Merger Policy in a Quantitative Model of International Trade*

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June 17, 2014

Abstract

In a globalizing world, the decisions of national merger authorities impose externalities on foreign jurisdictions. In a two-country international trade model with oligopolistic competition, we study the potential conflicts between national merger authorities and provide conditions under which they arise. When deciding whether to block a proposed merger to prevent harm on domestic consumers, each authority faces a trade-off between the market power effect of the merger and its efficiency effect. Because of trade costs and asymmetries between countries, the same merger may be good for consumers in one country but bad for consumers in the other. Endogenizing the merger formation process and explicitly modeling the authorities' decisions, we calibrate the model to match industry-level data for 160 sectors in the U.S. and Canada. We use the calibrated model to study the impact of different policy regimes such as introducing or abolishing veto rights on foreign mergers, or the establishment of a North American competition authority. We also look at the interaction of merger and trade policy by studying how the changes in consumer surplus resulting from these policy changes vary with the level of trade costs.

Keywords: Mergers and Acquisitions, Merger Policy, Trade Policy, Cournot Competition, International Trade

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

*We thank Luis Cabral, John Morrow, Peter Neary, Philipp Schmidt-Dengler, Yuya Takahashi and seminar and conference participants at the AEA Annual Meeting 2013, Bielefeld, CesIfo 2013, CLEEN Workshop 2013, CORE, DISSETTLE Workshop 2013, EARIE 2013, Essex, ETSG 2012, Geneva/WTO, Harvard, Lancaster, LSE, MaCCI Annual Meeting 2013, Munich, Nagoya, Princeton, PSE, SFB/TR 15 2013, Stanford, Tuebingen, VfSP 2013, Vienna, Wharton and Yale for helpful suggestions. We gratefully acknowledge financial support from the German Science Foundation (SFB/TR 15).

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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 arising from 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 1999 between the South African firms Gencor and Lonrho. In both cases, the merger was cleared by the firms' domestic competition authority but blocked by the EU Commission due to concerns about the mergers' anticompetitive effect in Europe.

In this paper, we propose a quantitative framework which can be used to understand the determinants of conflict between merger authorities, to analyze which type 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 will be 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 competing 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 (domestic and foreign) consumer surplus: 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. We characterize the conditions under which the domestic consumer surplus standard of a national authority is

too tough or too soft from the viewpoint of consumers in the foreign country. We show that with identical countries and positive symmetric trade costs, a domestic merger will always have weaker anti-competitive effects abroad, because exporters will have lower initial market shares (i.e., less market power) there than a home. In this case, domestic merger authorities will tend to block too many mergers from the point of view of the foreign competition authority and foreign consumers. If the countries are characterized by different initial market structures (summarized by the relative equilibrium price in our Cournot model) this effect can be overturned. For example, if country 1 has a substantially lower initial price level than country 2, a country-1 merger could lower prices there but raise prices in country 2 despite the presence of positive trade cost. In this case, country 1 would like the merger to go ahead but country 2 would like to block it. An important result from our model is that, apart from special cases in which differences in initial market structure and trade costs exactly cancel each other out, there will always be one of these two types of conflict.

Most of our initial theoretical results rely on only very weak assumptions about demand and cost structures. In order to be able to say more about which types of conflict are likely to be relevant in practice, and to get a better understanding of their economic importance, we impose more structure and calibrate the model to sectoral level data. This involves operationalizing the model 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). Using industry-level data for the year 2002 from 160 sectors in the United States and Canada, we choose parameters to match relevant empirical moments, including industry sales, concentration ratios, relative export prices, the yearly number of mergers, and trade flows. In doing so, we assume that national authorities implement the "effects doctrine" of international competition law, according to which national authorities can block not only domestic but also foreign mergers if these hurt domestic consumers.[1]

In the paper's third and final part, we use the calibrated model to study counterfactual scenarios. First, we keep the level of trade costs fixed at the levels obtained from the calibration and look at different ways of coordinating national merger policies. To investigate whether national authorities are too tough on foreign mergers (from the viewpoint of foreign consumers), we consider three counterfactual policy experiments: in the first two, we unilaterally remove the veto rights over foreign mergers for one country; in the third, we remove both veto rights simultaneously.

We find that removing U.S. veto rights over Canadian mergers has only very small effects:

[1]In our robustness checks, we also consider a version where national authorities cannot block foreign mergers but only domestic ones (the 'no veto rights' case).

when a merger between Canadian firms is beneficial for Canadian consumers, it also tends to increase consumer surplus in the United States. The reverse is not always true: removing Canadian veto rights over U.S. mergers has a large negative impact on Canadian consumers in several sectors. As we show, this is because competition in Canada is much less intense than in the U.S. (the Canadian price is higher), implying that the market power effect of a merger between U.S. firms is larger in Canada, despite the existence of trade costs.

In the majority of sectors, however, abolishing veto rights does not change merger activity and consumer surplus. In these sectors, domestic competition policy was too tough on domestic mergers from the point of view of foreign consumers. Removing veto rights does nothing to address this type of conflict. For this, we need to look for ways to take into account foreign consumer surplus in a antitrust authorities' decision.

One way of doing this is to introduce a supra-national North American antitrust authority which blocks a merger if and only if it reduces the sum of U.S. and Canadian consumer surplus. Given that this authority internalizes cross-border effects of mergers, it is not surprising that we find a large positive impact on aggregate North American consumer surplus. Interestingly, however, this comes at the price of hurting Canadian consumers. While losses are smaller than for the removal of veto rights (because more U.S. mergers which increase consumer surplus in Canada get cleared), the overall consumer surplus change is negative. Put simply, the new merger authority gives much more weight to the larger U.S. market and 'ignores' Canada.

Given the crucial role of trade costs in our analysis, we also study the interaction of trade and merger policy. We do so by analyzing the scope for conflicts for both higher and lower levels of trade costs. We repeat the earlier counterfactual policy experiments for different level of trade costs and study how the gains from coordination change as trade costs evolve.

With prohibitively high trade costs, cross-border price effects converge to zero and conflicts between the authorities disappear. As trade costs fall, however, two effects emerge. On the one hand, lower trade costs imply lower prices so that domestic authorities are more likely to approve domestic mergers. On the other hand, 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 simulations, this switch occurs for trade cost reductions which seem relatively small from a historical perspective (around 25-30%). Overall, these

trade-cost induced changes result in a complex variation in the gains from national merger policy coordination. Interestingly, our calibration suggests that the gains from coordination are highest at, or close to, current levels of trade costs. With both higher and lower trade costs, gains are smaller and disappear altogether as we move towards autarky.

We believe that these results have important implications for the coordination of merger and trade policy. First, conflicts between competition authorities can be expected to be frequent; they arise unless trade costs and market asymmetries happen to exactly offset each other. Second, the majority of these conflicts will be 'hidden', in the sense that they will not show in high-profile cases in which domestic authorities block foreign mergers (such as the cases mentioned in the beginning of this introduction). 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. This issue can only 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 relatively small trade cost reductions, 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 liberalisation will make it more important for domestic authorities to exercise control over mergers taking place abroad.

The rest of this paper is organized as follows. Section 2 discusses the related literature. In Section 3, we introduce a simple two-country model of imperfect competition. In Section 4, 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 Sections 5 and 6, we calibrate this model on data for the year 2002 for 160 manufacturing sectors in the U.S. and Canada. In Section 7, we describe the results of our calibration and use the calibrated model for counterfactual analysis. Section 8 concludes.

2 Related Literature

Our paper relates to several strands in the literature. First, we contribute to the literature regarding the optimal design of merger policy (e.g., Williamson (1968), Farrell and Shapiro (1990), Nocke and Whinston (2010; 2013)). This literature focuses almost exclusively on closed economy settings, which, as we argue, abstracts from some important cross jurisdictional aspects of merger policy on which we concentrate here. Examining competition policy in open economy settings also allows for possible interactions between competition and trade policy, which is another aspect of our analysis. Another key difference is that the above-mentioned literature characterizes the optimal merger approval policy whereas our paper *quantifies* the positive and normative effects of changes in merger policy (as well as of changes in structural parameters for a given merger policy).

More closely related to our paper is a relatively small literature which also looks at aspects of competition policy in open economy settings, and possible interactions of competition and trade policy (e.g., Head and Ries (1997), Horn and Levinsohn (2001)). Our main contribution compared to this literature is that we provide a quantitative framework for the analysis of such issues. Having such a framework is important because it allows to quantify the importance of possible externalities, and to conduct counterfactual simulations to analyze the effects of different competition or trade policy regimes. Calibrating our model to match important cross-sectional moments in the data also imposes some discipline on parameter values and functional forms. We think that this is important given the lack of general results in the literature (see, for example, Horn and Levinsohn (2001)). Finally, we also provide a more realistic modelling approach to merger formation by allowing for endogenous merger formation, rather than simply setting the number of firms in each country as existing studies do.

We also contribute to the literature in international trade 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 behaviour and trade policy in open economy settings (e.g., Brander and Spencer (1983, 1985); Brander (1995)). While competition policy is not usually the focus of this literature, we share an interest in the consequences of introducing mergers and strategic interactions into models of international trade, and use comparable modelling frameworks. The techniques we introduce to calibrate our model should also be applicable to a quantification of some of the insights from this earlier literature.

Finally, our paper draws on the parts of the industrial organization literature related

to merger incentives and endogenous merger formation (e.g., Salant, Switzer and Reynold (1983), Perry and Porter (1985), Deneckere and Davidson (1985); Kamien and Zang (1990), Pesendorfer (2005)) and to closed-economy merger simulations (e.g., Nevo (2000)). We show how to adapt the insights from this literature to open economy settings and, regarding our model's calibration, how to make do with the more limited amount of information available for the parameterization of our framework.

3 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:

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

where Q_0 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 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.[2]

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 $P_s^i\left(Q_s^i\right) = \max\left\{u_s^{i\prime}\left(Q_s^i\right), 0\right\}$.

[2] An implication of this assumption is that the ownership structure of domestic and foreign firms is irrelevant for the subsequent analysis.

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 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 5 below.

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. Consider firm $k \in \mathcal{N}_s^i$. Let $c_{k,s}$ denote the firm's marginal (and unit) cost of *producing* one unit of good s, $c_{k,s}^j \equiv \tau^{ij} c_{k,s}$ the firm's marginal cost of *selling* one unit of the good in country j, and $q_{k,s}^j$ the firm's output in country j. We say that firm k is *active* in country j and sector s if $q_{k,s}^j > 0$ in equilibrium.

We impose the following standard assumption on demand and thus, implicitly, on the sub-utility function u_s^i [see, e.g., Vives (2001)]:

Assumption 1. *For any country i and sector s, $P^i(Q) > \min_{k \in \mathcal{N}_s^i} c_{k,s}$ for $Q > 0$ sufficiently small. Moreover, for any aggregate output $Q > 0$ such that $P_s^i(Q) > 0$:*

(i) $P_s^{i\prime}(Q) < 0$,

(ii) $P_s^{i\prime}(Q) + Q P_s^{i\prime\prime}(Q) < 0$,

(iii) $\lim_{Q \to \infty} P_s^i(Q) = 0$.

As is well known, this assumption implies that there exists a unique and stable Nash equilibrium in each sector and country [see, e.g., Vives (2001)]:

Lemma 1. *There exists a unique Nash equilibrium. The aggregate equilibrium output in each country i and sector s, Q_s^{i*}, is strictly positive, and is weakly decreasing in firm k's marginal cost of selling in country i, $c_{k,s}^i$, and strictly so if the firm is active in that country.*

Proof. See Appendix. □

4 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. In line with antitrust laws

in the U.S., the EU and many other jurisdictions, we assume that each national authority approves a proposed merger if and only if it does not decrease domestic consumer surplus (CS). In the following, we characterize what types of conflicts may arise (and when) between national authorities.

Consider merger $M_s = \{1, 2\}$ between firms $1 \in \mathcal{N}_s^1$ and $2 \in \mathcal{N}_s^1$, both of which produce good s in country 1. Dropping the subscript s from now on for notational ease, let $\overline{c}_M$ denote the merged entity's post-merger marginal cost. Denote aggregate output in country i before the merger by Q^{i*}, and after the merger by $\overline{Q}^{i*}$. The induced change in consumer surplus in country i is

$$\Delta CS^i(M) = -\int_{Q^{i*}}^{\overline{Q}^{i*}} QP^{i\prime}(Q)dQ,$$

which is positive if and only if $\overline{Q}^{i*} > Q^{i*}$. We say that merger M is *CS-neutral* in country i if $\Delta CS^i(M) = 0$, *CS-decreasing* if $\Delta CS^i(M) < 0$, and *CS-increasing* if $\Delta CS^i(M) > 0$.

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) and Nocke and Whinston (2010) to a two-country world, fully characterizes the effect of merger M on consumer surplus in country i:

Lemma 2. *Consider merger $M = \{1, 2\}$ between firms $1 \in N^1$ and $2 \in N^1$, both of which are located in country 1. Assuming that both firms are active in country i pre-merger, 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 $\overline{c}_M < \widehat{c}_M^i$, where*

$$\begin{aligned} \widehat{c}_M^1 &\equiv c_1 + c_2 - P^1(Q^{1*}) \\ \text{and } \widehat{c}_M^2 &\equiv c_1 + c_2 - \frac{P^2(Q^{2*})}{\tau^{12}}. \end{aligned}$$

If the merger is CS-nondecreasing (i.e., either CS-neutral or CS-increasing) in country i, it raises the merger partners' joint profit from selling in that country.

Proof. See Appendix. □

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 $\bar{c}_M > \max\{\widehat{c}_M^1, \widehat{c}_M^2\}$ and approve the merger if $\bar{c}_M < \min\{\widehat{c}_M^1, \widehat{c}_M^2\}$. If $\min\{\widehat{c}_M^1, \widehat{c}_M^2\} < \bar{c}_M < \max\{\widehat{c}_M^1, \widehat{c}_M^2\}$, 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 depends on whether merger M can be blocked not only by the domestic (here, country 1's) authority but also by the foreign (here, country 2's) authority. In the real world, the antitrust authorities and courts in many countries (including the U.S. and the EU) have claimed extra-territorial jurisdiction: according to the "effects doctrine," domestic competition laws apply also to foreign firms insofar as the actions of these firms have significant effects on the domestic market.

The above discussion suggests a taxonomy of conflict. For merger M taking place in country 1, country 1's CS-standard is a *too-tough-for-thy-neighbor policy* if $\widehat{c}_M^1 < \widehat{c}_M^2$, and, provided country 2 does not have jurisdiction over country 1 mergers, a *too-lenient-for-thy-neighbor policy* if $\widehat{c}_M^1 > \widehat{c}_M^2$. If country 2 does have a veto power over country 1 mergers, then the latter type of conflict cannot arise. However, when $\widehat{c}_M^1 > \widehat{c}_M^2$, country 2 may end up blocking a merger that country 1 would have wanted to go through. In this case, we say that country 2's CS-standard is a *too-tough-for-thy-neighbor policy on foreign mergers*.

The following proposition characterizes when a merger approval policy based on domestic consumer surplus is too tough or too lenient for the other country:

Proposition 1. *Consider a merger M between firms located in country 1. The domestic CS-standard for merger approval in the home country 1 is a* too-tough-for-thy-neighbor policy *if $P^1(Q^{1*}) > P^2(Q^{2*})/\tau^{12}$ and, if the foreign country 2 does not have veto power over the merger, a* too-lenient-for-thy-neighbor policy *if $P^1(Q^{1*}) < P^2(Q^{2*})/\tau^{12}$. If country 2 does have veto power over merger M, then its policy is a* too-tough-for-thy-neighbor policy on foreign mergers *whenever country 1's policy would be too lenient otherwise, i.e., if $P^1(Q^{1*}) < P^2(Q^{2*})/\tau^{12}$.*

Proof. This is an immediate implication of Lemma 2. □

While the cost threshold $\widehat{c}_M^i$ is specific to the characteristics of the merger M under

consideration, Proposition 1 shows that the type of potential conflict (whether the home country is tougher than the foreign country or the reverse) is the same for any merger between firms located in the same country (and sector), depending only on the pre-merger prices and the trade cost from the home country to the foreign country. Put differently, for a given industry structure, it is not possible to find a country-1 merger M which country 1 would like to block and country 2 would like to approve, and another country-1 merger M' which country 2 would like to block and country 1 would like to approve.[3]

The conditions for the different types of misalignment of interests, as stated in Proposition 1, involve endogenous prices. This raises the question: Under what conditions on primitives is one type more likely to arise than the other? The following Corollary is an immediate implication of Proposition 1:

Corollary 1. *Suppose the two countries are identical, i.e.,* $P^1(.) = P^2(.)$, $\tau^{12} = \tau^{21} \equiv \tau$, $N^1 = N^2$ *and* $(c_k^2)_{k\in\mathcal{N}^2}$ *is a permutation of* $(c_k^1)_{k\in\mathcal{N}^1}$. *Then, the domestic CS-standard for merger approval is*

- *a* too-tough-for-thy-neighbor policy *by the home country if* $\tau > 1$,
- *and, if countries have (resp., do not have) veto power over foreign mergers, a* too-tough-for-thy-neighbor policy *by the foreign country (resp.* too-lenient-for-thy-neighbor policy *by the home country) if* $\tau < 1$.

The corollary hints at what type of conflict is more likely to arise if countries are similar: to the extent that one would expect the iceberg-type trade cost τ to be larger than one, the merger partners' home country is more likely to block the merger than the foreign country. If so, whether or not authorities have veto power over foreign mergers would not affect the outcome.

Corollary 1 can easily be generalized to asymmetric countries:

[3]Note that 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:

$$\frac{1}{\tau^{12}} \leq \frac{P^1(Q^{1*})}{P^2(Q^{2*})} \leq \tau^{21}.$$

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.

Proposition 2. *There exists a threshold value $\widehat{\tau}^{12}$ of trade costs from country 1 to country 2 such that the domestic CS-standard for approval of a merger between firms in country 1 is*

- *a* too-tough-for-thy-neighbor policy *by the home country 1 if $\tau^{12} > \widehat{\tau}^{12}$,*
- *a* too-tough-for-thy-neighbor policy *by the foreign country 2 if $\tau^{12} < \widehat{\tau}^{12}$, provided that country has veto power (and a* too-lenient-for-thy-neighbor-policy *by the home country 1 otherwise).*

Moreover, $\widehat{\tau}^{12}$ is weakly decreasing in τ^{21}.

Proof. See Appendix. □

Intuitively, if τ^{12} is high, or if τ^{21} is high, then the firms located in country 1 have higher market shares and hence more market power at home than they do abroad. It is therefore more likely that a merger between country-1 firms will benefit foreign consumers and harm domestic consumers.

To obtain further results on the misalignment of interests between the two countries, we impose additional structure:

Proposition 3. *Suppose that inverse demand in country $i \in \{1, 2\}$ is linear and given by $P^i(Q^i) = a^i - b^i Q^i$. Suppose also that all $N^1 + N^2$ firms are active in both countries, and let $\tilde{c}^i = \frac{1}{N^i} \sum_{k \in \mathcal{N}^i} c_k$. Then, the threshold value $\widehat{\tau}^{12}$ is given by*

$$\widehat{\tau}^{12} = \frac{a^2 + N^2 \tilde{c}^2}{a^1 + N^2 \tau^{21} \tilde{c}^2}.$$

Hence, $\partial \widehat{\tau}^{12}/\partial a^1 < 0$, $\partial \widehat{\tau}^{12}/\partial a^2 > 0$, $\partial \widehat{\tau}^{12}/\partial N^1 = \partial \widehat{\tau}^{12}/\partial \tilde{c}^1 = 0$, and $\partial \widehat{\tau}^{12}/\partial N^2$ and $\partial \widehat{\tau}^{12}/\partial \tilde{c}^2$ have the same sign as $a^1 - a^2 \tau^{21}$.

Proof. The equilibrium price in country i is given by:

$$P^{i*} = \frac{a^i + N^i \tilde{c}^i + N^j \tau^{ji} \tilde{c}^j}{N^1 + N^2 + 1}.$$

The result then follows from elementary algebraic manipulations. □

Threshold $\widehat{\tau}^{12}$ can be thought of as the "likelihood"that the domestic CS-standard for merger approval in country 2 for a merger taking place in country 1 is a *too-tough-for-thy-neighbor policy*. As a^1 increases, demand in country 1 becomes less elastic, which tends to make country 1's market relatively less competitive than country 2's. This explains why

$\partial\widehat{\tau}^{12}/\partial a^1 < 0$. The intuition for $\partial\widehat{\tau}^{12}/\partial a^2 > 0$ is similar. Comparative statics on N^i and $\tilde{c}^i$ are ambiguous in general, because an increase in N^i (or a decrease in $\tilde{c}^i$) tends to lower equilibrium prices in both countries. With linear demands, these two effects exactly offset each other, so that a change in N^1 or $\tilde{c}^1$ has no impact on the misalignment of interests between the two countries. The impact of a change in N^2 or $\tilde{c}^2$ depends on whether country 1's consumers are more or less price-elastic than consumers in country 2, adjusting for trade costs.

5 Model Operationalization

In this section, we put more structure on preferences and technologies and define a merger formation process. This will allow us to take our model to the data in the next section.

5.1 Preferences and Technologies

In sector s and country i, sub-utility $u_s^i(.)$ introduced in Section 3 is given by $u_s^i(Q_s^i) = a_s^i Q_s^i - \frac{1}{2} b_s^i \left(Q_s^i\right)^2$. This quadratic functional form generates a linear inverse demand function for sector s's product in country i:

$$P_s^i\left(Q_s^i\right) = \max\left(a_s^i - b_s^i Q_s^i, 0\right),$$

We solve the Cournot competition game with linear demand in Appendix B.

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 industry i, and z_k is the productivity of firm k. The implied marginal and unit cost of firm k is given by

$$\begin{aligned} c_k &= \frac{1}{z_k}(w^i)^{\eta_s^i}(P_0^i)^{(1-\eta_s^i)}, \\ &= \frac{1}{z_k}(\alpha^i)^{\eta_s^i}. \end{aligned}$$

There are initially N_s^i potentially active manufacturing firms in sector s and country i. The inverse of firm k's productivity in sector s and country i, $1/z_k$, is initially drawn from a

Pareto distribution with scale parameter x_s^i and shape parameter ζ_s^i.

When two firms merge, synergies can affect their original productivities. We assume that if firm k merges with firm l in sector s and country i, then the productivity of the merged firm becomes:[4]

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

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 $z_m = \max(z_1, z_2)$, which corresponds to the case of no synergies in the sense of Farrell and Shapiro (1990). For a merger between two symmetric firms with pre-merger productivity z, equation (1) implies that the merged-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.

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 parameter $\log(\beta_s^i) - \frac{1}{2}$ and variance parameter 1, where β_s^i is a parameter of the model.[5]

5.2 Merger Formation Process

We allow firms to merge horizontally, subject to two conditions. First, mergers must be profitable for the merger partners. That is, the profits of the joint entity must be strictly larger than the sum of the initial profits of the merger partners. Second, mergers must not decrease consumer surplus (i.e., not increase price). This is, by and large, current practice of most merger authorities, including the United States and the European Union. We also assume that national antitrust authorities can block any merger, independently of whether the merger under consideration involves domestic or foreign firms. In our counterfactual simulations below, we will examine various modifications to this baseline competition policy standard and evaluate the resulting consequences for industrial structure and welfare.

We want our model to generate predictions on how many mergers will take place, as well as on how these mergers will affect various industry-level variables, such as relative prices, market concentration, etc. This involves finding the outcome of a bargaining process, which raises a number of challenges. First, there are several firms in each industry and multiple mergers may obtain. Second, the bargaining process involves externalities as firms compete in

[4] We abstract from cross-border mergers in this preliminary version of the paper. We also abstract from conglomerate mergers, in the sense that a firm in sector s cannot merge with a firm in sector s'.

[5] The $-1/2$ term in the distribution of δ ensures that the mean δ is equal to β_s^i.

the same market. Unfortunately, the literature on bargaining does not provide any convincing off-the-shelf solution to such bargaining processes.[6]

We use a simple and tractable dynamic random matching approach to solve this multi-player bargaining problem with externalities. 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. Out of these $T_s^1 + T_s^2$ periods, 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 in $\{1, \ldots, T_s^1 + T_s^2\}$ in which country 2 will receive merger opportunities. From now on, we drop sector subscripts for ease of notation.

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 authorities in both countries decide whether to approve it. We assume that the domestic antitrust authority makes its approval decision before the foreign one.[7]

5. Firms decide whether to stay in the industry. If a firm exits, then it receives a positive but arbitrarily small scrap value.[8]

6. Firms compete in quantities in both manufacturing markets.

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

[6] The small literature on bargaining with externalities (e.g., Jehiel and Moldovanu (1995a; 1995b), Gomes (2005), Gomes and Jehiel (2005)) provides only partial characterization results.

[7] 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 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.

[8] This assumption ensures that inactive firms exit the industry, and allows us to focus on mergers involving active firms, which is what we observe in our dataset.

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 high numbers of firms and periods we have to deal with. This impatience assumption also implies that antitrust authorities follow a simple rule, whereby they block a merger if and only if this merger lowers their (static) welfare criterion (here: domestic consumer surplus) given the current market structure. We do not view this feature as problematic, as we believe it adequately captures current practice in most countries: it would be difficult for a antitrust authority to clear (or block) on the grounds that this merger is likely to lead to more (or fewer) mergers in the future.

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 $T^1 + T^2$.

We view T^1 and T^2 as parameters capturing frictions in the market for firms' ownership. A low T^i means that these frictions are strong, so that few mergers are technologically feasible. Conversely, a high T^i means that almost every merger is feasible, albeit not necessarily profitable or approvable. In the following, it will be useful to allow T^1 and T^2 to take non-integer values. This is done as follows: denote by n^i and r^i the integer and fractional parts of T^i, respectively. Then, country i receives n^i merger opportunities with probability r^i and $n^i + 1$ merger opportunities with probability $1 - r^i$. These random variables are realized in period 0, before the game starts.

6 Calibration

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. Our data sources are the U.S. Census Bureau, Statistics Canada, the NBER website (see Feenstra, Romalis and Schott, 2002) and Thomson SDC Platinum. 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 for the year 2002 for which we have data for all required variables. Appendix C provides more details on the construction of our dataset.

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), η^{US} and η^{CAN} (the labor shares), β^{US} and β^{CAN} (the strength of synergies), and T^{US} and T^{CAN} (the numbers of merger opportunities). We also require parameter values for α^{US} and α^{CAN} (the productivities of the outside sectors).

Parameters calibrated outside the model. 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 β^{US} and β^{CAN} equal to 50 in all sectors. As we will see in Section 7.1, these parameter values (along with the calibrated parameters we obtain) imply that, on average, an approved merger reduces the marginal costs of the merging parties' by about 10%. We will later perform a sensitivity analysis on the values of these parameters.

Parameters calibrated within the model. This leaves us with an eleven-dimensional vector of parameters to calibrate in every sector:

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

The value of Γ is chosen so as to match the following eleven empirical moments: the ratio of U.S. to Canadian export prices, domestic sales, the value of U.S. and Canadian bilateral exports, production-based Herfindahl-Hirschman concentration indices (HHI), total costs and merger activity in both countries. Our calibration procedure essentially involves solving a non-linear system of eleven equations with eleven unknowns in each sector.

Identification We now provide a brief intuitive discussion of the features in the data which allow for the identification of the parameters in Γ. Each of our empirical moment has a natural parameter counterpart which makes this discussion straightforward. 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}. Since in our model domestic and foreign firms both receive the same price in each domestic market, P^{CAN}/P^{US} is equal to the price charged by U.S. exporters

in Canada relative to the price charged by Canadian exporters to the U.S. We choose a^{CAN} to match this relative export price. As can be seen in Appendix B, 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. Finally, T^i has a direct, strong and positive effect on merger activity in country i.

Calibration algorithm. We approximate our theoretical moments using Monte Carlo integration. For a given vector of parameter values Γ, we draw M realizations of productivity vectors and merger opportunities, where M is a large number.[9] For each realization, we play the merger game, compute the final equilibrium, and calculate our eleven theoretical moments at the final equilibrium.

We use the following iterative calibration procedure. We first calibrate the model under the assumption that mergers and acquisitions are not feasible. We first pick an initial guess Γ_0 for our parameters, with $T^{US} = T^{CAN} = 0$. We adjust parameters a^{CAN}, b^{US}, b^{CAN}, $\tau^{US,CAN}$, $\tau^{CAN,US}$, x^{US}, x^{CAN}, ζ^{US} and ζ^{CAN} to perfectly match domestic sales, exports, total costs, HHIs and the price ratio using standard derivative-based methods, and update our initial guess to Γ_1. Next, we increase T^{US} and T^{CAN} by a small amount, re-optimize on a^{CAN}, b^{US}, b^{CAN}, $\tau^{US,CAN}$, $\tau^{CAN,US}$, x^{US}, x^{CAN}, ζ^{US} and ζ^{CAN}, and update our guess to Γ_2. We keep iterating this way until all moment deviations are sufficiently close to zero. We store the last parameter guess we obtained, and subsequently use it as a starting value for the simplex algorithm, which minimizes the sum of squared residuals.[10] The output of the

[9] In the present draft, $M = 200$.

[10] Denoting the theoretical moment by θ and the corresponding empirical moment by ε, the residual is defined as

$$\frac{\theta - \varepsilon}{\frac{\theta+\varepsilon}{2}}$$

These weights are convenient when we run the calibration routine, as they ensure that residuals behave symmetrically (equal punishment for negative and positive deviations) and always remain bounded. This residual is equivalent to the standard percentage deviation when θ is in the neighborhood of ε:

$$\frac{\theta - \varepsilon}{\frac{\theta+\varepsilon}{2}} \underset{\theta \to \varepsilon}{\sim} \frac{\theta - \varepsilon}{\varepsilon}.$$

simplex algorithm gives us our calibrated parameters.

7 Results

In this section, we present the results of our calibration exercise. We first present descriptive statistics for our empirical moments and analyze the fit of the model with these moment (both in-sample and out-of-sample). We also discuss the calibrated parameter values and the implied marginal cost reductions and price effects of mergers. We then move on to a number of counterfactual analyses which will shed light on the empirical relevance of the different types of conflicts discussed in Section 4.

7.1 Calibration Results

Empirical moments and model fit. Table 1 shows descriptive statistics for our empirical moments. On average, U.S. industries are over ten times larger in terms of sales, and average M&A activity is about 10 times higher than in Canada. U.S. industries are also significantly less concentrated in terms of production, as can be seen from the average HHIs (1298 in Canada vs. 603 in the U.S.). In the average sector, the price of U.S. exports to Canada is 36% percent higher than the price of Canadian exports to the U.S. However, this large price difference seems to be driven in part by outliers; the price difference in the median sector is only 15%.[11] Finally, we note that Canada ran a substantial trade surplus in manufactured goods with the U.S. in 2002.

Figure 1 plots the model fit for our 11 targeted moments in all 160 sectors. Each red dot represents a sector. The horizontal coordinate is the value of the empirical moment in this sector; the vertical coordinate is the value of the predicted theoretical moment. If the dot lies on the 45-degree line, then we have a perfect fit in this sector for the moment under consideration. As can be seen graphically, we match our empirical moments exactly in all but 4 sectors.[12]

As a cross-validation check, Figure 2 plots the model fit for 6 moments that were not directly targeted in the calibration: the 4-, 8- and 20-firm concentration ratios in both

[11] In appendix C, we compare these price differences to relative Canadian-U.S. industry-level output prices calculated by Inklaar and Timmer (2012) from purchasing power parities (PPP) collected for the 2005 International Comparisons Program. The median price across the 14 aggregate manufacturing industries in the Inklaar-Timmer data was 1.10 in 2005.

[12] We drop these four sectors in the rest of the analysis. Including them does not qualitatively affect any of the following results.

countries. Our calibrated model does a reasonably good job at predicting these moments as well.

Parameter values. 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. Notice also that the average 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. We obtain that $x^{US} < x^{CAN}$ in the average and median sectors.[13] This suggests that U.S. firms are more productive than Canadian firms in manufacturing as well. However, there is more dispersion in productivity in the U.S. than in Canada. This comes from the fact that the U.S. has many more firms, which, for a given level of productivity dispersion, should imply much lower American HHIs. While American 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 American HHIs.

Trade costs from the U.S. to Canada are about 20% higher than trade costs from Canada to the U.S. in the average sector and in the median sector. This is driven by the fact that the U.S. was running a trade deficit with Canada in 2002. While τ's are higher than one in most sectors, there are a few sectors in which they are smaller than one, which seems to be at odd with the conventional interpretation of iceberg transportation 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 could be 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.

Next, we discuss preference parameters. 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. Things appear to be different in the average sector, where a^{CAN} is about three times as high as in the U.S. We interpret these findings as follows. As we discuss in Appendix C, 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 than the U.S., which seems to be enough 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 are not enough, and the model needs to make

[13] Recall that *the inverse of* productivities are drawn from a Pareto distribution with scale parameter x.

Canadian consumers much less price-elastic than U.S. ones. This seems to be driving the average a^{CAN}. In the median sector, $1/b^{US}$ is about 14 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 Panel A of Table 1). 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.

Finally, T^{US} is significantly higher than T^{CAN} in the median and average sectors, which is consistent with the fact that the U.S. had a much higher level of merger activity in 2002. Note, however, that the ratio T^{US}/T^{CAN} is substantially higher than the corresponding ratio of the number of mergers in the data. This is due to the fact that the probability that an additional merger opportunity will lead to an additional merger declines with the number of past opportunities and mergers in our model.

Implied price effects and marginal cost reductions of mergers. Tables 3 and 4 show summary statistics on the distribution across sectors of the average price and marginal cost reductions induced by mergers in our calibrated model. For each sector, we calculate average price and marginal cost reductions as follows. Using our calibrated parameter values, we recompute the model's equilibrium M times (where M is the number of iterations used in our Monte Carlo integration).[14] For each iteration, we observe a number of mergers of which each will entail marginal cost reductions as well as price changes in the domestic and/or the foreign market. Following Farrell and Shapiro (1990), 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. Note that because countries have veto rights, only mergers which do not increase prices in both countries will be permitted and price effects are thus all (weakly) negative. 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 M iterations.

As seen in Table 3, mergers have slightly larger effects on domestic prices than on foreign prices in both the mean and the median sector. By construction, all sectors experience price reductions or unchanged prices. There is a large degree of heterogeneity in terms of the magnitude of effects, however, with price reductions reaching from 0% to close to -2%

[14] We reset the seed values of our random number generator ahead of these computations. Thus, we obtain the same theoretical moments and fit to the data as reported for our baseline calibration in Table 2 and Figures 1 and 2.

in a few sectors. Table 4 shows that the average cost reductions implied by mergers is about 10% in the median and average sectors in both countries. While we are not aware of comparable estimates of synergies in the literature, cost reductions of this magnitude do not seem unreasonably large.

7.2 Counterfactual Experiments

Using our calibrated model, we now perform a number of counterfactual experiments. We begin by looking at how the scope for conflicts changes with changing trade costs. This is useful to understand the effect of policy coordination, to which we turn next. We first remove veto rights from Canada and the United States. We do so one country at a time initially and then both countries together. We also simulate the introduction of a North American competition authority which maximises joint US and Canadian consumer surplus. We carry out these counterfactual policy changes at both the current level of trade cost (i.e., at the values of τ calibrated in the last section) and at both higher and lower trade costs.

7.2.1 Trade Costs and the Scope for Conflicts

To see how the scope for conflicts evolve as trade costs change, it is useful to define the following statistics:

$$\rho^{US} = \tau^{US,CAN} \times \frac{P^{US}}{P^{CAN}}$$

$$\rho^{CAN} = \tau^{CAN,US} \times \frac{P^{CAN}}{P^{US}}$$

Recall from our earlier discussion that if $\rho^{US} > 1$, we have that $\widehat{c}^{US}_{M_{US}} < \widehat{c}^{CAN}_{M_{US}}$. That is, U.S. merger policy is too tough on domestic mergers from the point of view of Canadian consumers. If $\rho^{US} < 1$, Canadian merger policy is too tough on U.S. mergers from the point of view of U.S. consumers. Similarly, $\rho^{CAN} > 1$ and $\rho^{CAN} < 1$ imply that Canadian policy is too tough on domestic mergers, or that U.S. policy is too tough on Canadian mergers, respectively.

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 replay the merger game with the new trade cost parameters but keep all other calibrated parameters constant. This leads to new prices

(P^{US}, P^{CAN}) which we use to compute ρ^{US} and ρ^{CAN}.[15] 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 Canadian competition policy is too tough on U.S. mergers. As Figure 4 shows, the situation is different in Canada. There are no sectors in which the U.S. is too tough on Canadian mergers 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 much more competitive than the Canadian market, which is reflected in a lower relative price P^{US}/P^{CAN}. Even though trade costs are positive 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.

Figures 3 and 4 also tell us how the potential for conflict evolves as trade costs change. As trade costs increase, both ρ^{US} and ρ^{CAN} rise as well. This means that the number of sectors in which foreign merger policy is too tough on domestic mergers decreases. Intuitively, if trade costs are very high, the anti-competitive effects of foreign mergers on the domestic market are negligible and domestic competition authorities do not block these mergers. As trade costs come down, however, foreign firms gain market shares in the domestic market and the anti-competitive effects of any merger between those firms becomes more important. Thus, the likelihood of foreign authorities blocking domestic mergers increases.

The above results only tell us about the *potential* for conflicts. For a given realisation of synergies, no merger might fall in the zone between $\widehat{c}_M^{US}$ and $\widehat{c}_M^{CAN}$, and so that no *actual* conflict arises. To get a clearer picture of how often conflicts actually arise, we look at the number of profitable merger opportunities which are blocked by either the U.S. or Canada. Note that if neither or both authorities want to block a merger, no conflict arises. Given that trade cost changes also influence profitability, we express the number of blocked mergers as a fraction of all profitable merger opportunities in a given sector.[16]

[15]Note that prices change after each merger in the merger game. We compute ρ as an average across all price realizations during the game. As before, we repeat the merger game 200 times and take the average across the realized ρ. This average ρ is what is reported in Figures 3 and 4. Also note that we reset the seed values of our random number generator before computing the new equilibrium price path. Thus, any changes in relative prices are due to changes in trade costs rather than to different realizations of randomness.

[16]An additional reason for why we need to look at actual conflicts is that we calculate ρ^{US} and ρ^{CAN} based on average price realisations during the merger process (see footnote 15). This means that even if ρ is larger than unity, there may have been situations during the merger process in which prices were such that the

Figure 5 plots the average of this fraction across sectors against the percentage change in trade costs for U.S. mergers.[17] Consistent with the earlier figures on potential conflicts, the most common type of conflict is that the U.S. blocks its own domestic mergers, whereas situations in which Canada blocks U.S. mergers are much rarer, although it still happens in 13% of all profitable merger opportunities across sectors. The same is true when we look at Canadian mergers (Figure 6) although there the second type of conflict – the U.S. blocking Canadian mergers – is much rarer still.[18] Again, the intuition is that Canada is the less competitive market. So if Canada clears a domestic merger, the presence of trade costs and the more competitive nature of the U.S. market mean that the U.S. is very likely to clear the same merger as well. The opposite does not necessarily hold, given that a U.S. merger might take place in a very competitive domestic market, but that the same market in Canada is much less competitive (implying a high P^{CAN}/P^{US}).

As trade costs increase, changes in actual conflict patterns resemble changes in potential conflict patterns closely. Domestic mergers which are cleared by the foreign authority but blocked by the domestic authority increase as a fraction of all profitable mergers. The reason for this is that higher trade costs increase prices on the domestic market, so that domestic merger authorities become less likely to clear domestic mergers. The same is not true for the foreign merger authorities because rising trade costs mean that the merging firms see their market shares abroad shrink, and are thus less likely to raise prices by merging. Indeed, as trade costs become prohibitively high, foreign firms are no longer active in the domestic market and their merger decisions become irrelevant. The opposite is true as trade costs fall below the initially calibrated level. Falling domestic prices mean that the domestic merger authority is now more likely to clear mergers. By contrast, lower trade costs imply more significant anti-competitive effects of foreign mergers. This leads to a reversal of the relative likelihood of the two types of conflicts. Domestic mergers cleared by the domestic authority but blocked by the foreign authority now become the most frequent type of conflict.

foreign authority blocked domestic mergers even though they had been authorised by the domestic authority.

[17] We calculate this average across sectors with positive merger activity only (i.e., where T_{US} or T_{CAN} are positive). In sectors without merger opportunities, the ratio of blocked mergers to profitable merger opportunities is of course not defined.

[18] Note that at first sight there seems to be a contradiction between finding actual conflicts (albeit in just three sectors) and our earlier finding that there were no sectors with potential conflicts at all. The reason for this is that the potential conflicts measure is computed using average price realisations during the merger game, whereas actual conflicts can happen at any point during the game (see the discussion in footnote 15).

7.2.2 Counterfactual Policy Regimes

With veto rights, one of two types of conflict can arise. Either domestic authorities are too tough on domestic mergers from the point of view of foreign consumers, or foreign merger authorities are too tough on domestic mergers from the point of view of domestic consumers. We now consider counterfactual policy regimes which address one or both types of conflicts and see what the resulting consumer surplus changes are.

Removing Veto Rights We first remove veto rights for each country in turn and calculate changes in consumer surplus in each sector for both countries. This will allow us to judge the importance of eliminating conflicts resulting from foreign authorities blocking too many domestic mergers. Thus, we would expect this new regime to increase consumer surplus at home and lower it abroad, with the overall welfare effects being unclear a priori.

We compute the model's equilibrium as before, using the calibrated parameter values from Table 2. This time, however, we change the rules governing whether a merger is permissible or not. For example, when we remove the U.S. veto on Canadian mergers, a proposed Canadian merger will take place if it is profitable and does not increase prices in Canada. Whether or not it increases prices in the U.S. is no longer relevant.[19] We first look in detail at the effects of removing veto rights for the present level of trade costs (Table 5). We then analyze how these effects change as trade costs increase or decrease (Figure 7).

The first three lines of Table 5 show that the consumer surplus effects of removing U.S. veto rights are small, as is the resulting increase in Canadian M&A activity (line 5 of Table 5). This is of course consistent with our earlier results that there were only very few sectors in which the U.S. blocked Canadian mergers authorized by Canada (Figure 6). As discussed, this finding is driven by the fact that the U.S. market is more competitive than the Canadian market in most sectors (in the sense of a lower equilibrium price).[20] Note also that whenever additional mergers in Canada do take place, the consumer surplus effects are quantitatively small, both in Canada and the U.S.. We conclude that removing U.S. veto rights does not have substantial consequences for consumer surplus in North America.[21]

[19] We again reset the seed values of our random number generator before computing the new equilibrium. Thus, any changes in consumer surplus and in our theoretical moments are due to changes in the merger rule rather than different realizations of randomness.

[20] Note that we set the percentage change in merger activity to 0% rather than missing if no mergers took place in the data (and thus the baseline calibration). This is to ensure that we have an equal number of observations underlying each row in Table 5-8.

[21] There are a few sectors in which U.S. consumer surplus increases which might seem puzzling at first. The explanation is that the removal of U.S. veto rights allows mergers to take place in Canada which lower U.S. consumer surplus but also lower prices in Canada. As a consequence, additional mergers can now take place

Table 6 looks at the consequences of removing Canadian veto rights over mergers taking place in the U.S. The effects of this change are more substantial. This is again consistent with the result reported in Figure 5 that Canada blocked a significant number of U.S. mergers which had been previously authorized by the U.S.[22] Thus, as Canadian veto rights are abolished, U.S. merger activity increases, leading to consumer surplus gains in the U.S. and losses in Canada. Consumer surplus in the average U.S. sector increases by 44 million USD or six billion dollars across all 156 U.S. manufacturing sectors. While Canadian consumer surplus also drops by 14 million USD in the average Canadian sector, total North American consumer surplus goes up by almost 5 billion USD.[23] While these effects are large, a more striking result is maybe that abolishing veto rights does not change merger activity and consumer surplus at all in the majority of sectors. In these sectors, domestic competition policy was too tough on domestic mergers from the point of view of foreign consumers. Removing veto rights does nothing to address this type of conflict.

Table 7 shows what happens if we remove veto rights from both countries simultaneously. Not surprisingly, the consequences for consumer surplus are very similar to the abolition of Canada's veto rights discussed above. Scrapping all veto rights over foreign mergers combines the effects of the two unilateral abolitions. But as we have seen, removing U.S. veto rights over Canadian mergers did not have large consumer surplus effects relative to the removal of Canadian veto rights. Thus, the combined effect is similar to abolishing the Canadian veto only.

How do changes in trade costs influence the above results? In Figure 7, we plot changes in Canadian, U.S. and total consumer surplus resulting from the removal of veto rights against the change in trade costs. As trade costs increase, both U.S. gains and Canadian losses decline

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 initial Canadian mergers. Secondly, there is also a negative consumer surplus change in one Canadian sector. This is again due to changes in merger possibilities triggered by the newly permissible Canadian mergers. In this case, these new mergers increase prices in the U.S. which leads to previously permissible U.S. mergers being blocked by the U.S. antitrust authority. Since these mergers were consumer surplus increasing in Canada, the overall consumer surplus change in Canada can be negative.

[22]The fact that a merger is blocked by the Canadian competition 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. As mentioned earlier, another potential concern is that Canada may not have *de facto* veto rights over U.S. mergers. To address this, we re-calibrate our model under the assumption that countries do not have jurisdiction over foreign mergers in Section 7.2.3, and show that our insights remain unchanged.

[23]Again, there is a small number of Canadian sectors in which consumer surplus increases. This is again due to newly permissible U.S. mergers changing the set of feasible subsequent U.S. mergers (compare the previous footnote).

in absolute terms. This is consistent with our earlier results that higher trade costs reduce cross-border price effects of mergers and the number of conflicts in which foreign authorities block domestic mergers. If such conflicts become less severe, U.S. gains from eliminating Canadian veto rights shrink, and Canadian consumers are hit less hard if Canada loses her veto rights. Of course, eliminating U.S. veto rights did not have much of an impact at present levels of trade costs and becomes even less important as trade costs rise.

The situation is more complicated when we reduce trade costs. On the one hand, the number of U.S. mergers which raise prices in Canada goes up, and Canada would like to block more of these mergers. Removing Canadian veto rights is thus increasingly beneficial for U.S. consumers. On the other hand, there are now more and more Canadian mergers which raise prices in the U.S. (see Figure 6), and the price impact of these mergers becomes stronger with lower trade costs. This second effect overcompensates the first effect and total U.S. gains from the elimination of veto rights shrink. For Canada, the situation is similar. Although it gains from being able to implement mergers blocked by the U.S. at lower levels of trade costs, this positive effect is overcompensated by the more frequent and more price-increasing impact of U.S. mergers.[24] Interestingly, the largest overall consumer surplus gains from removing veto rights are realized close to the present level of trade costs. As trade costs fall, veto rights become more important as an insurance against price-increasing foreign mergers, and the gains from abolishing them fall.

Introducing a North-American Competition Authority In the final counterfactual scenario we consider, the two countries form a joint merger authority that blocks a merger if and only if it decreases the sum of U.S. and Canadian consumer surplus. Given that this authority internalizes cross-border effects of mergers, it is not surprising that we find a large positive impact on aggregate North American consumer surplus.[25] Less expected is the fact that this overall gain comes at the expense of Canada which sees a total drop in consumer surplus of over 1.5 billion USD. Intuitively, the total North American consumer surplus effects of a given merger are dominated by changes in U.S. consumer surplus because of the substantial market size advantage of the U.S. Accordingly, the new antitrust authority

[24] There is also an additional effect which arises from the fact that the number of profitable merger opportunities changes with trade cost. This explains the non-monotonicities in Figure 7.

[25] There are a few sectors where total North American consumer surplus goes down. This is a consequence of the myopic behaviour 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.

bases its decision mainly on U.S. consumer surplus effects.

As we have seen previously, U.S. consumers benefit from allowing more domestic U.S. mergers as compared to the veto-rights case. So it comes as no surprise that U.S. merger activity increases in this new counterfactual scenario. More interestingly, the number of Canadian mergers also goes up, suggesting that Canadian competition policy used to be too tough on domestic mergers from the point of U.S. consumers and total North American consumer surplus. As discussed above, we have $\hat{c}^{CAN}_{M_{CAN}} < \hat{c}^{US}_{M_{CAN}}$ in most sectors, implying that a large number of Canadian mergers were blocked by Canada even though they were consumer surplus increasing in the U.S.. Note that this is a form of price externalities which can only be addressed through the introduction of a joint merger authority. Granting veto rights on Canadian mergers to the U.S. authority does not help U.S. consumers. The problem is that too few Canadian mergers take place in Canada, not too many. We believe that this is important insight which is absent from most policy discussions on a possible international coordination of merger regimes.

Figure 8 looks at the consumer surplus changes induced by a joint merger authority for different levels of trade costs. As before, higher trade costs imply weaker cross-border price effects and thus lower gains from policy coordination. As trade costs fall firms merging at home have higher market shares abroad and synergies translate into larger increases in foreign consumer surplus. Since many of these mergers were previously blocked by domestic authorities (see Figures 5 and 6), the benefits from introducing a North-American authority grow. As trade costs continue to fall, however, the same mergers also become anticompetitive abroad which partially offsets the previous gains. The total effect is inverse u-shaped for the U.S. and total consumer surplus. Again, the highest total gains are realized at trade costs close to present levels.

7.2.3 Using a No-Veto-Rights Baseline

We calibrated our model under the assumption that countries have veto rights on mergers taking place abroad. As discussed, this is the current legal situation in essentially all countries, including Canada and the US. In practice, however, countries may have *de jure* but not *de facto* veto rights over foreign mergers. This seems particularly relevant for Canada, which is a much smaller economy than the U.S. and might not be able to exert control over U.S. mergers. Thus, as a robustness check, we rerun our calibration under the assumption that countries do not have veto rights. That is, we match the same moments using the same set of parameters as before, but now we assume that from the beginning, countries do not

have the power to block foreign mergers.

Given the different structure of the merger process, we would expect to obtain different parameter values for this recalibration. In practice, differences are relatively minor with the exception of the number of merger opportunities (T^{US} and T^{CAN}) which are significantly lower than before (see Table A1 in the Appendix). In particular, T^{US} is now only around 225 in the mean sector, compared to 611 in our original veto-rights calibration. Intuitively, because mergers now only need to clear one hurdle instead of two, we need fewer merger opportunities to match the same number of mergers observed in the data.

The types of counterfactuals we can carry out for the no-veto rights calibration are of course different from the veto rights calibration. However, the underlying intuition for our results is very similar to the veto-rights baseline, so that we can keep the following discussion short.

Recall from the theoretical section that if we assume no veto rights, $\widehat{c}^{US}_{M_{US}} > \widehat{c}^{CAN}_{M_{US}}$ implies that U.S. merger policy is too lenient from the point of view of Canadian consumers. That is, the U.S. authorizes domestic mergers which increase consumer surplus in the U.S. but lower it in Canada. Likewise, $\widehat{c}^{CAN}_{M_{CAN}} > \widehat{c}^{US}_{M_{CAN}}$ means that the Canadian merger authority is too lenient on domestic mergers from the point of view of U.S. consumers. As with the veto-rights baseline, the cases, $\widehat{c}^{US}_{M_{US}} < \widehat{c}^{CAN}_{M_{US}}$ and $\widehat{c}^{CAN}_{M_{CAN}} < \widehat{c}^{US}_{M_{CAN}}$ still imply that domestic merger policy is too tough from the point of view of foreign consumers.

How lenient or tough are merger policies according to our new calibration? In Tables A2 and A3, we relax domestic competition policy slightly, in the sense that we now also authorise mergers which increase prices by no more than 0.1%. If competition policy was too lenient from the point of view of foreign consumers, we should observe consumer surplus decreases abroad. By contrast, if merger policy was too tough, we should see consumer surplus increases in the other country.

Table A2 shows that when we relax U.S. merger policy, Canadian consumer surplus increases in the mean as well as the median sector. There is a strong degree of sectoral heterogeneity, however, with Canadian consumer surplus strongly decreasing in a few sectors. Table A3 shows broadly similar results for a relaxation of Canadian merger policy which leads to increases in U.S. consumer surplus. This time, however, we do not find any sectors with negative consumer surplus effects. The explanation for these findings is again the presence of positive trade costs together with the more competitive nature of the US market. As discussed previously, the existence of trade costs implies that in most sectors, domestic merger policy will be too tough from the point of view of foreign consumers. These consumers want more,

not fewer mergers abroad. Exceptions to this general pattern are a few U.S. sectors in which the more competitive nature of the U.S. market means that even with trade costs, U.S. mergers can sometimes decrease consumer surplus in Canada.

Table A4 looks at what happens if we introduce veto rights on foreign mergers. These results are the mirror image of our earlier counterfactual of abolishing veto rights (Table 7): we see increases in consumer surplus in the average Canadian sector, and decreases in the average U.S. sectors. The intuition is the same as before. There are a few sectors in which U.S. merger policy is too lenient on domestic mergers. Once Canada has veto rights, it blocks the corresponding mergers which leads to an increase in its consumer surplus. The reverse is not true because there are very few mergers which the U.S. would have liked to block. The losses from not being able to implement the domestic mergers now blocked by Canada outweigh the very small gains from being able to prevent consumer-surplus decreasing Canadian mergers. Note, however, that nothing happens in the majority of sectors. In these sectors, domestic competition policy was too tough on domestic mergers from the point of view of foreign consumers. Introducing veto rights again does nothing to address this type of conflict.

Finally, Table A5 again considers the scenario of a North American merger authority. The qualitative results are very similar to once presented in Table 8. Because the new merger authority considers total consumer surplus, it is able to address consumer surplus losses arising from too-tough-for-thy neighbor policies. The overall gains are again positive even though Canada still loses out. The only difference to our earlier result in Table 8 is that we start from a different initial situation, so that the magnitude of the gains are different.

Overall, our no-veto-rights baseline counterfactuals confirm the main results from our previous analysis. The main problem for the international coordination of merger policy is not that domestic authorities are too lenient on domestic mergers from the point of view of a foreign consumers. Rather, they are too tough and do not authorise mergers which would increase consumer surplus abroad.

8 Conclusion

Because of cross-border demand and supply linkages, merger approval decisions of national antitrust authorities have important effects on other jurisdictions. In this paper, we have provided a quantitative framework to analyze the resulting conflicts between consumer-surplus maximizing merger authorities. For very general demand and cost structures, we have shown

that the relevant factors influencing the type and likelihood of conflict are initial market structures and the trade cost between markets. To judge which situations are prevalent in practice, and to get an idea of the magnitude of the economic consequences of conflict, we have calibrated our model to match sectoral data for 160 U.S. and Canadian manufacturing sectors for 2002.

Our first key results is that conflicts between competition authorities can be expected to be frequent; they arise unless trade costs and market asymmetries happen to exactly offset each other. Second, the majority of these conflicts will be 'hidden', in the sense that they will 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. This issue can only 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 liberalisation will make it more important for domestic authorities to exercise control over mergers taking place abroad. Moreover, our results suggest that the gains from coordination through supranational merger authorities may be largest at trade costs close to present levels.

While our quantitative results were derived under very specific assumptions regarding demand and cost structures, we believe 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 framework 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.

References

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

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

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

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

[5] Brander, James A., and Barbara J. Spencer (1983). ?????

[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] Deneckere, Raymond and Carl Davidson (1985). "Incentives to Form Coalitions with Bertrand Competition." *Rand Journal of Economics*, vol. 16(4), 473-486.

[8] diGiovanni, 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.

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

[10] Gomes, Armando (2005). "Multilateral Contracting with Externalities." *Econometrica*, vol. 73(4), 1329-1350.

[11] Gomes, Armando, and Philippe Jehiel (2005). "Dynamic Processes of Social and Economic Interactions: On the Persistence of Inefficiencies." *Journal of Political Economy*, vol. 113(3), 626-667.

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

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

[14] Robert Inklaar and Marcel P. Timmer (2012), "The Relative Price of Services," forthcoming in *Review of Income and Wealth.*

[15] Jehiel, Philippe, and Benny Moldovanu (1995a). "Negative Externalities May Cause Delay in Negotiations." *Econometrica*, vol. 63(6), 1321-1335.

[16] Jehiel, Philippe, and Benny Moldovanu (1995b). "Cyclical Delay in Bargaining with Externalities." *Review of Economic Studies*, vol. 62(4), 619-637.

[17] Kamien, Morton I., and Israel Zang (1990). "The Limits of Monopolization through Acquisition." *Quarterly Journal of Economic*s, vol. 105(2), 465-499.

[18] McAfee, R. Preston, and Michael A. Williams (1992). "Horizontal Mergers and Antitrust Policy." *Journal of Industrial Economics,* vol. 40(2), 181-87.

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

[20] Nevo, Aviv (2000). "Mergers with Differentiated Products: The Case of the Read-to-Eat Breakfast Cereal Industry." *Rand Journal of Economics,* vol. 31(3), 395-421.

[21] 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.

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

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

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

[25] Perry, Martin K., and Robert H. Porter (1985). "Oligopoly and the Incentive for Horizontal Merger." *American Economic Review*, vol. 75(1), 219-227.

[26] Pesendorfer, Martin (2005). "Mergers under Entry." *Rand Journal of Economics*, vol. 36(3), 661-679.

[27] Salant, Stephen W., Sheldon Switzer, and Robert J. Reynolds (1983). "Losses from Horizontal Merger: The Effects of an Exogenous Change on Industry Structure on Cournot-Nash Equilibrium." *Quarterly Journal of Economics*, vol. 98(2), 185-199.

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

A Proofs

A.1 Proof of Lemma 1

Proof. Because firms are able to segment markets perfectly, we can focus on a single sector s and country i. Dropping the sector index for notational convenience, firm k's profit-maximizing output in country i, conditional on aggregate output Q^i, is given by the fitting-in function

$$h(Q^i; c_k^i) = \max\left\{0, -\frac{P^i(Q^i) - c_k^i}{P^{i\prime}(Q^i)}\right\}.$$

Assumption 1 ensures that there is at least one firm k such that $h(Q^i; c_k^i) > 0$ for Q^i sufficiently small, and that, for every k, $h(Q^i; c_k^i) = 0$ for Q^i sufficiently large. Let

$$\Gamma(Q^i; (c_k^i)_{k\in\mathcal{N}^1\cup\mathcal{N}^2}) \equiv \sum_{k\in\mathcal{N}^1\cup\mathcal{N}^2} h(Q^i; c_k^i) - Q^i.$$

The properties of the fitting-in function imply that $\Gamma(Q^i; (c_k^i))$ is strictly positive for Q^i sufficiently small and strictly negative for Q^i sufficiently large. By continuity, there exists an equilibrium level of aggregate output, denoted Q^{i*}, such that $\Gamma(Q^{i*}; (c_k^i)) = 0$. Notice also that $P(Q^{i*}) > c_k^i$ for some k.

Next, we establish uniqueness of this equilibrium aggregate output level. Suppose $\tilde{Q}^i$ is

such that $\Gamma(\tilde{Q}^i;(c_k^i))=0$, and let $k \in \mathcal{N}^1 \cup \mathcal{N}^2$. If $P^i(\tilde{Q}^i) > c_k^i$, then:

$$\begin{aligned}\partial_1 h(\tilde{Q}^i; c_k^i) &= -\frac{(P^{i\prime})^2(\tilde{Q}^i) - \left(P^i(\tilde{Q}^i) - c_k^i\right) P^{i\prime\prime}(\tilde{Q}^i)}{\left(P^{i\prime}(\tilde{Q}^i)\right)^2}, \\ &= \frac{1}{-P^{i\prime}(\tilde{Q}^i)}\left(P^{i\prime}(\tilde{Q}^i) + h(\tilde{Q}^i; c_k^i)P^{i\prime\prime}(\tilde{Q}^i)\right),\end{aligned}$$

which is strictly negative by Assumption 1.[26] If $P^i(\tilde{Q}^i) < c_k^i$, then $\partial_1 h(\tilde{Q}^i; c_k^i) = 0$. Finally, if $P^i(\tilde{Q}^i) = c_k^i$, then $h(.; c_k^i)$ has a strictly negative left derivative and a right derivative equal to zero. Combining these findings, we conclude that $\Gamma(.;(c_k^i))$ is strictly decreasing in the neighborhood of $\tilde{Q}^i$. By continuity, it follows that $\Gamma(.;(c_k^i))$ intersects the horizontal axis once and only once.

Finally, we prove that Q^{i*} is weakly decreasing in c_k^i, and strictly so if $q_k^{i*} > 0$. Let $c_k^{i\prime} > c_k^i$ and $c_l^{i\prime} = c_l^i$ for all $l \neq k$. Suppose first that $q_k^{i*} = 0$. Then,

$$\Gamma(Q^{i*};(c_k^{i\prime})) = \Gamma(Q^{i*};(c_k^i)) = 0,$$

so the equilibrium aggregate output is not affected by an increase in c_k^i. Conversely, suppose $q_k^{i*} > 0$. Clearly, $h(Q^{i*}; c_k^i) > h(Q^{i*}; c_k^{i\prime})$, and

$$\Gamma(Q^{i*};(c_k^{i\prime})) < \Gamma(Q^{i*};(c_k^i)) = 0.$$

It follows that the equilibrium aggregate output is strictly decreasing in c_k^i. □

A.2 Proof of Lemma 2

Proof. Merger M is CS-neutral in country i if, conditional on the pre-merger aggregate output Q^{i*}, the merged firm wants to produce exactly as much output as the merger partners did before the merger. Using the same notation as in the proof of Lemma 1, this means that $\Delta CS^i(M) = 0$ if

$$h(Q^{i*}; \overline{c}_M^i) = h(Q^{i*}; c_1^i) + h(Q^{i*}; c_2^i)$$

[26] If $P^{i\prime\prime}(\tilde{Q}^i) \leq 0$, then this is trivial. If $P^{i\prime\prime}(\tilde{Q}^i) > 0$, then

$$\begin{aligned}P^{i\prime}(\tilde{Q}^i) + h(\tilde{Q}^i; c_k^i)P^{i\prime\prime}(\tilde{Q}^i) &\leq P^{i\prime}(\tilde{Q}^i) + \tilde{Q}^i P^{i\prime\prime}(\tilde{Q}^i), \\ &< 0,\end{aligned}$$

where the first line follows from the fact that $\tilde{Q}^i \geq h(\tilde{Q}^i; c_k^i)$ (since $\Gamma(\tilde{Q}^i;(c_k^i)) = 0$) and the second line follows from Assumption 1.

or, rewriting,

$$P^i(Q^{i*}) - \overline{c}^i_M = [P^i(Q^{i*}) - c^i_1] + [P^i(Q^{i*}) - c^i_2].$$

Solving for $\overline{c}^i_M = \tau^{1i}\overline{c}_M$, we obtain

$$\overline{c}_M = c_1 + c_2 - \frac{P^i(Q^{i*})}{\tau^{1i}} \equiv \widehat{c}^i_M.$$

As a decrease in $\overline{c}_M$ raises aggregate output by Lemma 1, it follows that merger M is CS-increasing in country i if $\overline{c}_M < \widehat{c}^i_M$, and is CS-decreasing if the inequality is reversed.

To see that merger M is profitable in country i if it is CS-neutral in that country, note that (i) the price remains unchanged after the merger, (ii) the merged firm produces the same output as the merger partners did jointly before the merger, but (iii) the output is produced at lower costs after the merger as $\widehat{c}^i_M < \min\{c^i_1, c^i_2\}$. To see that a CS-increasing merger is profitable, note that it involves lower post-merger cost than a CS-neutral merger and that the joint output of the firms not involved in the merger is lower as well (as the fitting-in function $h(Q;c)$ is decreasing in Q). □

Proposition 2: *There exists a threshold value $\widehat{\tau}^{12}$ of trade costs from country 1 to country 2 such that the domestic CS-standard for approval of a merger between firms in country 1 is*

- a *too-tough-for-thy-neighbor policy* by the home country 1 if $\tau^{12} > \widehat{\tau}^{12}$,
- a *too-tough-for-thy-neighbor policy* by the foreign country 2 if $\tau^{12} < \widehat{\tau}^{12}$, provided that country has veto power (and a *too-lenient-for-thy-neighbor-policy* by the home country 1 otherwise).

Moreover, $\widehat{\tau}^{12}$ is weakly decreasing in τ^{21}.

Proof. We introduce the following notations: for $i, j \in \{1, 2\}$,

$$\begin{aligned} \Lambda^{ij+} &= \left\{k \in \mathcal{N}^i : \ P^{j*} > c^j_k\right\}, \\ \Lambda^{ij-} &= \left\{k \in \mathcal{N}^i : \ P^{j*} \geq c^j_k\right\}. \end{aligned}$$

In the following, we denote by $\frac{\partial f^+}{\partial x}$ (resp. $\frac{\partial f^-}{\partial x}$) the right (resp. left) derivative of function f with respect to variable x. Let $i \neq j$ in $\{1, 2\}$. Applying the implicit function theorem to

equation $\Gamma(Q^i;(c_k^i))=0$, we obtain:

$$\begin{aligned}\frac{\partial P^{i*+}}{\partial \tau^{ji}} &= P^{i\prime}(Q^{i*})\frac{\partial Q^{i*+}}{\partial \tau^{ji}},\\ &= \frac{1}{\tau^{ji}}\frac{\sum_{k\in\Lambda^{ji+}} c_k^i}{|\Lambda^{ii+}|+|\Lambda^{ji+}|+\frac{P^{i\prime}(Q^{i*})+Q^{i*}P^{i\prime\prime}(Q^{i*})}{P^{i\prime}(Q^{i*})}},\\ &\leq \frac{1}{\tau^{ji}}\frac{|\Lambda^{ji+}|P^i(Q^{i*})}{|\Lambda^{ii+}|+|\Lambda^{ji+}|+\frac{P^{i\prime}(Q^{i*})+Q^{i*}P^{i\prime\prime}(Q^{i*})}{P^{i\prime}(Q^{i*})}},\\ &\leq \frac{P^i(Q^{i*})}{\tau^{ji}},\end{aligned} \tag{2}$$

where the last inequality follows from Assumption 1. A similar inequality can be derived for $\frac{\partial P^{i*-}}{\partial \tau^{ji}}$ if we replace Λ^{ii+} and Λ^{ji+} by Λ^{ii-} and Λ^{ji-} respectively. Therefore, P^{i*}/τ^{ji} is strictly decreasing in τ^{ji}. Moreover, P^{i*}/τ^{ji} is continuous and converges to $+\infty$ and 0 as τ^{ji} goes to 0 and ∞, respectively. This establishes the existence of threshold $\widehat{\tau}^{ji}$.

Last, notice that P^{j*} is weakly increasing in τ^{ij} (see equation (2) above). This implies that $\widehat{\tau}^{ji}$ is indeed weakly decreasing in τ^{ij}. □

B Solution of the Cournot Game with Linear Demand

As each firm can sell its good at home and abroad, the number of potentially active firms in sector s is $N_s = N_s^1 + N_s^2$ in both countries. However, because a firm can profitably sell in a market only if its unit cost is less than the market price it faces (net of iceberg transportation costs), the number of *active* firms can vary across countries. We drop sector subscripts from now on to ease notation.

Consider the manufacturing market in country i. We relabel firms such that $c_1^i \leq c_2^i \leq \ldots \leq c_N^i$, i.e., adjusting for trade costs, firms are ranked from the most productive to the least productive.

Consider an equilibrium candidate in which the first K firms are active. For $1 \leq k \leq K$, the profit of firm k in country i is given by $\pi_k^i = \left(a^i - b^i(q_k^i + Q_{-k}^i) - c_k^i\right) q_k^i$, where $Q_{-k}^i = \sum_{l\neq k} q_l^i$ is the total output of firm k's rivals. This yields the usual first-order condition: $a^i - b^i Q_{-k}^i - c_k^i - 2b^i q_k^i = 0$. Denoting by $C_M^i = \sum_{k=1}^K c_k^i$ the sum of the marginal costs of the first K firms, and summing over the active firms' first-order conditions, we obtain the market price in country i in this equilibrium candidate:

$$P^i = \frac{a + C_K^i}{K+1}.$$

It follows from usual stability arguments (e.g., Vives, 2001) that there exists a unique $\overline{K} \in \{0, 1, \ldots, N\}$ such that

$$\begin{aligned} &\tfrac{a^i + C^i_K}{K+1} > c^i_K \quad \text{for all } 1 \leq K \leq \overline{K}, \\ \text{and} \quad &\tfrac{a^i + C^i_K}{K+1} \leq c^i_K \quad \text{for all } \overline{K}+1 \leq K \leq N. \end{aligned}$$

Therefore, at the unique Nash equilibrium, only the first $\overline{K}$ firms are active, and

$$\begin{aligned} P^i &= \frac{a^i + C^i_{\overline{K}}}{\overline{K}+1}, \\ q^i_k &= \frac{\max(P^i - c^i_k, 0)}{b^i}, \quad 1 \leq k \leq N, \\ \pi^i_k &= \frac{\max(P^i - c^i_k, 0)^2}{b^i}, \quad 1 \leq k \leq N. \end{aligned}$$

C Data Appendix

For the calibration procedure described in Section 6, we require data on the number of mergers per industry, industry sales, total costs, labor cost shares, bilateral trade flows and relative export prices for trade between the United States and Canada, and production-based Herfindahl indices for each industry in Canada and the U.S. For the out-of-sample model validation in Section 7.1 we also need Canadian and U.S. concentration ratios (sales shares of the 4, 8, and 20 largest firms in each 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 for the year 2002 for which we have data for all required variables.[27]

Data on U.S. and Canadian industry-level sales, total costs, labor cost shares, 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

[27] We later drop four sectors in which our model does not match the empirical moments well; see Section 7.1.

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). Using the same data, we also calculate unit values which we use as proxies for industry-level export prices. 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.

The NBER trade data report quantities and values at the ten-digit level of the harmonized system (HS). We use the concordance by Pierce and Schott (2009) to map these data from HS into NAICS, and then compute unit values as the ratio of NAICS-level trade value to quantity. If the HS products mapping into a given NAICS code contain multiple types of units (e.g., kg and square metres), we use the unit appearing most frequently. To reduce the importance of outliers, we take averages over each industry's unit values over the period 1998-2006. We also winsorize all data below the 10th percentile and above the 90th percentile of the distribution of unit values across industries. In order to check the plausibility of the resulting relative Canadian-U.S. prices, we have compared them to relative industry-level output prices calculated by Inklaar and Timmer (2012) 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. We weigh these by the count of sectors in our data corresponding to each of these aggregated industries.[28] Using these weights to determine the median sector, we obtain a median relative price of 1.10 which is close to the median relative price of 1.15 reported in Table 1.

We convert all value entries into U.S. dollars using the average U.S.-Canadian dollar exchange rate over the period 1997-2007.[29] 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 36,510

[28]For example, the aggregate sector "Food, Beverage & Tobacco" corresponds to 22 sectors in our data and so obtains a weight of 22/156.

[29]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). However, using the 2002 exchange rate does not affect any of our conclusions.

USD and an average wage rate for Canada of 27,386 USD in 2002.[30]

[30]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.

Figure 1: Theoretical vs. Empirical Moments (Targeted Moments)

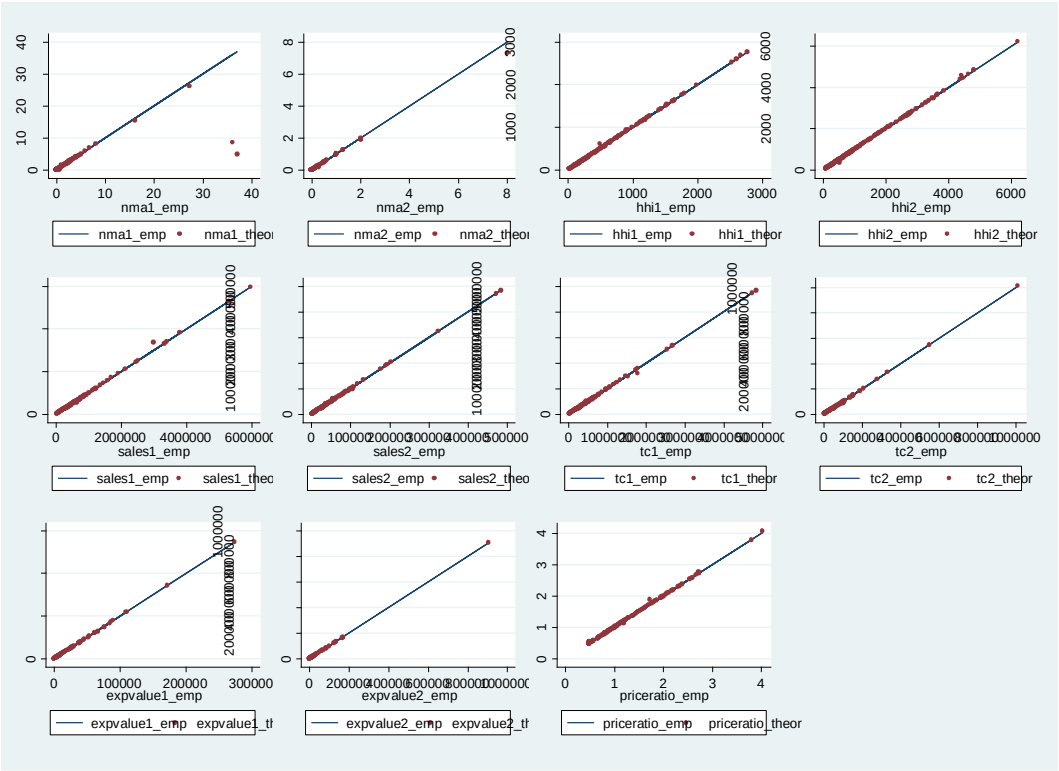


Figure 2: Theoretical vs. Empirical Moments (Moments not Targeted)

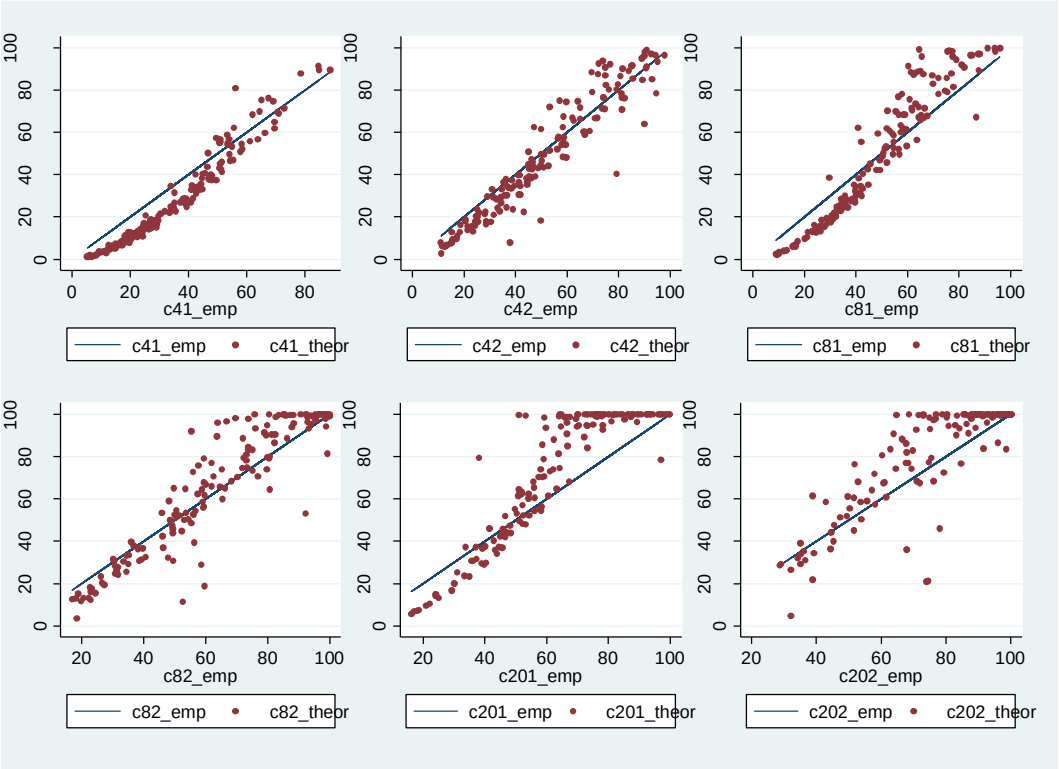
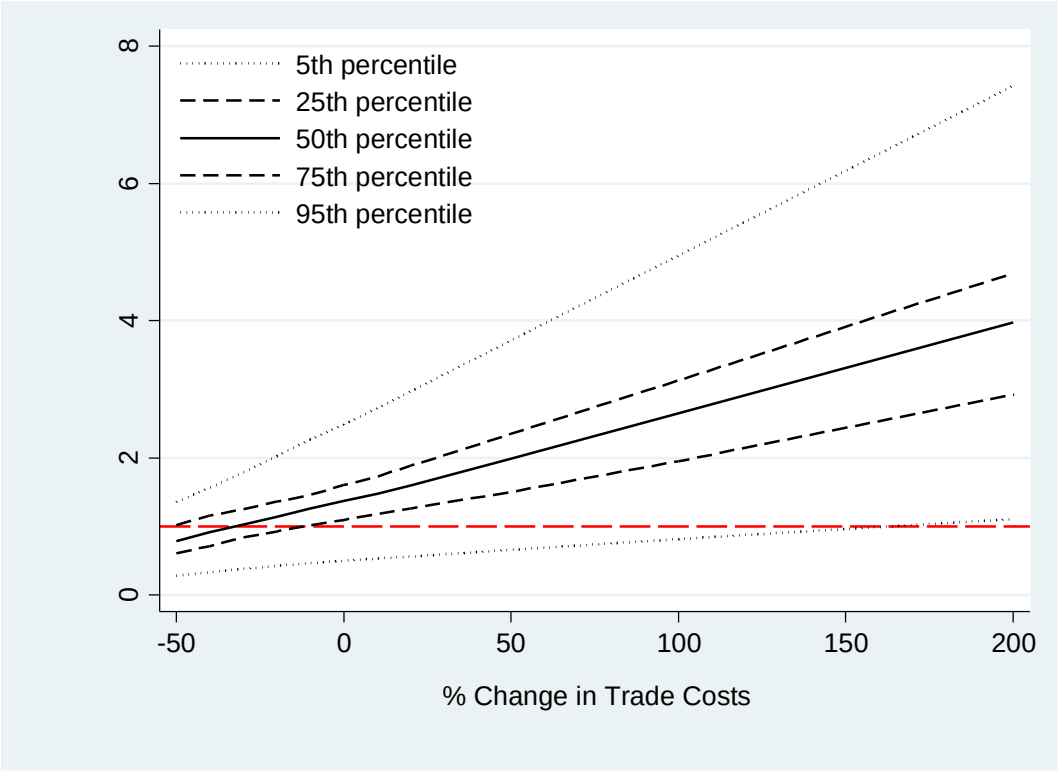
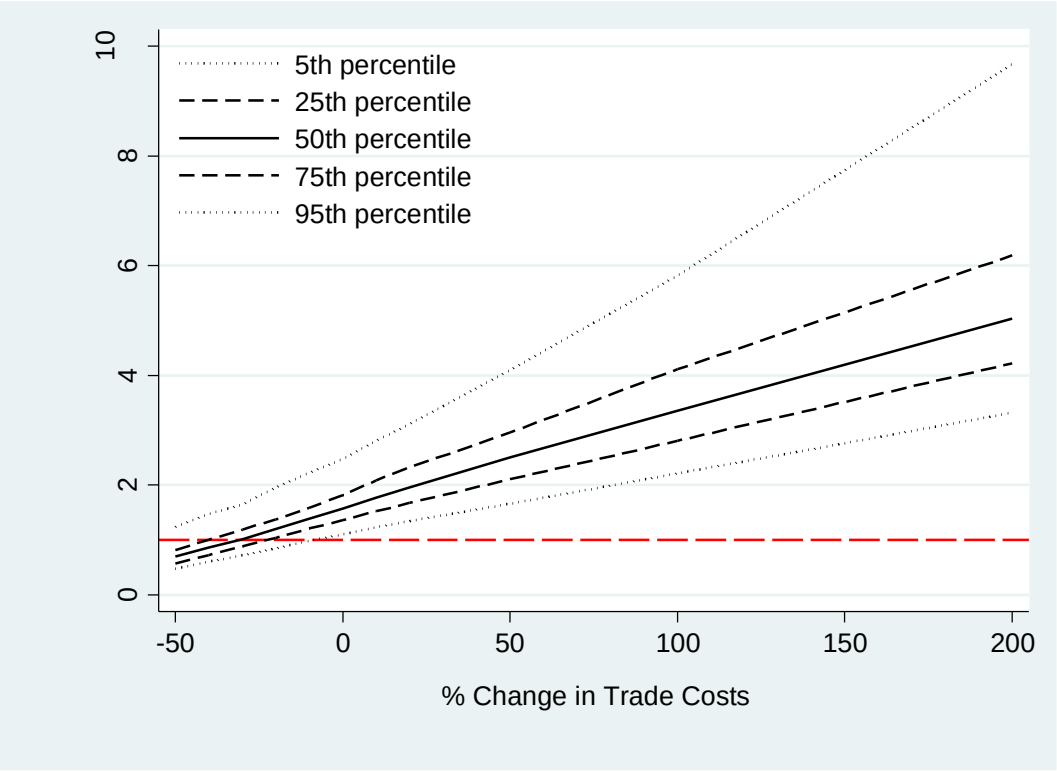


Figure 3: Potential Conflicts arising from U.S. Mergers (Veto-Rights Baseline)



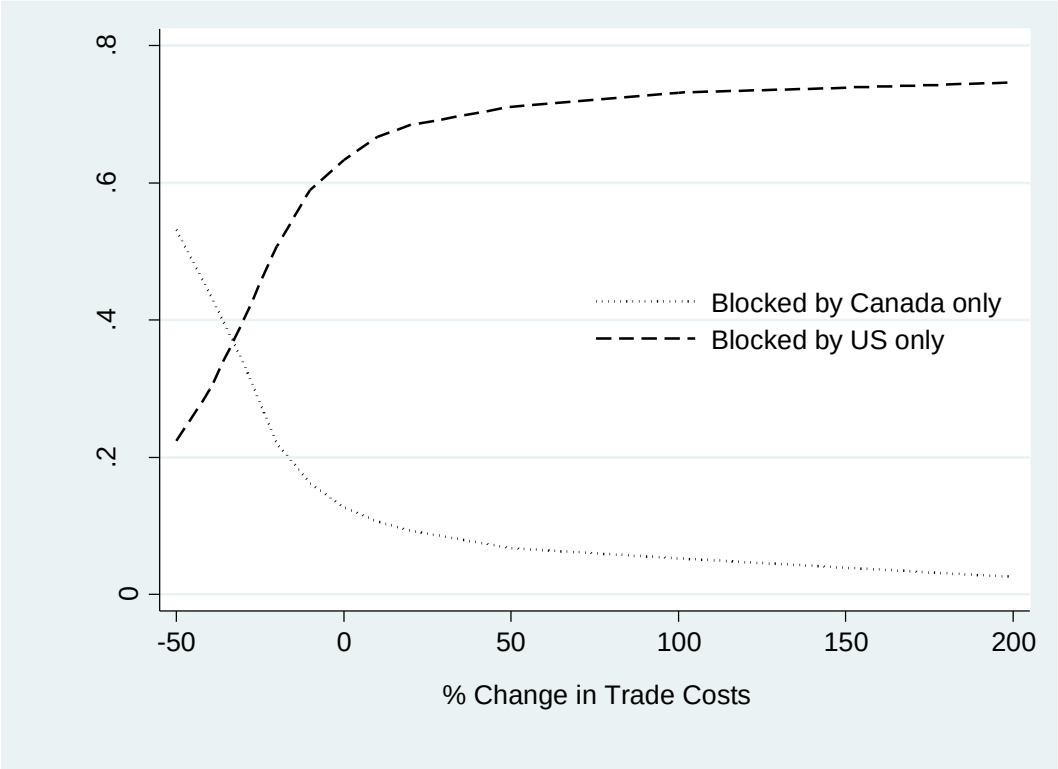
Notes: Figure shows percentiles of the distribution of $\tau_{USCAN} * P_{US}/P_{CAN}$ across sectors for different trade cost changes. Values larger than 1 indicate U.S. merger control (over U.S. mergers) will be too tough for Canada. Values smaller than 1 indicate Canadian merger control is too tough for the U.S.

Figure 4: Potential Conflicts arising from Canadian Mergers (Veto-Rights Baseline)



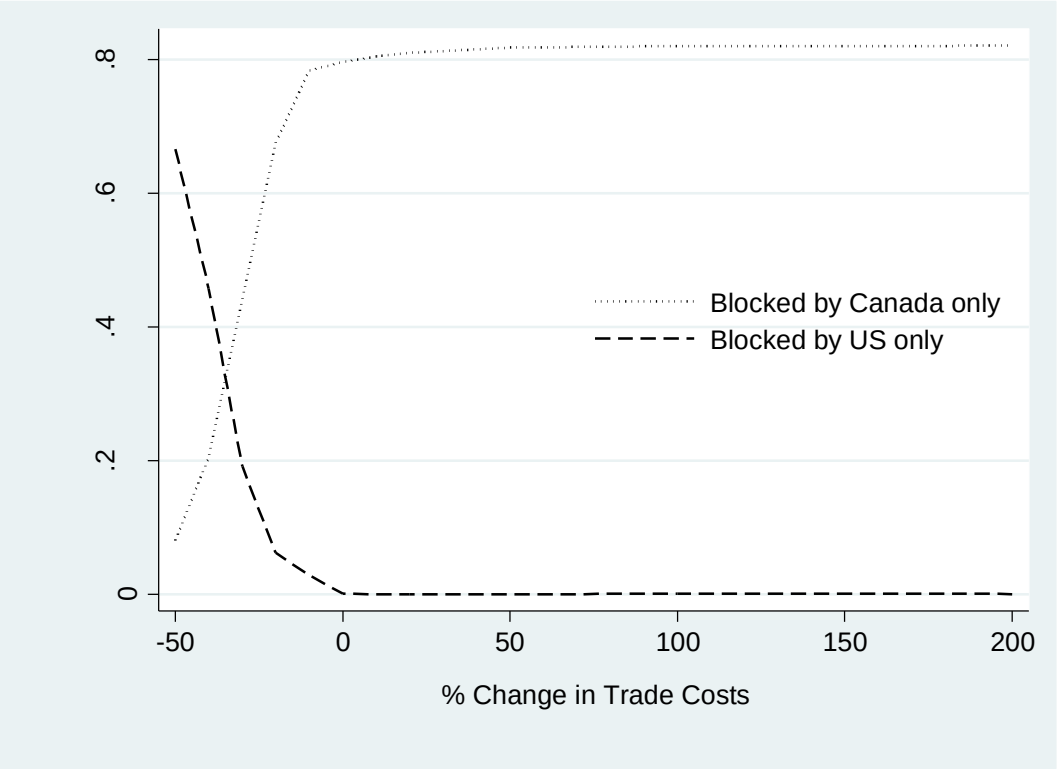
Notes: Figure shows percentiles of the distribution of $\tau_{CANUS} * P_{CAN}/P_{US}$ across sectors for different trade cost changes. Values larger than 1 indicate Canadian merger control (over Canadian mergers) will be too tough for the U.S. Values smaller than 1 indicate U.S. merger control is too tough for Canada.

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



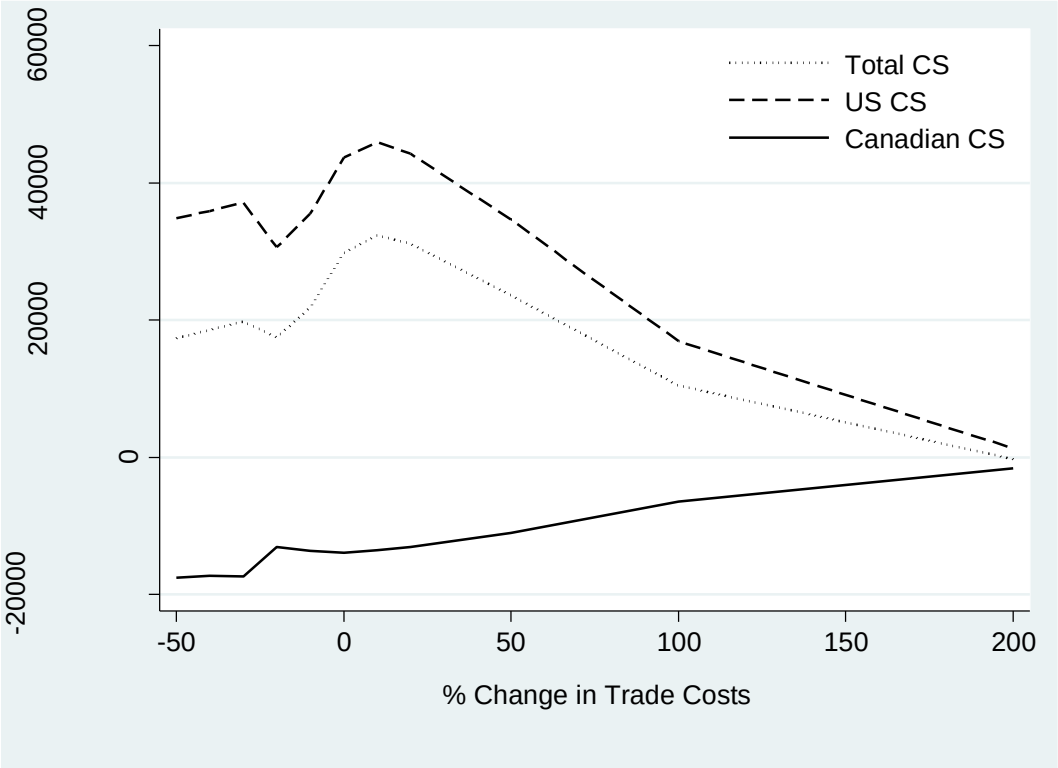
Notes: Figure shows means across sectors of the fraction of profitable mergers where a conflict arose (calculated as a fraction of all profitable merger opportunities for each sector). "Blocked by Canada only" means that the U.S. authorised the merger but Canada blocked it; "blocked by US only" means that Canada authorised the merger but the US blocked it. If there are no merger opportunities in a sector, the sector is dropped.

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



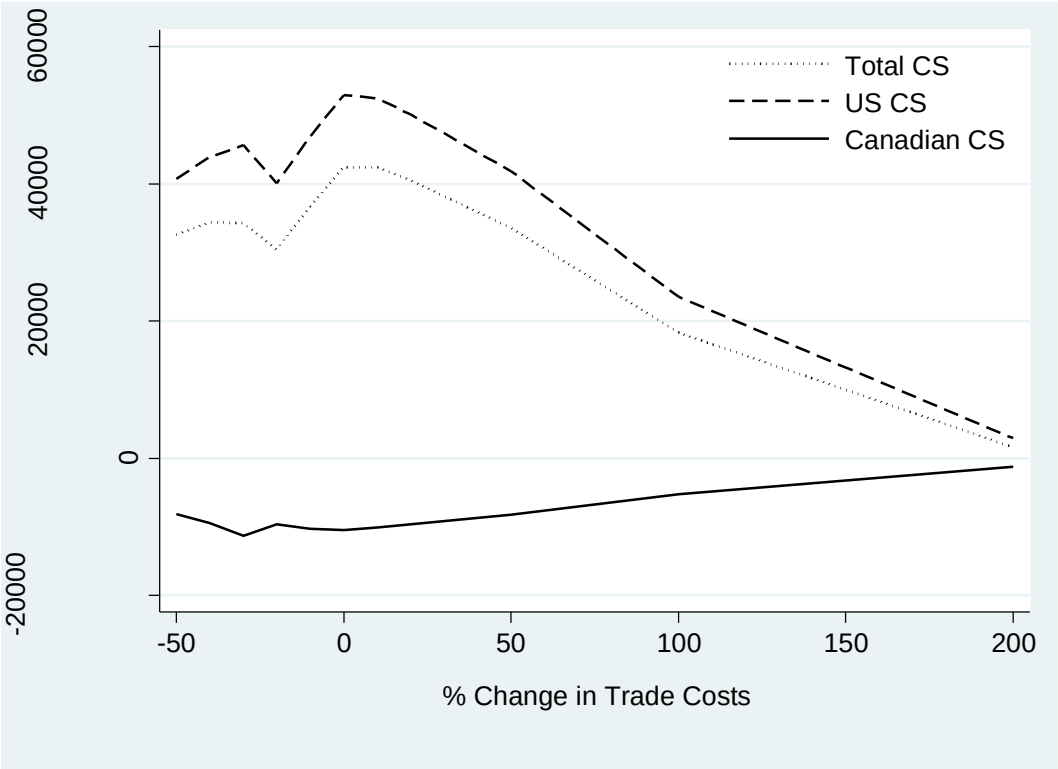
Notes: Figure shows means across sectors of the fraction of profitable mergers where a conflict arose (calculated as a fraction of all profitable merger opportunities for each sector). "Blocked by Canada only" means that the U.S. authorised the merger but Canada blocked it; "Blocked by US only" means that Canada authorised the merger but the US blocked it. If there are no merger opportunities in a sector, the sector is dropped.

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



Notes: The figure shows the USD change in consumer surplus induced by a move from veto rights to no-veto rights for different levels of trade cost changes.

Figure 8: Consumer surplus change, move from Veto-Rights Case to North-American Competition Authority



Notes: The figure shows the USD change in consumer surplus induced by a move from the veto-rights case to a North-American competition authority for different levels of trade cost changes.

Table 1: Empirical Moments - Summary Statistics

Empirical Moment	Mean	Median	Standard Deviation	Minimum	Maximum
# M&As US	1.42	0.89	2.81	0	27.2
# M&As CAN	0.13	0	0.32	0	2
Export Price Ratio CAN/US	1.36	1.15	0.7	0.48	3.8
Shipments US ('000 USD)	20964381	12060038	29162888	979685	217802672
Shipments CAN ('000 USD)	1542081	866175	2436758	43903	17671654
Exports US ('000 USD)	553462	202249	1124503	3508	9980264
Exports CAN ('000 USD)	796970	190584	2817971	158	33085242
HHI US (%)	603	411	566	19	2758
HHI CAN (%)	1298	873	1194	77	6204
Total Cost US ('000 USD)	15635689	9095777	23553436	664830	176386832
Total Cost CAN ('000 USD)	1773852	854798	3665252	40338	36910824
Observations	156	156	156	156	156

Notes: 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.

Table 2: Parameter Values - Summary Statistics

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}	1594.378	655	3175.09	21	32805
N^{CAN}	270.135	128	428.432	10	3840
β^{US}	50	50	0	50	50
β^{CAN}	50	50	0	50	50
η^{US}	0.287	0.275	0.1	0.034	0.53
η^{CAN}	0.259	0.259	0.097	0.017	0.488
B) Calibrated Parameters	**Mean**	**Median**	**Standard Deviation**	**Minimum**	**Maximum**
T^{US}	611.34	27.822	4167.06	0	50000
T^{CAN}	18.346	0	152.625	0	1901.004
a^{US}	25	25	0	25	25
a^{CAN}	80.087	22.923	224.181	2.092	2432.047
$1/b^{US}$	17785.24	6072.238	46246.42	220.46	460120.188
$1/b^{CAN}$	7562.416	418.235	38038.5	1.13	408213.375

$\tau^{CAN,US}$	1.472	1.248	0.701	0.578	4.566
$\tau^{US,CAN}$	1.776	1.524	1.036	0.057	5.555
ζ^{US}	0.19	0.117	0.327	0.004	3.404
ζ^{CAN}	1.46	0.418	9.248	0.024	115.52
x^{US}	2.428	1.712	2.444	0.107	19.639
x^{CAN}	3.137	2.263	3.011	0.087	22.587
Observations	156	156	156	156	156

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

Table 3: Simulated Domestic and Cross-Border Price Effects of Mergers between Active Firms (Baseline: Veto Rights)

Price Effect	Mean	Median	Standard Deviation	Minimum	Maximum
US merger, US price	-0.16%	-0.11%	0.15%	-0.78%	0.00%
US merger, Canadian price	-0.15%	-0.10%	0.22%	-1.99%	0.00%
Canadian merger, Canadian price	-0.12%	-0.07%	0.12%	-0.63%	0.00%
Canadian merger, US price	-0.09%	-0.04%	0.17%	-1.09%	0.00%

Table 4: Synergy Effects for Baseline Case (reduction in marginal costs of merged firm relative to merger party with the lowest marginal costs)

MC Reduction	Mean	Median	Standard Deviation	Minimum	Maximum
US mergers	-11.5%	-10.4%	4.8%	-32.6%	-2.0%
Canadian mergers	-10.3%	-10.0%	4.4%	-26.4%	-3.0%

Table 5: Simulated Effects of a Merger Policy Change (Counterfactual 1: Eliminate US Veto on Canadian Mergers – but Canada still has veto rights on US mergers).

Change in Outcome (000s USD or %)	Mean	Median	Standard Deviation	Minimum	Maximum
Total Consumer Surplus US+Canada	-0.4	0	84.9	-961.1	314.9
Consumer Surplus US	-4.2	0	92.8	-1099.9	277.2
Consumer Surplus Canada	3.8	0	20	-1.7	155.8
Number of US Mergers	0.00%	0.00%	0.04%	-0.20%	0.43%
Number of Canadian Mergers	0.23%	0.00%	0.99%	0.00%	9.09%
US HHI	0.00%	0.00%	0.00%	-0.01%	0.00%
Canadian HHI	0.00%	0.00%	0.03%	-0.04%	0.33%

Table 6: Simulated Effects of a Merger Policy Change (Counterfactual 2: Eliminate Canadian Veto on US Mergers – but US still has veto rights on Canadian mergers).

Change in Outcome (000s USD or %)	Mean	Median	Standard Deviation	Minimum	Maximum
Total Consumer Surplus US+Canada	29912.4	0	156214.5	-1459.2	1704687
Consumer Surplus US	43870.2	0	246161.1	-1456.7	2813619
Consumer Surplus Canada	-13957.8	0	92743.1	-1108932	288.4
Number of US Mergers	106.7%	0.0%	300.7%	-0.2%	1515.1%
Number of Canadian Mergers	-0.9%	0.0%	5.8%	-53.0%	0.0%
US HHI	0.8%	0.0%	3.9%	-0.5%	39.3%
Canadian HHI	-2.4%	0.0%	10.0%	-77.2%	0.0%

Table 7: Simulated Effects of a Merger Policy Change (Counterfactual 3: Abolishing Veto Rights, only domestic CS changes taken into account).

Change in Outcome (000s USD or %)	Mean	Median	Standard Deviation	Minimum	Maximum
Total Consumer Surplus US+Canada	29927.8	0	155929.9	-1459.2	1700494
Consumer Surplus US	43972.5	0	246206.3	-1456.7	2814383
Consumer Surplus Canada	-14044.7	0	93214.8	-1113889	288.4
Number of US Mergers	106.7%	0.0%	300.7%	-0.2%	1515.1%
Number of Canadian Mergers	-0.2%	0.0%	3.4%	-33.5%	9.1%
US HHI	0.8%	0.0%	3.8%	-0.5%	39.1%
Canadian HHI	-2.3%	0.0%	9.8%	-77.2%	0.8%

Table 8: Simulated Effects of a Merger Policy Change (Counterfactual 4: Accept Mergers which Increase Total CS).

Change in Outcome (000s USD or %)	Mean	Median	Standard Deviation	Minimum	Maximum
Total Consumer Surplus US+Canada	42632.2	198.8	210583.5	-12368.1	2400434
Consumer Surplus US	53201.5	0	271261.7	-17255	3127187
Consumer Surplus Canada	-10569.3	0	62106.5	-726753	4886.9
Number of US Mergers	72.4%	3.5%	194.0%	0.0%	1044.6%
Number of Canadian Mergers	37.3%	0.0%	97.9%	0.0%	780.0%
US HHI	0.6%	0.1%	2.1%	-1.9%	22.0%
Canadian HHI	1.9%	0.0%	14.4%	-71.9%	116.8%

Table A1: Parameter Values for No-Veto-Rights Calibration

Calibrated Parameters	Mean	Median	Standard Deviation	Minimum	Maximum
T^{US}	225.845	14.348	1156.856	0	12061.15
T^{CAN}	15.307	0	114.738	0	1417.515
a^{US}	25	25	0	25	25
a^{CAN}	80.07	23.225	225.182	2.092	2432.047
$1/b^{US}$	17893.49	6112.178	46390.98	220.46	460120.2
$1/b^{CAN}$	7610.588	430.105	38157.02	1.165	408213.4
$\tau^{CAN,US}$	1.468	1.246	0.702	0.578	4.566
$\tau^{US,CAN}$	1.784	1.528	1.034	0.059	5.555
ζ^{US}	0.189	0.115	0.328	0.004	3.404
ζ^{CAN}	0.733	0.417	1.066	0.024	7.417
x^{US}	2.418	1.703	2.446	0.107	19.639
x^{CAN}	3.135	2.274	3.015	0.087	22.587
Observations	156	156	156	156	156

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

Table A2: The U.S. accepts mergers which increase prices by less than 0.1%; Canada accepts mergers which do not raise prices.

Change in Outcome (000s USD or %)	Mean	Median	Standard Deviation	Minimum	Maximum
Total Consumer Surplus US+Canada	-188614	-11801.5	663034.8	-5769545	0
Consumer Surplus US	-190763	-10766.7	665397.3	-5769841	0
Consumer Surplus Canada	2149.8	118.3	5653.9	-11735.7	39143.6
Number of US Mergers	181.6%	180.9%	190.5%	0.0%	1200.0%
Number of Canadian Mergers	0.3%	0.0%	2.1%	-5.0%	16.7%
US HHI	5.1%	1.0%	9.8%	0.0%	59.9%
Canadian HHI	2.2%	0.1%	7.9%	-6.2%	79.1%

Table A3: Canada accepts mergers which increase prices by less than 0.1%; the U.S. accepts mergers which do not raise prices.

Change in Outcome (000s USD or %)	Mean	Median	Standard Deviation	Minimum	Maximum
Total Consumer Surplus US+Canada	6729.5	0	31680.8	-5023.6	314115.2
Consumer Surplus US	9378.9	0	42395.5	0	403824
Consumer Surplus Canada	-2649.4	0	11917.4	-89708.7	0.5
Number of US Mergers	0.0%	0.0%	0.8%	-6.3%	6.3%
Number of Canadian Mergers	130.8%	0.0%	258.4%	0.0%	1350.0%
US HHI	0.0%	0.0%	0.2%	-0.5%	1.3%
Canadian HHI	4.5%	0.0%	22.2%	0.0%	257.5%

Table A4: Only Accept Mergers which Increase CS in both countries ("Veto Rights")

Change in Outcome (000s USD or %)	Mean	Median	Standard Deviation	Minimum	Maximum
Total Consumer Surplus US+Canada	-2739.1	0	10043	-95977.8	1228.9
Consumer Surplus US	-3456.9	0	13499.1	-136337	1324.6
Consumer Surplus Canada	717.8	0	3718.6	-288.4	40359.3
Number of US Mergers	-13.08%	0.00%	29.70%	-95.48%	0.00%
Number of Canadian Mergers	-0.12%	0.00%	1.45%	-8.33%	11.17%
US HHI	-0.04%	0.00%	0.25%	-2.14%	0.07%
Canadian HHI	0.33%	0.00%	2.22%	-0.01%	26.23%

Table A5: Only Accept Mergers which Increase Total Consumer Surplus.

Change in Outcome (000s USD or %)	Mean	Median	Standard Deviation	Minimum	Maximum
Total Consumer Surplus US+Canada	7971.7	64.6	34277.7	-4253.7	333187.7
Consumer Surplus US	9208.4	0	41290.9	-10085.1	379658.5
Consumer Surplus Canada	-1236.7	0	8198.5	-66845.4	6659.2
Number of US Mergers	-3.9%	0.1%	17.1%	-79.2%	19.0%
Number of Canadian Mergers	41.2%	0.0%	111.8%	0.0%	921.4%
US HHI	0.1%	0.0%	0.4%	-2.5%	2.1%
Canadian HHI	4.7%	0.0%	22.8%	0.0%	254.6%