

**The Effects of Trade Liberalization
Between High and Low Cost Countries
when Merger Behavior is Endogenous**

Abstract:

This paper examines how the effects of trade liberalization depend on merger behavior. We endogenize merger choice among owners in an oligopolistic industry in asymmetric countries to analyze the consequences of trade cost reductions on competitiveness and welfare. In this context, the non-cooperative game supports asymmetric market structures. We also find that trade liberalization is not necessarily pro-competitive in countries with the competitive advantage, even if trade costs are completely abolished. More over, the tariff-jumping explanation of international mergers does not necessarily apply. The welfare analysis shows that merger behavior can significantly alter any gains from liberalization. Countries should consider enforcing competition in regional agreements. Specifically, to avoid a reduction in domestic welfare following trade liberalizing reductions in trade costs, a high-cost country's optimal policy may be to ban international mergers.

Keywords: Trade liberalization; Mergers; Tariff-jumping argument, Market structure.

JEL classification : F15 ;F23 ;L13 ;R38

1-Introduction

In the international economics literature there has been a methodological evolution in the analysis of the relationships between domestic market structures and international trade and policy. Originally it was believed that trade could affect market structure: an open economy, without tariffs or quotas, would support a more competitive market and better domestic producers' performance (e.g., Caves and Jones, 1973). Among the first, White (1974) explored the reverse relationship. Under the traditional assumption that producers take world prices as given, he demonstrated that under some conditions, market structures can influence trade.

Even after imperfect competition was formalized in the international trade literature, most studies considered market structures to be exogenous. In the most recent decade, the trade literature has been enriched by increased attention to market structure issues such as foreign direct investment and multinational enterprise, motivated by the increasing processes of trade liberalization. Step by step, models with endogenous market structure have been developed. For a survey, see Markusen, 1995.

Much interest has centered on the international location decisions of firms. For example, Horstmann and Markusen (1992) identified the market structures that arise in open economies among mobile firms that face identical marginal costs across countries. Later, Maggi (1996) examined the impact of optimal trade policies on endogenous market structures under incomplete compared to complete information (see also Motta and Norman, 1996). This literature identified the 'tariff jumping' explanation for international mergers in the presence of high trade costs.

Other papers on mergers in the context of trade liberalization have drawn on the Industrial Organization literature, and focus on the optimal regulation of mergers. Most of the

existing papers compare the welfare implications of just two market structures, an initial one with a merged one (e.g., Gaudet G. and R.Kanouni, 2004, Bertrand O. and Zitouna H., 2006). Collie (2003) has analysed the effects of foreign and domestic mergers on the domestic country's optimal trade policy under the assumption that there is no consumption in the foreign country.

Horn and Persson (2001) made a key contribution to the analysis of the dependence of market structure on the conditions of trade by providing a model of merger choice in an oligopolistic industry. Their criterion for the incentive to merge is more general than the one in the I-O literature. Assuming that firms' costs are the same in each country, Horn and Persson obtained results contrary to the 'tariff-jumping' argument. They show that firms merge internationally when trade costs are low, and merge domestically when they are high. Motta (1992) also arrived at such "unconventional conclusions."

Straume (2003) and Yildiz (2003) applied the Horn and Persson framework to examine the effects of trade liberalization on the nature of merger incentives. Both of those efforts maintain two assumptions. One, marginal production costs are identical across countries. Two, they abstract from corner solutions by assuming that trade costs (or tariffs) are never at prohibitive levels; so that output is always positive, profits are never negative, and firms never exit. In this paper, we also apply a version of the Horn and Persson framework, but relax the assumptions that production costs are identical and that trade costs are never prohibitive.

We model a world in which the marginal cost of production differs from country to country. The new model should be more useful in predicting the changes in market structure that may be induced by the creation of a customs union or free trade area between heterogeneous countries. Wage differences can be large between parties to regional trade agreements. For

example, concerning the North American Free Trade Agreement (NAFTA) Canadian and U.S. wages are much higher than in Mexico. Differences in production costs are also significant among the parties to MERCOSUR, CARICOM and COMESA. EU enlargement also involves high wage differentials between old and new members.

One of the questions addressed in the present paper is whether or not the existing literature's prediction about international mergers following reductions in trade costs due to liberalization is robust to more general and more realistic assumptions, including differences in costs of production among countries.

Second, this paper investigates some of the fears in higher-wage countries about the employment consequences of trade liberalization with lower-wage countries. We consider all four possible market structures, most notably, that i) domestic firms in high-wage/higher-cost countries effectively compete with firms in lower cost countries; ii) domestic firms leave the market entirely; iii) domestic firms internationally merge and choose either to produce within each market, or, iv) to concentrate all production in one country (as feared by citizens in the higher-cost country). As indicated above, (ii) and (iv) have been ignored by assumption in the existing literature. The model presented here rationalizes all four possible market structures. We identify the conditions under which each alternative may occur.

Third, liberalization is supposed to reduce prices paid by consumers significantly. Indeed, the objective of trade liberalization is to increase exchange and welfare by the reduction of costly impediments to trade. That hope has been alternately challenged (e.g., by Brander and Krugman, 1983) or reinforced (e.g., by Yildiz, 2003). Even the empirical evidence is unconvincing (e.g. World Bank Support for Trade 1987-2004). We contribute to our understanding of the issue by taking the endogeneity of market structure into account while investigating the welfare consequences of trade liberalization between asymmetric countries.

Thus the aim of this paper is three-fold: (i) to show the impact of trade liberalization on market structures when countries have different marginal production costs, (ii) to show the effects of trade liberalization when market structures are fully endogenous and firms may exit, and (iii) to analyze the welfare consequences and the distribution of the gains (or losses) of these alternative outcomes. The last step may help us understand why parties that the previous literature hypothesized would gain from liberalization have not gained or have opposed it, and vice-versa.

The paper is organized as follows. We present a two country model and the endogenous merger framework in section 2. We introduce asymmetry into the Horn and Persson framework by assuming that marginal costs differ across countries. This asymmetry allows a more general modelling of international mergers. Internationally merged firms choose ownership structure and location. They may produce only in one country and incur trade costs when serving the other market. They may also choose to produce locally in both markets and avoid trade costs.

The interactions occur in two stages: first, owners decide to merge (nationally or internationally) or not. Second, firms compete non-cooperatively on both markets. Section 3 characterizes the equilibrium ownership structures. One finding is that international mergers arise only at low levels of synergies: low trade costs and/or small differences between countries' production costs. More specifically, we show that for high trade costs, the equilibrium ownership structure (EOS) is a national merger within each country. When trade costs decrease, owners in the higher cost country choose a defensive strategy. They decentralize to protect their market shares. The EOS may be an asymmetric market structure with a national merger only in the lower-cost country. The likelihood of the result of such a strategy, however, decreases as the difference between countries' production costs increases. At some point as trade costs fall, firms

in high cost countries cannot compete, and should exit. Lower-cost country asset owners may induce that exit by an offensive strategy.

In section 4 we focus on the pattern of trade and the degree of competitiveness in each market. We uncover new insights that contrast with the traditional trade literature. One, we find that a regional trade agreement between different countries may lead to a stable asymmetric market structure with more competition in the higher-cost country, but not in both countries. Consumers in the country with the competitive advantage may still suffer from a less competitive market structure. Moreover, we identify discontinuities in trade, and non-linearities with respect to trade costs. Specifically, as trade costs decline, exports from low-cost country firms can actually be undermined by defensive strategic behavior on the part of import-competing country firm owners. Both findings contrast with the idea that greater decreases in trade costs should systematically allow for more trade.

We consider welfare aspects in section 5 and conclude in section 6 with a summary of the findings.

2.The model

Following Horn and Persson (2001), assume that the production of a homogeneous good needs one unit of an asset and that four owners are endowed with such asset units. Initially, owners 1 and 2 and their assets are located in country H (Home). Owners 3 and 4 and their assets are located in country F (Foreign). In each country, there is an identical linear demand:

$P = 1 - Q$. Markets are segmented because firms must pay a trade cost $1 \geq t \geq 0$ if they export. In contrast with Horn and Persson, assume that technology differs across countries, described by a constant marginal cost, $1 > C_H > 0.1$ in Home and $C_F = 0$ in Foreign.

With respect to merger behavior, the sequence of decisions can be summarized as follows. In the first stage, owners choose to merge nationally or internationally, or to remain firms. We assume that mergers within a country do not give rise to cost savings, and that fully concentrated market structures are excluded as illegal. If firms faced identical production costs across countries as assumed in the existing literature, trade costs can be avoided by merging internationally. In our model with different production costs, international mergers can give rise to cost savings two ways. Firms can still avoid trade costs if each merged firm produces in each country. But they can also avoid high production costs by choosing to produce only in the lower cost country and exporting to the other country's market. The first structure will be called 'trade cost saving' and the second 'production cost saving.'

Owners will prefer the trade cost saving structure for higher values of trade costs: formally, if $t > C_H$. This is consistent with the literature on foreign direct investment and multinational enterprise location choice. Merged firms move the locus of production out of the higher cost country if the difference between production costs is higher than the trade cost.

The second stage is a Cournot game where firms compete non-cooperatively on both markets, taking as given trade costs and the owners' choice. Let us now define the owners' choice criteria concerning alternative ownership structures.

2.1. First stage: merger framework

Merger formation is modeled as a cooperative game of coalition formation (Horn and Persson, 2001; Yildiz, 2003). The feasible ownership structures are:

- 1) No mergers. This ownership structure is denoted $M^{1,2,3,4} = [\{1\}, \{2\}, \{3\}, \{4\}]$
- 2) One national merger and no merger in the other country: $M^{12,3,4} = [\{12\}, \{3\}, \{4\}]$ or $M^{1,2,34} = [\{1\}, \{2\}, \{34\}]$
- 3) Only one international merger: $M^{13,2,4} = [\{13\}, \{2\}, \{4\}]$ (equivalently $[\{14\}, \{2\}, \{3\}]$; $[\{1\}, \{23\}, \{4\}]$; $[\{1\}, \{24\}, \{3\}]$)
- 4) Two national mergers: $M^{12,34} = [\{12\}, \{34\}]$
- 5) Two international mergers: $M^{13,24} = [\{13\}, \{24\}]$ (equivalently $[\{14\}, \{23\}]$).

We assume that monopoly with an international merger of all four, $\{1234\}$ and duopoly with an international merger of three firms, for example $\{123,4\}$, are not allowed by any country's authorities. This assumption can be justified by the relevance of the dominant position concept, particularly with respect to EU merger control, even if it is not a dominant position itself that raises concerns but an abusive conduct which is penalized (see Seabright, 2000).

When considering a merger, participating owners also have to consider how to distribute the payoff among themselves. The distribution must satisfy two constraints: the sum of distributed payoffs must equal the amount of each coalition's profits to be earned in the second stage, and there is no redistribution across coalitions.

To proceed we identify the decisive owners, those who are not indifferent to alternative firm coalitions. Although Horn and Persson state that "the formal definition of a decisive group may appear somewhat opaque" one can identify the decisive owners by looking at the members of each coalition before and after a structural change. All owners who do not belong to the same coalition in both the 'before' and 'after' structures are decisive. By the same token, decisive owners who cannot transfer resources between them belong to different decisive groups.

Examples of decisive groups of owners are provided in Table 1. For instance, with respect to the alternatives $M^{12,3,4}$ versus $M^{1,2,3,4}$, owners 1 and 2 are merged in one but distinct firms in the other, while owners 3 and 4 are always distinct and do not change. So only 1 and 2 are decisive with respect to that pair of alternatives. To contain the size of this table, we let $M^{13,2,4} = [\{13\}, \{2\}, \{4\}]$ be representative of all structures with only one international merger, and $M^{13,24} = [\{13\}, \{24\}]$ represent all structures with two international mergers.

TABLE 1: Decisive groups

	$M^{1,2,3,4}$	$M^{13,24}$	$M^{12,34}$	$M^{13,2,4}$
$M^{12,3,4}$	$\{1,2\}$	$\{1,2,3,4\}$	$\{3,4\}$	$\{1,2,3\}$
$M^{1,2,34}$	$\{3,4\}$	$\{1,2,3,4\}$	$\{1,2\}$	$\{1,3,4\}$
$M^{13,2,4}$	$\{1,3\}$	$\{2,4\}$	$\{1,2,3,4\}$	
$M^{12,34}$	$\{1,2\}and\{3,4\}$	$\{1,2,3,4\}$		
$M^{13,24}$	$\{1,3\}and\{2,4\}$			

As in the industrial organization literature, we assume that in the first stage, decisive owners choose the structure leading in the second stage to the higher combined profit. It follows that one structure dominates another if and only if the combined profit of each decisive group is larger in the former than in the latter. When there is more than one decisive group, domination must hold for each decisive group. The dominance relation is asymmetric: if M^j dominates M^i for $i \neq j$, M^i cannot dominate M^j .

We now specify the non-cooperative game of the second stage.

2.2. Second stage: competition on both markets

In the first stage, the decisive groups of owners chose the structure to maximize the combined profit that they will earn in the second stage. Firms' profits depend on whether they are able or not to export and whether or not firms in the other country export. It follows that profits are determined by the interaction of two parameters: the difference between production costs and trade costs; and a strategy variable- the ownership structure chosen in the first stage.

To focus on the implications of trade liberalization, we assume that marginal production costs remain unchanged. Trade costs are assumed to decline as the result of a regional agreement. Note that we deliberately do not explicitly specify what the trade cost, t , includes. It may represent tariff or non tariff barriers, market accessibility, transport and distribution costs, combinations of all those things, and more. Thus, while a trade liberalization agreement can decrease the trade cost by removing tariffs between countries, the ultimate size of t depends on many other elements.

Let $t = 1$ be the trade cost prior to trade liberalization. Consider the impact of a decline in trade cost on the market structures and profits, for each ownership structure decided in the first stage, in each market. Consistent with the insight of Brander and Krugman (1983), the rivalry of oligopolistic firms in segmented markets may lead to a two-way trade if the autarky price in each country exceeds the marginal cost of exports (which is the cost of production plus trade cost in our model) from the other country.

It follows that Foreign will export only if:

$$P_A^H > C_F + t \quad (1)$$

And Home will export if $P_A^F > C_H + t \quad (2)$

Where P_A^i ($i = H, F$) are the autarky prices.

From (1) and (2) it is obvious that, with the exception of a duopoly with two international mergers¹, a firm's capacity to export from its country depends on the marginal cost of production, trade cost, and ownership structure, because that also conditioned the determination of the autarky price. The more decentralized a country's ownership structure, the lower is the level of trade cost that would prevent the other country's exports after liberalization. As we elaborate in the next section, it follows that owners may have an incentive to strategically choose a more decentralized structure before their countries conclude a trade liberalization agreement in order to deter import competition after trade costs decline.

The limit values of trade costs consistent with exporting are²:

$$1 > t_F^{12,34} = t_F^{12,3,4} = t_F^{13,2,4} > t_F^{1,2,34} = t_F^{1,2,3,4} \geq t_H^{12,34} = t_H^{1,2,34} > t_H^{1,2,3,4} = t_H^{12,3,4} = t_H^{13,2,4} \geq 0 \quad (3)$$

with $t_F^{12,34} = \frac{1}{2} + \frac{C_H}{2}$, $t_F^{1,2,34} = \frac{1}{3} + \frac{2C_H}{3}$, $t_H^{12,34} = \frac{1}{2} - C_H$, $t_H^{1,2,3,4} = \frac{1}{3} - C_H$

where superscripts indicate the chosen ownership structure and subscripts indicate the country (Home or Foreign) able to export when the trade cost reaches the corresponding limit value. For

example, in the ownership structure $M^{12,34}$, Foreign exports when t is below $t_F^{12,34} = \frac{1}{2} + \frac{C_H}{2}$, but

Home firms are able to export only if t is below $t_H^{12,34} = \frac{1}{2} - C_H$.

Two features are clear from the above ranking. First, the extreme values of t under which a country's firms export depend on the level of firm concentration in the other country. Second, regardless of the ownership structure, firms in the competitive advantage country can export at higher values of t .

Table 2 shows the array of possible market structures in each country at each value of t under each ownership structure, assuming even Home firms remain competitive. As we shall

show, there are trade costs low enough that it is not profitable for any production to occur in Home. To conserve space, we exclude such outcomes from Table 2.

For example, at relatively high trade costs, $1 \geq t \geq t_F^{12,34}$, neither country's firms can export. If firms in both Home and Foreign are nationally merged, the ownership structure is denoted ($M^{12,34}$), and the resulting market structure are monopolies in both countries. With the same ownership structure, when t drops below $t_F^{12,34}$, Foreign firms can now export but Home firms still cannot (until $t < t_H^{12,34}$), so the Home market becomes a duopoly while the Foreign market remains a monopoly. At that level of trade cost, if $M^{12,3,4}$ were the ownership structure instead, because both Foreign firms could export, the Home market structure would be triopoly; and so on.

TABLE 2: Taxonomy of Market structures in each country at each t

		$M^{12,34}$	$M^{12,3,4}$	$M^{1,2,34}$	$M^{1,2,3,4}$	$M_{TCS}^{13,2,4}$	$M_{PCS}^{13,2,4}$	$M_{TCS}^{13,24}$	$M_{PCS}^{13,24}$
$1 \geq t \geq t_F^{12,34}$	Home	Monopoly	Mono	Duo	Duo	Duo		Duo	
	Foreign	Monopoly	Duo	Mono	Duo	Duo		Duo	
$t_F^{12,34} > t \geq t_F^{1,2,34}$	Home	Duopoly	Triopoly	Duo	Duo	Duo		Duo	
	Foreign	Monopoly	Duopoly	Mono	Duo			Duo	
$t_F^{1,2,34} > t \geq t_H^{12,34}$ and $t > \frac{3}{2}C_H - \frac{1}{2}$	Home	Duo	Trio	Trio	Quadriopoly	Trio	Trio	Duo	Duo
	Foreign	Mono	Duo	Mono	Duopoly	Duo	Duo	Duo	Duo
$t_H^{12,34} > t \geq t_H^{1,2,3,4}$	Home	Duo	Trio	Trio	Quad	Trio	Trio	Duo	Duo
	Foreign	Duo	Duo	Trio	Duo	Duo	Duo	Duo	Duo
$t_H^{1,2,3,4} > t \geq 0$	Home	Duo	Trio	Trio	Quad	Trio	Trio	Duo	Duo
	Foreign	Duo	Trio	Trio	Quad	Trio	Trio	Duo	Duo

The last four columns of Table 2 concern internationally merged ownership structures. As noted earlier, international mergers can be motivated by two types of cost savings. A trade cost saving ownership structure is indicated by the subscript TCS and a production cost saving structure by subscript PCS. When $1 > t \geq t_F^{1,2,34}$, only the TCS structure is relevant, because $t > C_H$, $\forall C_H < 1$.

The market structure that will obtain is the one that best achieves the owners' objectives. The problem is solved by backward induction. For each range of trade costs, decisive owners choose the ownership structure that supports the market structure with the higher profit for their merger (or solo firm) relative to the alternative ownership structures.

3. Equilibrium ownership structures (EOS)³

Proposition 1 (i) There exists a t' , $t_F^{12,34} > t' > t_F^{1,2,34}$, such that for all $1 \geq t > t'$ the EOS is a national merger in each country ($M^{12,34}$).

(ii) For $t' > t \geq t_H^{12,34}$ and $t > \frac{3}{2}C_H - \frac{1}{2}$ the structure $M^{1,2,34}$ (a national merger in the low cost (Foreign) country, no merger in Home) is the EOS.

(iii) When $t \leq \frac{3}{2}C_H - \frac{1}{2}$, the EOS is a national duopoly in Foreign ($M^{3,4}$). The best strategy for Foreign owners is to decentralize. Home owners are driven out of the market.

(iv) When $t \leq 2C_H - 1$ the EOS is a national merger-monopoly in Foreign (M^{34}).

(v) For lower values of the trade cost and lower difference between production costs ($t < t_H^{12,34}$), the EOS, if it exists, is two internationally merged firms ($M^{13,24}$). Firms' choice

between TCS and PCS strategies depends on how the trade cost (t) compares to the difference between production costs (C_H).

Proposition 1 is graphically illustrated in Figure 1. The heavy lines are the boundaries defining the (t, C_H) pairs for which an endogenous change in ownership structure occurs while the light lines are the threshold values of t defined in section 2.

Starting from $t=1$ until t reaches $t_F^{12,34}$ indicated by the light line, countries are in autarky. Profits do not depend on the ownership structure in another country. Owners in each country are best off in domestic monopolies. They would not profit more if there were duopolies in either country, so they do not choose to merge internationally.

At levels of t lower than $t_F^{12,34}$, Foreign firms can export as long as Home owners (whose firm still cannot profitably export) remain in their national merged structure. And because they are protected by the trade cost barrier, owners 3 and 4 prefer to stay in their national merger in Foreign. Owners in Home would avoid the merged structure if it could prevent Foreign firms from entering their market. On the other hand, there is an incentive to remain merged nationally to enjoy monopoly profits. The dominance of $M^{12,34}$ over $M^{1,2,34}$ depends on how these two incentives compare. There is only one decisive group, comprised of owners 1 and 2, with respect to these structures. $M^{12,34}$ dominates $M^{1,2,34}$ only if $\Pi_{12}^{M^{12,34}} > \Pi_1^{M^{1,2,34}} + \Pi_2^{M^{1,2,34}}$. When the anti-competitive effect of the trade cost is high enough ($t > t'$), owners in Home prefer their original (merged) structure. In Figure 1, the boundary represented by the heavy line $t't'$ gives the (t, C_H) pairs for which owners in Home are indifferent between the more decentralized structure ($M^{1,2,34}$) and the national merged structure ($M^{12,34}$). For all (t, C_H) pairs above this boundary, the structure $M^{12,34}$ dominates all others.

At t below $t't'$, owners in Home profit more from decentralizing. It protects their domestic market from Foreign competition. The Foreign owners continue to profit most under their national merger. This asymmetric EOS ($M^{1,2,3,4}$) remains the unique equilibrium as long as Home firms cannot export ($t \geq t_H^{12,34}$) and the pair (t, C_H) is above the heavy line $C't'$. This is consistent with Salant *et al.* (1983). Essentially, their point was that a merger is less likely to be profitable between an arbitrary number of firms if there is sufficient ability of non-participants to expand output in response. In our model, when cost differences are large enough or trade costs high ($t \geq t_H^{12,34}$), a merger in Foreign (the low-cost country) is profitable because there is not threat of competition from the Home country. Home firms' ability to expand output is not sufficient, because they cannot export; so this does not prevent a Foreign merger. This asymmetric structure is never an EOS in a model, such as Horn and Persson's, without asymmetry among countries.

For sufficient differences between country production costs, to the right of the heavy line $C't'$ ($t \leq \frac{3}{2}C_H - \frac{1}{2}$), the best strategy for lower-cost Foreign country owners is to induce Home firm exit. They can do this by decentralizing. Owners 3 and 4 are the only decisive group with respect to the alternative structures $M^{1,2,3,4}$ and $M^{1,2,3,4}$. Note that Foreign owners would earn the highest profits by staying merged, using monopoly pricing, and setting a duopoly price abroad. But this dumping strategy would be banned by the authorities. Among the allowed strategies, in this range of (t, C_H) Home firms are no longer protected by trade costs. Because $\Pi_3^{3,4} + \Pi_4^{3,4} > \Pi_{34}^{1,2,3,4}$, owners 3 and 4 choose decentralization, and they capture the entire Home market as well. Home owners have no alternative. They cannot export regardless of the ownership structure, and they cannot under price the Foreign firms. They could earn positive

profits only in an internationally-merged structure $M_{PCS}^{13,24}$. Owners 3 and 4, however, would not profit from this merger.

For (t, C_H) below the heavy line $C''t'$ ($t < 2C_H - 1$), Foreign owners may again find a merger attractive, because Home firms are still unable to compete. The ownership structure remains M^{34} (if this Foreign monopoly is not outlawed by the competition authorities).

At even lower $t < t_H^{12,34}$ but still not too large production cost differences (the (t, C_H) left of the heavy line $C't'$), Home firms can export if Foreign firms are nationally merged. The threat of competition from Home firms will be able to undo the Foreign national merger. International mergers offer the highest (allowed) industry profit, so the EOS is two international mergers, providing that the set of EOS is not empty.

We are now able to summarize our results and derive some predictions about merger formation during trade liberalization between different cost countries. We obtain all four of the possible outcomes raised in the introduction.

First, there is a range of $(t, C_H) > t_H^{12,34}$ with $t > \frac{3}{2}C_H - \frac{1}{2}$ such that Home firms resist competition from Foreign country. They share their domestic market with a merged Foreign firm for $t_F^{12,34} > t > t'$ and $t_F^{1,2,34} > t > t_H^{12,34}$, and they cannot export, but they survive. Their incentives to avoid high trade or production costs by internationally merging are strong. But all owners $\{1,2,3,4\}$ are decisive in the choice between $M^{13,24}$ and $M^{1,2,34}$. And owners 3 and 4 would require very large shares of the combined profits resulting from the coalitions $M^{13,24}$ for those mergers to be incentive-compatible, leaving owners 1 and 2 with too little profit from their international mergers to be incentive-compatible for them. Their only rational strategy is to

remain un-merged, keep their prices as low as possible, and thus limit Foreign' s export penetration.

That strategy, however, is not sustainable when there are large differences between production costs. If $t \leq \frac{3}{2}C_H - \frac{1}{2}$ (right of the heavy line $C't'$), the high cost country firms will be driven out of the market.

Finally, international mergers occur only at low trade costs and low differences between production costs ($t < t_H^{12,34}$ with $t > \frac{3}{2}C_H - \frac{1}{2}$). The concentration of all productive activity in Foreign depends on the relative magnitudes of (t, C_H) . This finding that international mergers are dominated for large synergies is counterintuitive because international mergers give rise to efficiencies, while national mergers do not. This suggests that the presumption that international mergers will occur when there are strong saving opportunities is robust only to the extent that firms have no incentives to form alternative market structures.

IV. The pattern of trade and the competitiveness of the markets

Now we analyze the evolution of competitiveness in each country's market following trade liberalization. Liberalization is presumed to lead to lower prices paid by consumers. Let the price measure the degree of competitiveness in a market. If prices decrease unambiguously following a regional agreement, we conclude that competitiveness has increased as a result of the liberalization.

Starting from the autarky situation that would exist under high trade costs, we investigate how domestic prices compare under the endogenously determined market structures we have identified above as liberalization reduces trade costs. For small reductions of trade costs below

the threshold value $t_F^{12,34}$, only Foreign firms are able to export. The price in the Home market falls relatively to autarky. In Foreign, the autarky monopoly price remains in effect. Thus, liberalization increases the competitiveness in the higher-cost market but has no effect on market in the low-cost country with the competitive advantage.

At lower trade costs just below $t't'$, Home owners react and decentralize to protect their market, regardless of production cost differences C_H . This evolution causes a discontinuity in trade. Now a firm in the competitive advantage country is no longer able to export. Both countries would revert to autarky. The Home market structure would become a duopoly, however, so the price in Home would be lower. In Home, this liberalization has a pro-competitive effect even though it may not be trade-expanding.

At trade costs below $t_F^{1,2,34}$ but still above $C't'$ and $t_H^{12,34}$, the Foreign owners remain merged and trade recommences. The Home market structure is now a triopoly. The price in Home continues to decrease as the trade cost barrier declines, but in Foreign the price remains at the autarky monopoly price.

At lower trade costs, when cost asymmetries are high, to the right of $C't' (t > \frac{3}{2}C_H - \frac{1}{2})$ the low-cost country firms decentralize and the Foreign price falls for the first time since trade liberalization. Foreign's exports force Home firms out of the market. The price in Home drops, and continues to fall as trade costs decline further. Home firms never recover in this competitive advantage setting (negligible trade costs). Further trade liberalization appears to be actually anticompetitive. Ultimately, to the right of $C''t'$ in Figure 1, at trade costs below $t < 2C_H - 1$, Foreign firms re-merge and prices increase in both countries.

When production cost asymmetries are relatively small ($t > \frac{3}{2}C_H - \frac{1}{2}$), further trade liberalization, by reducing t below $t_H^{12,34}$, encourages international mergers. The ‘trade cost savings’ strategy arises when owners recognize they can afford the relatively small asymmetry between countries’ production costs and completely eliminates trade. In each country, two internationally-owned firms produce locally. Because no trade is profitable, consumers totally avoid trade costs. The price in Home, however, rises up to the autarky price under the EOS of the national duopoly (for $t' < t \leq t_F^{1,2,34}$). The price in Foreign decreases.

The trade and price outcomes, however, are different if the production cost asymmetry is large (relatively to trade costs); In that case, owners choose to save on production costs and trade instead. Foreign consumers gain. For Home consumers, the price will decrease only if

$$t < \frac{6}{5}C_H - \frac{1}{5}.$$

These are two new insights that contrast with existing trade literature. To summarize, one, a regional agreement between countries different enough to have a competitive-advantage basis to trade may lead to more competition in the higher-cost country, but not in both countries. Consumers in the lower-cost country may still suffer from a less competitive market structure. Two, we have identified discontinuities in trade and thus prices (or competitiveness) which are not linear with respect to trade costs. When the difference between production costs is high, the higher-cost country firms may never export, even at zero trade costs. In the lower-cost country, consumers may never gain even under total liberalization. Both these findings contrast with the prevailing idea that larger reductions in trade costs systematically support both more trade and more competitiveness.

5. Welfare considerations

Who gains and who loses? We contribute here to the debate about the welfare consequences of trade liberalization between asymmetric countries when market structure is endogenous. We address three concerns. One is the fear in higher-cost countries about consequences of trade liberalization with lower-cost countries. Two is the debate about policies discriminating between international and national mergers. Three is the need for internationally-agreed competition policy to complement trade liberalization. We now re-consider the fundamental questions: does social welfare increase with trade liberalization? And do the market structures that maximize decisive owners' profits also maximize domestic social welfare?

To answer the first question, we compare the sum of domestic consumer surplus and domestic owners' profits at each stage of trade liberalization, holding the production cost differential fixed. The social welfare consequences depend on whether C_H is low or high. When C_H is low, Home production is always competitive but international mergers may occur. When C_H is high, production in the Home country is not always profitable.

Figures 2a and 2b summarize the welfare consequences of trade liberalization in each country.

The top two panels illustrate the low C_H case. The autarky situation occurs at high t . Trade liberalization that reduces trade costs between $t_F^{12,34}$ and t' induces the ownership structure $M^{12,34}$. The left upper panel shows that Home social welfare declines, because Home consumers gain less than Home owners' profits fall when they have to compete with imports. Foreign social welfare rises because although Foreign consumer surplus remains at the autarky level, Foreign owners' profits rise when they export.

Trade liberalization induces ownership structure $M^{1,2,3,4}$ when t reaches t' . The Home market becomes an autarkic duopoly, Foreign remains a monopoly, and there are no gains from trade. This, however, supports a discrete rise in Home welfare because both consumers and owners gain from the owners' defensive strategy. Foreign welfare declines to the autarky level. Further trade liberalization that does not induce a change in ownership structure, $t \leq t_F^{1,2,3,4}$, supports trade expansion again. Foreign social welfare increases (Foreign consumer surplus remains at the autarky level, Foreign owners' profits rise with exports).

The competition from Foreign firms reduces Home owner profits more than Home consumer surplus rises, so Home social welfare decreases, but not below the autarky level.

Domestically-owned firms remain profitable until $t = t_H^{12,3,4}$. At lower trade costs, international mergers occur.

To evaluate domestic social welfare when there are international mergers requires additional assumptions about profit-sharing. In the absence of a theory of the distribution of profits among parties to mergers, we assume that decisive owners keep the profits they would earn without international mergers, and evenly split the difference between the combined profits with and without the international merger. For t below $t_H^{12,3,4}$, wholly-Home firms would export if the Foreign owners just remain in their national merger. Decisive owners 3 and 4 should threaten to decentralize to $M^{1,2,3,4}$ if Home owners refuse international mergers. Consequently, we divide the difference in the profits between $M^{13,2,4}$ and $M^{1,2,3,4}$ evenly, and add those to each owners' profits in the completely decentralized structure $M^{1,2,3,4}$ (details in the Appendix 3).

The international merger, however, reduces social welfare in Home below the autarky level, regardless of which strategy, trade cost or production cost saving, is followed. Home

consumer surplus decreases (if $t > \frac{6}{5}C_H - \frac{1}{5}$ in the PCS case). And owner profits in Home fall because they must compensate Foreign owners to avoid the threat of Foreign decentralization. Nevertheless Home owners prefer the structure with international mergers because $\Pi_1^{M^{13,24}} + \Pi_3^{M^{13,24}} > \Pi_1^{M^{1,2,3,4}} + \Pi_3^{M^{1,2,3,4}}$ and $\Pi_2^{M^{13,24}} + \Pi_4^{M^{13,24}} > \Pi_2^{M^{1,2,3,4}} + \Pi_4^{M^{1,2,3,4}}$) In contrast, Foreign owner profits rise and consumer surplus increases.

Social welfare in both countries continues to increase, however, with further declines in t until $t=0$. At zero trade costs, welfare is at its highest level in Foreign, and Home country welfare is just below its highest value, which was under an autarkic duopoly at $t' \geq t \geq t_F^{1,2,3,4}$.

The lower pair of panels in Figure 2 shows the welfare consequences of trade liberalization when the production cost asymmetry between countries is large. Starting from autarky, the first two degrees of trade liberalization ($t_F^{12,34} > t \geq t'$ and $t' > t \geq \frac{3C_H}{2} - \frac{1}{2}$) show the same pattern of welfare effects as discussed above, but Foreign firms can export at a higher t relative to the low C_H case, and the structure $M^{1,2,3,4}$ is an EOS for a smaller range of trade cost magnitudes. After t reaches the threshold value $t = \frac{3C_H}{2} - \frac{1}{2}$, Home firms exit if Foreign owners choose an offensive strategy and decentralize. Social welfare jumps in both countries. The duopoly that arises in Foreign supports consumer surplus gains for the first time. Foreign firms take the whole market in both countries and gain. Home consumers gain because enjoy buying the low cost goods. Domestic social welfare in Home increases even though there are no domestic owner profits.

As trade liberalization continues, welfare increases until the threshold value $t = 2C_H - 1$. Then, Foreign firms merge again (M^{34}). Welfare in both countries falls at first, reflecting the

monopoly's exploitation of consumers in both countries. Additional declines in trade costs allow increases in consumer surplus. Finally, at zero trade costs, welfare in both countries are at their highest levels. But welfare would be higher if Foreign firms had not merged, and remained in the structure $M^{3,4}$.

This suggests our second question: do the decisive owners' choices differ from the socially-preferred structures?

Figure 3 illustrates the most preferred ownership structures among the feasible ones by Home and Foreign, for different values of t and C_H . Consider the first stage of trade liberalization ($t_F^{12,34} > t \geq t'$). In both countries, the structure maximizing social welfare is No Mergers, $M^{1,2,3,4}$, and the upper portion of Figure 3 is so-labelled. In contrast, Figure 1 shows that this is not the structure that owners would choose under the same (t, C_H) conditions. Figure 1 illustrates that above $t't'$ the owners prefer two domestic monopolies.

At values of (t, C_H) between $t't'$ and $C't'$, Home owners' preferred domestic duopoly (which supports the triopoly market structure) corresponds to the socially optimal one in Home, while Foreign owners' preferred domestic monopoly still contrasts with the socially optimal one. It is interesting that in this range of (t, C_H) , for the same value of t , the social optimum in Home is the Foreign monopoly ($M^{1,2,34}$) at lower values of C_H , and the Foreign duopoly at higher values of C_H . This is because when C_H is small, Home firms can compete with a Foreign monopoly. When C_H is high, Home firms just survive with very low profits, so only the consumer surplus matters.

There is a limited range of (t, C_H) conditions under which the socially-preferred market structures are the one chosen by the owners, $M^{3,4}$. This is the area in Figures 1 and 3 below $C't'$ and above $C''t'$. In the extreme (far right sides of Figures 1 and 3), we can see that when there

is a strong competitive advantage basis for specialization and trade, the market structure chosen by Foreign owners (if allowed), $M^{3,4}$, never corresponds to the socially optimal one, $M^{3,4}$, regardless of the extent of trade cost reduction.

When there is little comparative-advantage basis for trade (lower left portion of figures 1 and 3), however, owners' preferred international duopoly, $M^{13,24}$, corresponds to the socially optimal structure in Foreign while the social optimum in Home is a Quadripoly, $M^{1,2,3,4}$.

The policy implications of our analysis depend on the extent of the competitive advantage basis for trade. To summarize, we come to four main findings:

- 1) The closure of firms in high-cost countries may be welfare enhancing.
- 2) When there is little competitive-advantage basis for trade and low trade costs, the social optimum in Home ($M^{1,2,3,4}$) contrasts with the socially-preferred structure in Foreign ($M^{13,24}$). An optimal policy in the higher-cost country would be to forbid international mergers. This would constrain foreign and home owners to choose the most decentralized structure, $M^{1,2,3,4}$.
- 3) The endogeneity of owner merger behaviour does not undermine the traditional "gains for trade" argument when a competitive advantage basis for trade is strong (Figure 2b), that social welfare can be enhanced by free trade (and the closure of firms in high-cost countries).
- 4) Fig.1 and Fig. 3 illustrates that, in a large range of trade costs, the socially-preferred structures in both countries (the decentralized one $M^{1,2,3,4}$ or $M^{3,4}$) never corresponds to the equilibrium ownership structures, regardless of the extent of production cost difference. Therefore, during trade negotiations agreement between countries with

differences between production costs, there is scope for welfare-enhancing anti-trust policy. Parties in both countries have incentives to include competition issues in the trade agreement, especially if the objective of trade liberalization is to encourage less concentrated ownership structures.

6. Conclusions

In this paper we have first shown the impact of trade liberalization on market structures when countries have different marginal production costs. We find that trade liberalization may lead to a stable asymmetric market structure with more competition in the higher-cost country, but not in both countries. The lower-cost country may still suffer from a less competitive market structure and, in this country, consumers' surplus may never increase even at zero trade costs. We show also that international mergers arise only at low levels of synergies: low trade costs and/or low differences between countries' production costs.

Our welfare analysis help us understand the consequences of trade liberalization between asymmetric countries. First we show that firms' exit in the high cost country may be welfare enhancing for high difference between production costs. Second, our results suggest that international mergers are not desirable from the point of view of social welfare in the higher cost country. This finding holds whatever the modelling of international mergers: whether firms choose to produce in the low cost country or produce locally in both markets, international mergers don't correspond to the socially most preferred structure by the high cost country. Finally we emphasize the need to include competition issues in the trade agreement.

Appendix 1: Autarky prices when owners choose to merge are:

$$P_{AH}^{12,34} = \frac{1}{2} + \frac{1}{2}C_H \quad \text{in Home} \quad \text{and} \quad P_{AF}^{12,34} = \frac{1}{2} + \frac{1}{2}C_F \quad \text{in Foreign}$$

$$\text{and when they don't merge: } P_{AH}^{1,2,3,4} = \frac{1}{3} + \frac{2}{3}C_H \quad \text{and} \quad P_{AF}^{1,2,3,4} = \frac{1}{3} + \frac{2}{3}C_F$$

Using (1) and (2), it is straightforward to obtain the limit values of t given in (3) and the corresponding ranking. However, whether $t_F^{1,2,34} > t_H^{12,34}$ or not depends on the difference between production costs. For a tiny difference, $t_F^{1,2,34} < t_H^{12,34}$, but if $C_H > \frac{1}{10} + \frac{9}{10}C_F$, then $t_F^{1,2,34} > t_H^{12,34}$.

Because we want to illustrate how trade liberalization does impact on the market structures when production costs are significantly different, we assume $C_H > 0.1$.

Appendix 2: Because of the asymmetry of the dominance relation, it suffices to show that

(i) $M^{12,34}$, (ii) $M^{1,2,34}$, (iii) $M^{3,4}$, (iv) M^{34} , (v) $M^{13,24}$ dominate all the other structures in the respective ranges of t .

(i) It is straightforward that $M^{12,34}$ dominates the other structures in autarky, when $1 \geq t \geq t_F^{12,34}$.

Consider now the range $t_F^{12,34} \geq t \geq t_F^{1,2,34}$:

a) One decisive group {3,4}: $M^{12,34}$ dominates $M^{12,3,4}$ if $\Pi_{34}^{M^{12,34}} > \Pi_3^{M^{12,3,4}} + \Pi_4^{M^{12,3,4}}$. This

condition holds if $t > \frac{1}{2}(1 - \sqrt{2} + C_H)^2$ (this $t < t_F^{1,2,34}$).

b) Two decisive groups {1,2} and {3,4}: $M^{12,34}$ dominates $M^{1,2,3,4}$:

$\Pi_{34}^{M^{12,34}} > \Pi_3^{M^{1,2,3,4}} + \Pi_4^{M^{1,2,3,4}}$ if $t > \frac{1}{124}(8 + 116C_H - 5\sqrt{134 - 144C_H + 72C_H^2})$ (this t is $< t_F^{1,2,34}$) and

$\Pi_{12}^{M^{12,34}} > \Pi_1^{M^{1,2,3,4}} + \Pi_2^{M^{1,2,3,4}}$ if $t > t'$ with $t' = C_H(2 - \sqrt{2}) - (1 - \sqrt{2})$. Note that $t_F^{12,34} > t' > t_F^{1,2,34}$.

c) One decisive group $\{1,2\}: M^{12,34}$ dominates $M^{1,2,34}$. This condition holds for $t > t' = C_H(2 - \sqrt{2}) - (1 - \sqrt{2})$. This last relation is graphically represented by the heavy line tt' in fig.1.

c) One decisive group $\{1,2,3,4\}: M^{12,34}$ dominates $M_{TCS}^{13,24}$, $M_{PCS}^{13,24}$, $M_{TCS}^{13,2,4}$, $\forall(t, C_H)$

and dominates $M_{PCS}^{13,2,4}$ if $t > \frac{1}{14}(1 + 13C_H - 2\sqrt{16 - 18C_H + 9C_H^2})$ (this t is $< t_F^{1,2,3,4}$).

This complete the proof of (i).

(ii) We use an identical reasoning.

a)Decisive group $\{1,2\}: M^{1,2,34}$ dominates $M^{12,34}$ for $t' > t$ (see above) .

b)Decisive group $\{3,4\}: M^{1,2,3,4}$ dominates $M^{1,2,3,4}$ $\forall t' > t > t_H^{12,34}$ if

$$t > \frac{3C_H}{2} - \frac{1}{2}.$$

c)Decisive group $\{1,3,4\}: M^{1,2,3,4}$ dominates $M_{TCS}^{13,2,4}$ for $t' > t > t_H^{12,34}$ and

dominates $M_{PCS}^{13,2,4}$ for $t' > t > \frac{1}{3}(-3 + 6C_H + \sqrt{7 - 18C_H + 9C_H^2})$.

d) Decisive group $\{1,2,3,4\}: M^{1,2,3,4}$ dominates $M_{TCS}^{13,2,4}$ for $t' > t > t_H^{12,34}$ and

dominates $M_{PCS}^{13,2,4}$ for

$$\frac{1}{67}(-23 + 90C_H - 2\sqrt{149 - 432C_H + 216C_H^2}) > t > \frac{1}{67}(-23 + 90C_H + 2\sqrt{149 - 432C_H + 216C_H^2})$$

This complete the proof of (ii). Note that $M^{1,2,3,4}$ is always an EOS if $t > C_H$

(when $M_{TCS}^{13,2,4}$ dom $M_{PCS}^{13,2,4}$). Results are more complicated if $t < C_H$: in this case,

$M_{PCS}^{13,2,4}$ dom $M^{1,2,3,4}$ (decisive owners $\{1,2,3,4\}$) in the interval

$$\frac{1}{67}(-23 + 90C_H - 2\sqrt{149 - 432C_H + 216C_H^2}) < t < \frac{1}{67}(-23 + 90C_H + 2\sqrt{149 - 432C_H + 216C_H^2})$$

but is dominated by $M^{12,34}$ (decisive owners $\{1,2,3,4\}$). Since it is also the case that

$M^{1,2,34}$ dominates $M^{12,34}$ (decisive owners $\{1,2\}$), there is no EOS in this interval.

(iii) and **(iv)** In the structure $M^{1,2,34}$ the quantities produced by home firms for the domestic market (remember that they cannot export in this range of (t, C_H)) are:

$q_1^{M^{1,2,34}} = q_2^{M^{1,2,34}} = \left(\frac{1}{4} - \frac{C_H}{2} + \frac{t}{4} \right)$ and in the structure $M^{1,2,3,4}$ home firms produce:

$$q_1^{M^{1,2,3,4}} = q_2^{M^{1,2,3,4}} = \left(\frac{1}{5} - \frac{3C_H}{5} + \frac{2t}{5} \right).$$

Home firms' production is positive at the condition that $t > 2C_H - 1$ in $M^{1,2,34}$ and $t > \frac{3C_H}{2} - \frac{1}{2}$

in $M^{1,2,3,4}$. It follows that home firms exit if foreign firms choose to decentralize when t

reaches the threshold value $t = \frac{3C_H}{2} - \frac{1}{2}$. And the best strategy for decisive owners $\{3,4\}$ is to

decentralize because $\Pi_3^{M^{3,4}} + \Pi_4^{M^{3,4}} > \Pi_{34}^{M^{1,2,34}}$. Note that this occurs only if $C_H > \frac{1}{3}$. When t

reaches the threshold value $t = 2C_H - 1$, foreign firms can take all the home market even if they

merge. Their best strategy now is to merge because $\Pi_{34}^{M^{34}} > \Pi_3^{M^{3,4}} + \Pi_4^{M^{3,4}}$. This ownership

structure occurs only if $C_H > \frac{1}{2}$.

(v) We are here in the case of low asymmetry between production costs $(t > \frac{3C_H}{2} - \frac{1}{2})$

1) $t > C_H$: $M_{TCS}^{13,24}$ dom $M_{PCS}^{13,24}$

a) Decisive group $\{1,2,3,4\}$: For $t_H^{12,34} > t \geq 0$, $M_{TCS}^{13,24}$ dom $M^{1,2,34}$ if

$t < \frac{1}{69}(9 - 6C_H + \sqrt{311 + 76C_H - 4196C_H^2})$ and dom $M^{12,34}$ if $t < \frac{1}{10}(2 - C_H + \sqrt{4 - 4C_H - 79C_H^2})$.

b) Two decisive groups $\{1,3\}$ and $\{2,4\}$: $M_{TCS}^{13,24}$ dom $M^{1,2,3,4} \forall t < t_F^{1,2,34}$ and $t \geq C_H$.

c) Decisive group {2,4}: when $t_H^{12,34} > t \geq t_H^{1,2,3,4}$, $M_{TCS}^{13,24}$ dominates $M_{TCS}^{13,2,4}$ if $t > \frac{1}{15} + \frac{14}{15}C_H$.

When $t_H^{1,2,3,4} > t \geq 0$, $M_{TCS}^{13,24}$ dominates $M_{TCS}^{13,2,4}$ for $t > \frac{1}{30}(6 - 3C_H - \sqrt{16 - 16C_H - 721C_H^2})$.

It follows that $M_{TCS}^{13,24}$ dominates all the other market structures in the range of trade costs

$t_H^{12,34} > t \geq t_H^{1,2,3,4}$ for $\frac{1}{10}(2 - C_H + \sqrt{4 - 4C_H - 79C_H^2}) > t > \frac{1}{15} + \frac{14}{15}C_H$ and in the range of trade

costs $t_H^{1,2,3,4} > t \geq 0$ for $t > \frac{1}{30}(6 - 3C_H - \sqrt{16 - 16C_H - 721C_H^2})$. There is no EOS when these

conditions do not hold.

2) $t < C_H$: $M_{PCS}^{13,24}$ dominates $M_{TCS}^{13,24}$.

a) Decisive group {1,2,3,4}: When $t_H^{12,34} > t \geq 0$,

$M_{PCS}^{13,24}$ dominates $M^{1,2,3,4}$ if $t < \frac{1}{175}(-5 - 18C_H + \sqrt{1775 + 12780C_H - 37476C_H^2})$.

$M_{PCS}^{13,24}$ dominates $M^{12,34}$ if $t < \frac{1}{8}(-C_H + \sqrt{(32 - 79C_H)C_H})$.

b) Two decisive groups {1,3} and {2,4}: $M_{PCS}^{13,24}$ dominates $M^{1,2,3,4} \forall t_H^{12,34} > t \geq 0$.

c) Decisive group {2,4}: when $t_H^{12,34} > t \geq t_H^{1,2,3,4}$, $M_{PCS}^{13,24}$ dominates $M_{PCS}^{13,2,4}$ for

$t < -\frac{1}{14} + \frac{15}{14}C_H$. When $t_H^{1,2,3,4} > t \geq 0$, $M_{PCS}^{13,24}$ dominates $M_{PCS}^{13,2,4}$ for

$t < \frac{1}{73}(1 - 9C_H + \sqrt{-145 + 2610C_H - 6489C_H^2})$.

Consequently, $M_{PCS}^{13,24}$ dominates all the other market structures when $t_H^{12,34} > t \geq t_H^{1,2,3,4}$ for

$t < -\frac{1}{14} + \frac{15}{14}C_H$ and $t < \frac{1}{8}(-C_H + \sqrt{(32 - 79C_H)C_H})$.

When $t_H^{1,2,3,4} > t \geq 0$, $M_{PCS}^{13,24}$ dominates all the other market structures for $t < \frac{1}{73}(1 - 9C_H + \sqrt{-145 + 2610C_H - 6489C_H^2})$. There is no EOS when these conditions don't hold.

Appendix 3 When t is below $t_H^{12,34}$, decisive owners 3 and 4 never stay in structure $M^{1,2,34}$ because now $\Pi_3^{M^{1,2,3,4}} + \Pi_4^{M^{1,2,3,4}} > \Pi_{34}^{M^{1,2,34}}$ (because home firms export in $M^{1,2,34}$ but cannot export in $M^{1,2,3,4}$).

It follows that participating owners to international mergers, choosing the payoff distribution among themselves, will compare the combined profits they could earn in $M^{1,2,3,4}$ with the combined profits if they internationally merge. Remember that there are two groups of decisive owners with respect to these structures $\{1,3\}$ and $\{2,4\}$. Because $\Pi_1^{M^{1,2,3,4}} + \Pi_3^{M^{1,2,3,4}} < \Pi_{13}^{M^{13,24}}$ and $\Pi_2^{M^{1,2,3,4}} + \Pi_4^{M^{1,2,3,4}} < \Pi_{24}^{M^{13,24}}$, decisive owners will choose to merge internationally. We assume that the payoff distribution is :

$$\Pi_1^{M^{13,24}} = \Pi_1^{M^{1,2,3,4}} + \frac{1}{2} \left(\Pi_{13}^{M^{13,24}} - \Pi_1^{M^{1,2,3,4}} - \Pi_3^{M^{1,2,3,4}} \right) \text{ and } \Pi_3^{M^{13,24}} = \Pi_3^{M^{1,2,3,4}} + \frac{1}{2} \left(\Pi_{13}^{M^{13,24}} - \Pi_1^{M^{1,2,3,4}} - \Pi_3^{M^{1,2,3,4}} \right)$$

(Equivalently for owners 2 and 4).

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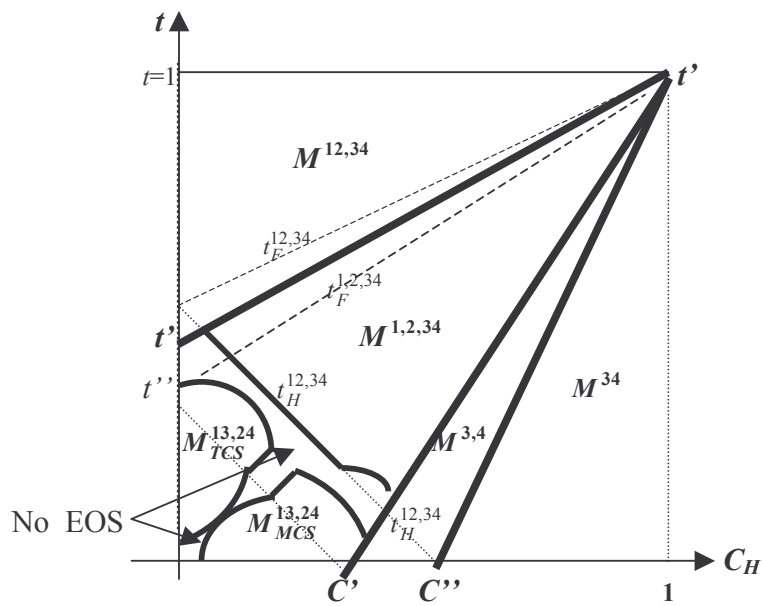


Fig.1 The equilibrium ownership structures

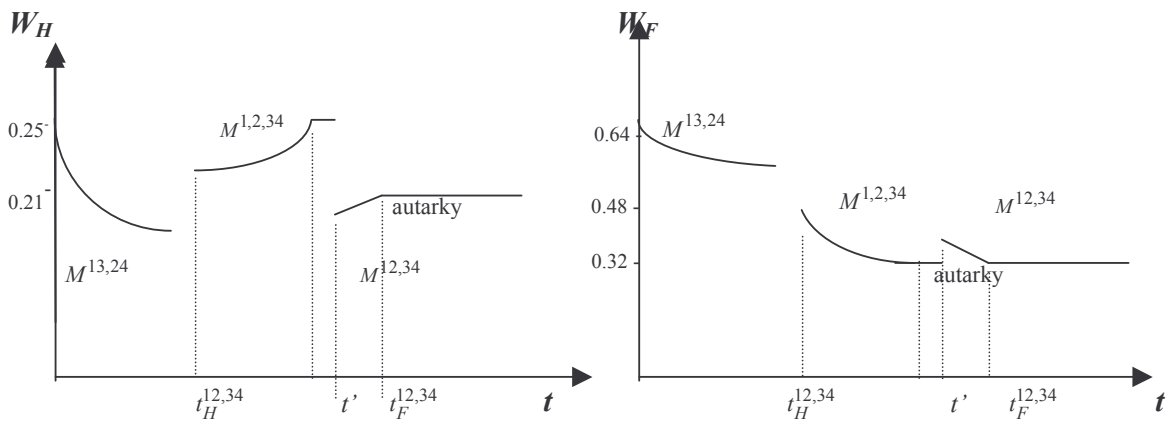


Fig.2a: Home and foreign welfares at different stages of trade liberalization. The case of low asymmetry between production costs ($C_H=0.25$)

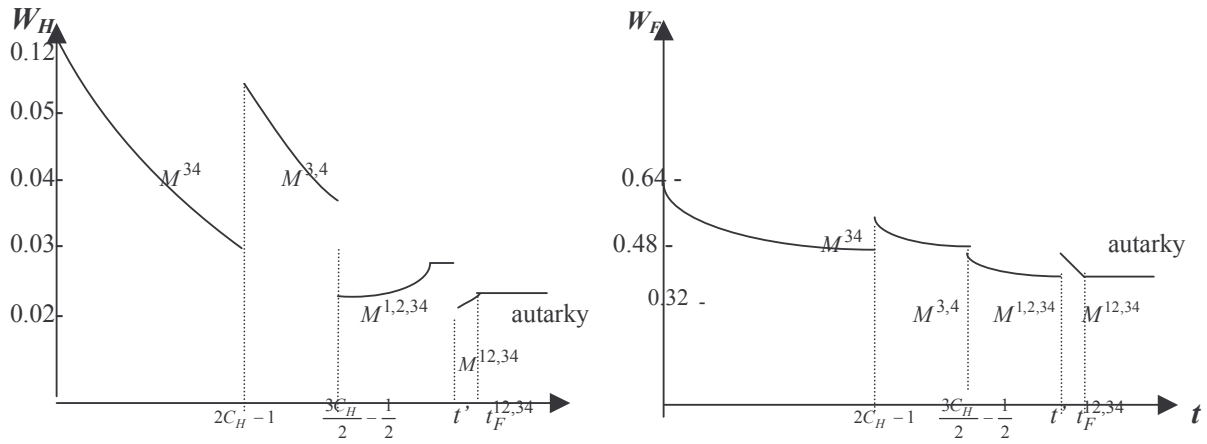


Fig.2b: The case of large asymmetry between production costs ($C_H=0.75$)

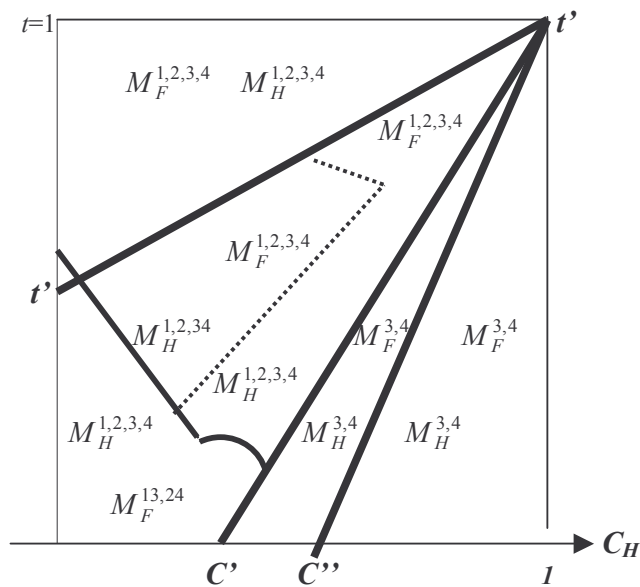


Fig. 3 The most preferred structures from a social point of view (M_i is the most preferred structure in country $i=H,F.$)

Notes

- ¹ Remember that in $M^{13,24}$, merged firms either do not export, or they operate only in the lower-cost country.
- ² See Appendix 1. Note that in the structure $M^{13,2,4}$ the limit values of t are relevant only in the production-cost-saving case.
- ³ Proofs of the equilibrium market structures are in Appendix 2.

Maximizing profits leads to:

Being of use to (i),(ii),(v): Market structure with international mergers, $\forall t \leq 1$

In the trade cost savings case (TCS):

$$\Pi_{13}^{M_{TCS}^{13,24}} = \Pi_{24}^{M_{TCS}^{13,24}} = \left(\frac{1}{3} - \frac{C_H}{3} \right)^2 + \left(\frac{1}{3} \right)^2$$

In the production cost saving case (PCS)

$$\Pi_{13}^{M_{PCS}^{13,24}} = \Pi_{24}^{M_{PCS}^{13,24}} = \left(\frac{1}{3} - \frac{C_F}{3} \right)^2 + \left(\frac{1}{3} - \frac{C_F}{3} - \frac{t}{3} \right)^2$$

It follows that owners will prefer the TCS for $t > C_H$ (when $C_F = 0$). Consequently, we have to consider only the trade cost saving combined profit when $t > t_F^{1,2,3,4}$, because in this range of trade costs, $t > C_H$, $\forall C_H < 1$.

Being of use to (i): 1) $t \geq t_F^{12,34}$: autarky in all market structures (at the exception of $M^{13,24}$ in the PCS case if $t < 1$). Maximizing profits leads to:

$$\Pi_{12}^{M^{12,34}} = \Pi_{12}^{M^{12,3,4}} = \Pi_2^{M_{PCS}^{13,2,4}} = \left(\frac{1}{2} - \frac{C_H}{2} \right)^2$$

$$\Pi_{34}^{M^{12,34}} = \Pi_{34}^{M^{1,2,3,4}} = \left(\frac{1}{2} \right)^2$$

$$\Pi_1^{M^{1,2,3,4}} = \Pi_2^{M^{1,2,3,4}} = \Pi_1^{M^{1,2,3,4}} = \Pi_2^{M^{1,2,3,4}} = \Pi_2^{M_{TCS}^{13,2,4}} = \left(\frac{1}{3} - \frac{C_H}{3} \right)^2$$

$$\Pi_3^{M^{1,2,3,4}} = \Pi_4^{M^{1,2,3,4}} = \Pi_3^{M^{12,3,4}} = \Pi_4^{M^{12,3,4}} = \Pi_4^{M_{TCS}^{13,2,4}} = \left(\frac{1}{3} \right)^2$$

$$\Pi_{13}^{M^{13,2,4}_{TCS}} = \left(\frac{1}{3} - \frac{C_H}{3}\right)^2 + \left(\frac{1}{3}\right)^2$$

2) $t_F^{12,34} > t \geq t_F^{1,2,3,4} = t_F^{1,2,3,4}$: autarky in $M^{1,2,3,4}$, $M^{1,2,34}$ and $M^{13,24}_{TCS}$ (in these market structures profits are still given above).

Now foreign firms are able to export if there is a merger in home country. It follows that:

$$\Pi_{12}^{M^{12,34}} = \left(\frac{1}{3} - \frac{2C_H}{3} + \frac{t}{3}\right)^2 \quad \text{and}$$

$$\Pi_{34}^{M^{12,34}} = \left(\frac{1}{2}\right)^2 + \left(\frac{1}{3} + \frac{C_H}{3} - \frac{2t}{3}\right)^2$$

$$\Pi_3^{M^{12,3,4}} = \Pi_4^{M^{12,3,4}} = \Pi_{13}^{M^{13,2,4}_{PCS}} = \Pi_4^{M^{13,2,4}_{PCS}} = \left(\frac{1}{3}\right)^2 + \left(\frac{1}{4} - \frac{t}{2} + \frac{C_H}{4}\right)^2$$

$$\Pi_2^{M^{13,2,4}_{PCS}} = \left(\frac{1}{4} - \frac{3C_H}{4} + \frac{t}{2}\right)^2$$

Being of use to (ii) (iii) and (iv): $t_F^{1,2,34} = t_F^{1,2,3,4} > t \geq t_H^{12,34} = t_H^{1,2,34}$: Foreign exports whatever the market structure in the other country but home is not able to export.

$\Pi_{34}^{M^{12,34}}$, $\Pi_{12}^{M^{12,34}}$, $\Pi_{13}^{M^{13,2,4}_{PCS}}$, $\Pi_4^{M^{13,2,4}_{PCS}}$: same values than above.

$$\Pi_{34}^{M^{1,2,34}} = \left(\frac{1}{2}\right)^2 + \left(\frac{1}{4} - \frac{3t}{4} + \frac{C_H}{2}\right)^2$$

$$\Pi_3^{M^{1,2,3,4}} = \Pi_4^{M^{1,2,3,4}} = \left(\frac{1}{3}\right)^2 + \left(\frac{1}{5} - \frac{3t}{5} + \frac{2C_H}{5}\right)^2 \quad \text{if } t > -\frac{1}{2} + \frac{3C_H}{2}$$

otherwise, home firms exit and $\Pi_3^{M^{1,2,3,4}} = \Pi_4^{M^{1,2,3,4}} = \Pi_3^{M^{3,4}} = \Pi_4^{M^{3,4}} = \left(\frac{1}{3}\right)^2 + \left(\frac{1}{3} - \frac{t}{3}\right)^2$

$\Pi_1^{M^{1,2,34}} = \Pi_2^{M^{1,2,34}} = \Pi_2^{M^{13,2,4}_{TCS}} = \left(\frac{1}{4} - \frac{C_H}{2} + \frac{t}{4}\right)^2$ if $t > 2C_H - 1$, otherwise, home firms exit.

$$\Pi_{13}^{M^{13,2,4}_{TCS}} = \left(\frac{1}{3}\right)^2 + \left(\frac{1}{4} + \frac{t}{4} - \frac{C_H}{2}\right)^2 \text{ if } t > 2C_H - 1$$

$$\Pi_4^{M^{13,2,4}_{TCS}} = \left(\frac{1}{3}\right)^2 + \left(\frac{1}{4} - \frac{3t}{4} + \frac{C_H}{2}\right)^2$$

Being of use to (v): $t_H^{12,34} = t_H^{1,2,34} > t \geq t_H^{1,2,3,4} = t_H^{12,3,4}$: Home is now able to export if there is a

merged structure in foreign. $\Pi_3^{M^{1,2,3,4}}$, $\Pi_4^{M^{1,2,3,4}}$, $\Pi_2^{M^{13,2,4}_{TCS}}$, $\Pi_4^{M^{13,2,4}_{TCS}}$: same values than above .

$$\Pi_{34}^{M^{1,2,34}} = \left(\frac{1}{4} + \frac{C_H}{2} + \frac{t}{2}\right)^2 + \left(\frac{1}{4} + \frac{C_H}{2} - \frac{3t}{4}\right)^2$$

$$\Pi_1^{M^{1,2,34}} = \Pi_2^{M^{1,2,34}} = \left(\frac{1}{4} - \frac{C_H}{2} + \frac{t}{4}\right)^2 + \left(\frac{1}{4} - \frac{C_H}{2} - \frac{t}{2}\right)^2$$

$$\Pi_{12}^{M^{12,34}} = \left(\frac{1}{3} - \frac{2C_H}{3} + \frac{t}{3}\right)^2 + \left(\frac{1}{3} - \frac{2C_H}{3} - \frac{2t}{3}\right)^2 \text{ et } \Pi_{34}^{M^{12,34}} = \left(\frac{1}{3} + \frac{C_H}{3} + \frac{t}{3}\right)^2 + \left(\frac{1}{3} + \frac{C_H}{3} - \frac{2t}{3}\right)^2$$

$$\Pi_1^{M^{1,2,3,4}} = \Pi_2^{M^{1,2,3,4}} = \left(\frac{1}{5} - \frac{3C_H}{5} + \frac{2t}{5}\right)^2$$

Finally when $t_H^{1,2,3,4} = t_H^{12,3,4} = t_H^{13,2,4} > t \geq 0$: Both countries export whatever the market structures in the other country:

$$\Pi_{13}^{M^{13,2,4}_{PCS}} = \Pi_4^{M^{13,2,4}_{PCS}} = \left(\frac{1}{4} + \frac{C_H}{4} + \frac{t}{4}\right)^2 + \left(\frac{1}{4} - \frac{t}{2} + \frac{C_H}{4}\right)^2$$

$$\Pi_1^{M^{1,2,3,4}} = \Pi_2^{M^{1,2,3,4}} = \left(\frac{1}{5} - \frac{3C_H}{5} + \frac{2t}{5}\right)^2 + \left(\frac{1}{5} - \frac{3C_H}{5} - \frac{3t}{5}\right)^2$$

$$\Pi_3^{M^{1,2,3,4}} = \Pi_4^{M^{1,2,3,4}} = \left(\frac{1}{5} + \frac{2C_H}{5} + \frac{2t}{5}\right)^2 + \left(\frac{1}{5} + \frac{2C_H}{5} - \frac{3t}{5}\right)^2$$

$$\Pi_4^{M^{13,2,4}_{TCS}} = \left(\frac{1}{4} + \frac{C_H}{4} + \frac{t}{4}\right)^2 + \left(\frac{1}{4} - \frac{3t}{4} + \frac{C_H}{2}\right)^2$$

$$\Pi_2^{M_{TCS}^{13,2,4}} = \left(\frac{1}{4} - \frac{C_H}{2} + \frac{t}{4} \right)^2 + \left(\frac{1}{4} - \frac{3t}{4} - \frac{3C_H}{4} \right)^2$$