now able to block all of the CS-decreasing U.S. mergers in the baseline. In the no-veto-rights baseline, the reason why Canada started to gain from a North-American merger authority was precisely because the joint authority addressed some of the too-lenient-for-thy-neighbor type conflict arising at lower trade costs. This source of gain for Canada is absent in the new veto-rights baseline.[39]

In conclusion, the forces at work in our model are robust to a different interpretation of the current legal regime concerning veto rights. Having said this, we think it unlikely that Canada has effective veto rights over U.S. mergers, casting doubt on the results driven by this assumption.[40]

6   Conclusion

Because of cross-border demand and supply linkages, merger approval decisions of national antitrust authorities have important externalities on other jurisdictions. To analyze the resulting conflicts of interest between merger authorities, we analyze a two-country model of international trade with oligopolistic competition. Within this model, we identify the conditions under which merger control based on a domestic consumer surplus standard is

---

[38]See Online Appendix Section E. We adjust T^{Cross} to match the number of cross-border mergers in the data. Note that the overall fit of the model deteriorates slightly, as we now have to match an additional moment. We now have to drop seven sectors (rather than four in the baseline calibration with mergers) for which we are unable to match our empirical moments.

[39]See Online Appendix Section F.

[40]In private correspondence with the Canadian competition authority, we were advised that no U.S. merger had been blocked by the Canadians over the past two decades, although remedies were imposed in a few cases.

too tough or too soft from the viewpoint of foreign consumers. We show that the type of conflict depends only on the value of an industry-level sufficient statistic which summarizes the relative competitiveness of the home and foreign markets, adjusting for trade costs. A key result is that, unless trade costs and market asymmetries happen to exactly offset each other, the interests of the national authorities are never fully aligned, so conflicts can be expected to be frequent.

To judge what type of conflict is most prevalent in practice, and to get an idea of the magnitude of the economic effects, we calibrate our model to match industry-level data for 160 U.S. and Canadian manufacturing sectors in the year 2002. We find that the majority of these conflicts are 'hidden', in the sense that they do not show in high-profile cases in which domestic authorities block foreign mergers. This is because, at current levels of trade costs, the main issue for the international coordination of merger policy is *not* that domestic authorities clear too many mergers from the point of view of foreign consumers. Rather, foreign consumers would like to see *more* mergers taking place abroad in the vast majority of sectors. This means that veto rights are a relatively inefficient tool when coordinating national merger policies. They cannot address the problem that domestic consumers mostly would like to see more, rather than fewer foreign mergers.[41] This issue can be resolved by the introduction of a supranational authority evaluating the global (or regional) consumer surplus effects of mergers. Given the likely asymmetric impact on the consumer surplus of different countries, however, this approach is unlikely to be acceptable to all participating countries.

This situation changes dramatically as trade costs decrease, however. For trade cost reductions which seem relatively small from a historical perspective (around 25-30%), conflicts arising from the consumer surplus decreasing effects of mergers taking place abroad become the dominant type of conflict. This clearly shows that merger and trade policy interact in an important sense. Further trade liberalization will make it more important for domestic authorities to exercise control over mergers taking place abroad. More optimistically, reductions of trade barriers might also make it easier to coordinate merger policy. As the role of a supranational merger authority increasingly becomes to address conflicts arising from domestic policies which are too lenient, the benefits of such coordination to smaller, less competitive economies increase, making agreement between countries more likely.

While our quantitative results are derived under specific assumptions regarding demand

---

[41]See Cabral (2005), however, for an analysis of how the problem may be solved in an infinitely repeated game in which each country has veto power over both domestic and foreign mergers but, in equilibrium, uses this only selectively.

and cost structures, our robustness checks make us confident that our findings will appear in a variety of different settings. What is important are differences in initial market structure and the presence of substantial trade costs, irrespective of the particular specification used. The finding that trade costs are still high despite decades of trade liberalization and reductions in transportation costs is not specific to our calibration, but has been shown in a wide variety of contexts and using different methodologies (e.g., Anderson and van Wincoop, 2004). But our results also show that even relatively small additional decreases in trade costs might have important implications for the interaction between trade and merger policy.

In addition to providing a theoretical and quantitative analysis of international aspects of merger policy, the paper also makes a methodological contribution. It showcases how industry-level data can be used to put discipline on parameter values in international trade models with heterogeneous firms and oligopolistic competition. The techniques we introduce to calibrate our model may be helpful to quantify some of the insights from the literature on strategic trade policy.

References

[1] Anderson, James E. and Eric van Wincoop (2004). "Trade costs." *Journal of Economic Literature*, vol. 42, 691–751.

[2] Bagwell, Kyle, Chad P. Bown and Robert W. Staiger (2015). "Is the WTO Passé?" *CEPR Discussion Paper* 10672.

[3] Barros, Pedro P. and Luis Cabral (1994). "Merger Policy in Open Economies." *European Economic Review*, vol. 38(5), 1041-1055.

[4] Brander, James A. (1995). "Strategic Trade Policy." In: *Handbook of International Economics*, vol. 3, eds. Gene Grossman and Kenneth Rogoff. Amsterdam: North Holland.

[5] Brander, James A. and Paul Krugman (1983). "A 'Reciprocal Dumping' Model of International Trade." *Journal of International Economics*, vol. 15(3-4), 313-321.

[6] Brander, James A. and Barbara J. Spencer (1985). "Export Subsidies and International Market Share Rivalries." *Journal of International Economics*, vol. 18(1), 81-100.

[7] Breinlich, Holger (2008). "Trade Liberalization and Industrial Restructuring through Mergers and Acquisitions." *Journal of International Economics*, vol. 76(2), 254-266.

[8] Cabral, Luis M. B. (2005). "An Equilibrium Approach to International Merger Policy." *International Journal of Industrial Organization*, vol. 23(9-10), 739-751.

[9] di Giovanni, Julian (2005). "What Drives Capital Flows? The Case of Cross-Border M&A Activity and Financial Deepening." *Journal of International Economics*, vol. 65(1), 127-149.

[10] Falvey, Rod (1998). "Mergers in Open Economies." *World Economy*, vol. 21(8), 1061-1076.

[11] Farrell, Joseph and Carl Shapiro (1990). "Horizontal Mergers: An Equilibrium Analysis." *American Economic Review*, vol. 80(1), 107-26.

[12] Feenstra Robert C., John Romalis and Peter K. Schott (2002). "U.S. Imports, Exports, and Tariff Data, 1989-2001." *NBER Working Paper* No. 9387.

[13] Gifford, Daniel J. and Robert T. Kudrle (2005). "Rhetoric and Reality in the Merger Standards of the United States, Canada, and the European Union." *Antitrust Law Journal*, vol. 72(2), 423-469.

[14] Griffin, Joseph P. (1999). "Extraterritoriality in U.S. and EU Antitrust Enforcement." *Antitrust Law Journal*, vol. 67(1), 159-199.

[15] Head, Keith and John Ries (1997). "International Mergers and Welfare under Decentralized Competition Policy." *Canadian Journal of Economics*, vol. 30(4b), 1104-1123.

[16] Horn, Henrik and James Levinsohn (2001). "Merger Policies and Trade Liberalisation." *Economic Journal*, vol. 111(470), 244-276.

[17] Inklaar, Robert and Marcel P. Timmer (2014), "The Relative Price of Services." *Review of Income and Wealth,* vol. 60(4), 727-746.

[18] Long, Ngo Van and Neil Vousden (1995). "The Effects of Trade Liberalization on Cost-Reducing Horzontal Mergers." *Review of International Economics*, vol. 3(2), 141-155.

[19] Neary, J. Peter (2007). "Cross-Border Mergers as Instruments of Comparative Advantage." *Review of Economic Studies*, vol. 74(4), 1229-1257.

[20] Nocke, Volker and Michael D. Whinston (2010). "Dynamic Merger Review." *Journal of Political Economy,* vol. 118(6), 1200-1251.

[21] Nocke, Volker and Michael D. Whinston (2013). "Merger Policy with Merger Choice." *American Economic Review*, vol. 103(2), 1006-1033.

[22] Nocke, Volker and Stephen Yeaple (2007). "Cross-Border Mergers and Acquisitions vs. Greenfield Foreign Direct Investment: The Role of Firm Heterogeneity." *Journal of International Economics*, vol. 72(2), 336-365.

[23] Nocke, Volker and Stephen Yeaple (2008). "An Assignment Theory of Foreign Direct Investment." *Review of Economic Studies*, vol. 57(2), 529-557.

[24] Ossa, Ralph (2014). "Trade Wars and Trade Talks with Data." *American Economic Review,* vol. 104(12), 4104-4146.

[25] Pierce, Justin R. and Peter K. Schott (2012). "A Concordance Between U.S. Harmonized System Codes and SIC/NAICS Product Classes and Industries." *Journal of Economic and Social Measurement,* vol. 37(1-2), 61-96.

[26] Vives, Xavier (2000). *Oligopoly Pricing: Old Ideas and New Tools.* Cambridge, MA: MIT Press.

[27] Whinston, Michael D. (2007). "Antitrust Policy towards Horizontal Mergers " in: *Handbook of Industrial Organization,* vol. 3, eds. Mark Armstrong and Robert H. Porter. Amsterdam: North Holland.

[28] Williamson, Oliver E. (1968). "Economies as an Antitrust Defense: The Welfare Trade-offs." *American Economic Review,* vol. 58(1), 18-36.

A   Data Appendix

For the calibration procedure described in Section 4, we require data on industry sales, total costs, labor cost shares, the number of firms, bilateral trade flows, relative prices, and production-based Herfindahl indices for each industry in Canada and the U.S. For the out-of-sample model validation we also need Canadian and U.S. concentration ratios (sales shares of the 4, 8, and 20 largest firms in each industry). Finally, to calibrate the model extension with merger activity in Section 5, we require data on the number of mergers per industry.

We work at the five-digit level of the North American Industry Classification System (NAICS). This is the most disaggregated level at which Canadian and U.S. industry definitions are identical and for which we can thus compare Herfindahl indices across the two

countries. We obtain a total of 160 manufacturing industries in the year 2002 for which we have data for all required variables.

Data on U.S. and Canadian industry-level sales, total costs, labor cost shares, the number of firms, production-based Herfindahl indices and sales-based concentration ratios are from the U.S. Census Bureau and Statistics Canada, respectively. Total costs are measured as the sum of an industry's wage bill and intermediate input expenditures. Labor cost shares are calculated as an industry's wage bill divided by its total costs.

Data on the number of mergers are from Thomson SDC Platinum. In accordance with our model, we focus on domestic horizontal mergers, i.e., mergers in which both acquirer and target have the same primary industry classification and are both incorporated in either the U.S. or Canada.

Data on U.S. exports to, and imports from, Canada are from the NBER website (see Feenstra, Romalis and Schott, 2002) and report trade values and quantities at the ten-digit level of the harmonized system (HS). We use the concordance by Pierce and Schott (2012) to map these data from HS into NAICS.

Relative price data are obtained from Inklaar and Timmer (2014) who compute industry-level output prices from purchasing power parities (PPP) collected for the 2005 International Comparisons Program. Inklaar and Timmer report relative Canadian-U.S. prices for 14 aggregate manufacturing industries in the year 2005. This implies that our price data only varies at a more aggregate level than our other data sources. As a robustness check (see Section 4.4), we also calculate relative export prices from trade unit values, using the NBER data described above. We again use the concordance by Pierce and Schott (2012) to map these data from HS into NAICS, and then compute unit values as the ratio of NAICS-level trade value to quantity.[42] Because unit value data are notoriously noisy, we average each industry's unit values over the period 1998-2006 and winsorize all data below the 10th percentile and above the 90th percentile of the distribution of unit values across industries before computing relative prices. Still, even the cleaned unit value data yield relative prices ranging from 0.5 to close to 3, implying persistent price differences of up to 200% in relatively narrowly defined industries (see Online Appendix Table G.1.1).[43] We thus prefer to work with the more aggregated Inklaar and Timmer data for our baseline calibration, which yield

---

[42]Using one U.S. data source for bilateral U.S. and Canadian exports (where the latter are proxied by U.S. imports from Canada) has the advantage of greater comparability of collection methods and data cleaning procedures when compared to the alternative of using separate export data from U.S. and Canadian sources. The NBER data are also a standard source of trade values and quantities in the literature. Note that the U.S. export and import data we use are both valued on a free-alongside-ship basis and are thus directly comparable.

[43]Prior to winsorizing, we find a maximum relative Canadian-U.S. price of 75 and a minimum of 0.09.

more plausible price differences (see Table 1). As seen in Section 4.4, however, both types of relative price data yield very similar conclusions regarding the types of merger policy conflicts.

We convert all value entries into U.S. dollars using the average U.S.-Canadian dollar exchange rate over the period 1997-2007.[44] In accordance with our choice of units and numéraire, we further normalize value entries by the average U.S. wage rate for the year 2002. We calculate U.S. and Canadian wage rates by dividing the economy-wide wage bill by the number of persons in employment. This yields an average wage for the U.S. of USD 36,510 and an average wage rate for Canada of USD 27,386 in 2002.[45]

---

[44]We use this 11-year average rather than the 2002 exchange rate because the latter is a clear outlier (1.57 CND/USD as opposed to the 11-year average of 1.37 CND/USD).

[45]Data are again from the U.S. Census Bureau and Statistics Canada. We count both employees and self-employed persons. For the latter, we use total receipts (i.e., sales) as a proxy for the wage bill. This will overestimate wages of the self-employed, although dropping the self-employed does not change average wages by much.