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CTN – Coalition Theory Network

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National Versus International Mergers and Trade Liberalization

Summary

This paper uses an endogenous merger formation approach in a concentrated international oligopoly to examine the effects of trade liberalization on the nature of merger incentives (national vs. international). The effects of unilateral trade liberalization on a country's industry structure are found to be depending on the other country's trade policy regime. If the other country practices free trade, unilateral liberalization by a country yields international mergers whereas if it practices a restrictive trade policy, national mergers arise. As trade gets bilaterally liberalized, the resulting equilibrium market structure is the one with international mergers. These results fit well with the fact that global trade liberalization has been accompanied by an increase in international merger activity. Among equilibrium market structures, international ones are found to be preferable from a welfare point of view. As a result, social and private incentives become aligned together as trade gets liberalized.

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1. Introduction

Over the last two decades, the world economy has experienced a large wave of mergers. One particular characteristic of this merger wave is the high incidence of cross-border mergers and acquisitions (M&A's). In fact, international mergers and corporate take-overs have become an important vehicle for foreign direct investment (FDI) flows between developed countries. Cross-border merger activity involving developing countries, although quite small by the standards of developed ones, has also greatly expanded during the last fifteen years.[1] Today, cross-border M&A's constitute the dominant form of FDI with profound effects on international industry structure.[2] Despite the increase in cross-border M&A's, the literature on international trade and FDI has paid little attention to this phenomenon.[3] Instead, the focus has been the international location

[1] UNCTAD (1999) carried out a more detailed analysis of the incidence of cross-border M&A's in developing countries. It found that the share of M&A's in the accumulated FDI rises from 22% on average during 1988-91 to 72% during 1992-97 (China is excluded).

[2] An interesting feature of the current wave of cross-border M&A's is that it is truly international, as opposed to the previous waves, which involved primarily U.S. firms. Measured by dollar value, takeovers involving at least one U.S. party have declined from 88% worldwide in 1985 to 53% in 1999. Consequently, it no longer makes sense to see takeover booms and busts as national phenomena.

[3] Markusen (1995) surveyed the theoretical literature on FDI and multinational enterprises (MNE). This literature includes papers by Dunning (1977), Markusen (1984), Horstmann and Markusen (1992), Markusen and Venables (1995).

decisions of firms. In this literature, firms typically face a trade-off between the fixed cost of an additional plant in the export market and the benefit of economizing on tariffs and trade costs.[4] The present paper investigates the link between trade costs and merger incentives in an international oligopoly.[5] To this end, key motivating questions are: What are the effects of unilateral and bilateral trade liberalization on the nature of mergers (national or international) that emerges in equilibrium? What types of mergers (national or international) are preferred from a welfare point of view? If countries respond to mergers with optimal trade policy, which industry structures arise in equilibrium?

We consider a minimal symmetric oligopolistic industry in which firms sell differentiated goods in two segmented markets (home and foreign). The interaction takes place in two stages. In the first stage, industry structure is determined: firms decide whether to merge domestically, internationally or stay as competing units. In the second stage, firms compete in prices.[6] In determining industry structure, we employ the approach of endogenous merger formation developed by Horn and Persson (2001). An important feature of the model is that the origin of firms is crucial. If asset owners from different countries merge, the resulting firm is an international firm that has the advantage of avoiding tariff levels in both markets. By contrast, national firms face a tariff disadvantage when exporting.

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[4] Linkages between trade policy regime and FDI go back to Bhagwati (1973). See Konishi, Saggi, and Weber (1999) as a recent example of this line of research.

[5] Over the same period, the average tariff rates in the world, especially in manufacturing industries, have been substantially reduced during trade negotiations undertaken within the World Trade Organization.

[6] Unlike much of the literature on mergers in international markets, we follow Davidson and Deneckere's (1985) approach and utilize price competition in the product market. Since Salant et. al. (1983) it is well known that under quantity competition, firms can actually lose from a merger since the merged unit loses market share to outside firms.

We explore firms' incentives to form cross-border mergers under non-prohibitive tariff levels and show that two effects play an important role in merger formation: *protection gain* and *tariff savings*. The first effect represents the anti-competitive impact of trade policy and it arises when firms are national units. The tariff savings effect simply captures the incentive to avoid the trade cost by merging with a firm in the export market. An analysis of these two effects shows that the tariff level and the degree of product differentiation together create a trade-off between the relative attractiveness of national and international market structures. If the trade environment is restrictive, and the industry produces close substitutes, the former effect dominates the latter generating a tendency for national mergers. On the other hand, when the trade environment is close to free trade, the tariff savings dominates the protection gain and this dominance is stronger for highly differentiated products.

Next, we examine the implications of unilateral home trade liberalization at two extreme foreign tariff levels (prohibitive foreign tariff and zero tariff). We find that when products are close substitutes, different trade policy regimes in the foreign country can reverse the effects of unilateral home trade liberalization. When the foreign country practices free trade, unilateral home trade liberalization induces firms to form international mergers. However, when the foreign tariff is prohibitive, the impact of unilateral home trade liberalization depends on the degree of product differentiation: for highly differentiated products, the equilibrium market structure is international whereas for close substitutes, it is national. This result stems from the fact that, when there is severe competition among firms (i.e. when the degree of product differentiation is low), a highly protective trade policy regime in one country creates an incentive to merge

nationally rather than internationally since the protection gain is more important than the tariff savings in determining industry structure.

Given the effects of unilateral trade liberalization, it is natural to ask: What are the effects of bilateral trade liberalization on industry structure? This interaction is examined by assuming a common exogenous tariff level in both markets and then lowering it. In contrast to unilateral trade liberalization, the tariff reduction is realized in both markets so that both the tariff savings and the protection gain from tariffs declines. Our main result here is that, as trade gets bilaterally liberalized, the resulting equilibrium market structure is the one with international mergers. This result is consistent with the fact that global trade liberalization has been accompanied by an increase in cross-border merger activities. It is important to note that equilibrium market structures following unilateral and bilateral trade liberalization seem to provide the opposite intuition to the tariff jumping argument in the FDI literature where high tariffs create an incentive for FDI. This contrast is mainly due to the endogeneity of the merger formation in our model. Here, FDI can occur only via an international merger whereas the tariff jumping argument is typically made for a single firm under trade policy regime by comparing two discrete options: Export versus Greenfield entry.

What if countries can respond to changes in market structure via optimal tariffs? Endogenous trade policy is allowed in order to study equilibrium market structures and their welfare properties under optimal tariffs. It is found that as the market gets more concentrated nationally, each country imposes a higher tariff on imports whereas if the market gets more concentrated internationally, a country's optimal tariff actually declines. In the empirical literature, the effect of the industry concentration on the level of

protection is inconclusive. This result provides an alternative explanation for this ambiguity. Furthermore, the equilibrium market structure is the one with concentrated international mergers when products are highly differentiated whereas national mergers arise for close substitutes.

Turning to welfare, three effects are shown to be important in determining preferred market structures from a welfare point of view. The first two effects are the standard anti-competitive effects of tariffs and market concentration on consumer welfare and producer surplus. The third effect is the free rider effect, which arises under asymmetric market structures. It can be measured by the amount by which the profits of a non-merging firm increase when a merger happens. We find that, for lower tariffs, the market structure with no mergers is the welfare champion when product substitutability is low. When trade policy is not restrictive, the main welfare concern is the anti-competitive effect of market concentration on consumer welfare. When products are close substitutes, there is severe competition among firms so that the free rider effect of a foreign merger to home competing firms tips the balance in favor of the triopoly with a foreign merger. As the tariff level increases, the tariff saving feature of international mergers becomes important and international mergers are preferred market structures from a welfare point of view since international firms can avoid trade costs but national firms cannot.

Among equilibrium market structures, international market structures represent higher welfare than the national ones. This result provides support for the idea that there is scope for welfare-enhancing merger policies under a liberal trade environment. Interpreting merger policy as the choice of degree of industrial concentration, we show

that social and private incentives become aligned together as trade gets bilaterally liberalized.

Our paper is related to Horn and Persson (2001) who apply the endogenous merger formation approach to international trade and determine the equilibrium ownership structure of an international oligopoly. They show that the international pattern of ownership depends on trade and production costs. However, while investigating the effects of trade costs on the equilibrium ownership structures, they do not exclude prohibitive trade cost levels. This feature results in national ownership structures mainly due to the monopoly power in the domestic market. If we squeeze their results to the region of non-prohibitive trade-cost levels, the only surviving equilibrium market structure is the one with international mergers.[7] In this paper, however, we argue that concentrated national market structure can be the equilibrium one even under non-prohibitive tariff levels. Moreover, if the trade cost is interpreted as the tariff level, the equilibrium characterization in Horn and Persson (2001) indicates that bilateral trade liberalization results in an empty set of market structures (i.e. there is no equilibrium).

This paper shows that the choice of price as a basic strategic variable instead of quantity overcomes the non-existence problem, which arises as trade liberalization occurs. Under price competition with differentiated products, we find that unilateral and bilateral trade liberalization results in a non-empty equilibrium market structures. This

[7] Under Cournot competition, national mergers are never equilibrium candidates. Since Salant et. al. (1983), it has been well known that, under quantity competition, unless the merged unit achieves very high market share, merging firms can actually lose from a merger. As a result, the main comparison leading to equilibrium market structure is between the market structure with international mergers and the one with no merger.

result stems from the fact that under price competition, every single merger is profitable and there is no trivial elimination of concentrated market structures.

Brief mention must be made on the related line of research, which explores profitability of mergers, regulation issues, and the interaction between merger policies and trade liberalization. Examples of this line of research are: Barros and Cabral (1994), Collie (2002), Cowan (1989), Head and Ries (1997), Farrel and Shapiro (1990), Horn and Levinsohn (2001), Richardson (1999), and Saggi and Yildiz (2002). Unlike the present paper, this research uses the traditional criterion for merger incentives.

The essay is organized as follows. Section 2 introduces an endogenous merger formation model in a concentrated international oligopoly with differentiated products. The model is employed in Section 3 to determine the equilibrium market structure characterization following unilateral and bilateral trade liberalization. The welfare implications of trade liberalization and optimal merger policy are discussed in section 4. In Section 5, endogenous trade policy is allowed. Concluding discussion will follow in Section 6. Finally, most of the calculations and proofs can be found in the appendix.

2. The Model

The model is a two-country partial equilibrium set-up in which countries are indexed by k, where $k = h$ (home country), f (foreign country). Countries are identical with respect to market size and demand. In each exporting country, there is a single industry consisting of two firms that produce symmetrically differentiated products. Each firm is endowed with one unit of an indivisible asset assumed to be fixed in supply. Firms are indexed by i= 1, 2, 3, 4 where 1 and 2 (3 and 4) denote home (foreign) firms and their

assets are located in home country and foreign country respectively. Firms own the exclusive technology for their particular brand and the marginal cost of production for all firms is constant ($c \geq 0$).

The interaction takes place in two stages. In the first stage, industry structure is determined: firms decide whether to merge domestically, internationally or stay as competing units. In the second stage, firms formed in the first stage compete non-cooperatively in Bertrand fashion in two countries' markets.

Following Shubik (1980), we adopt the following demand function for each market:

$$q_i(p_1,...,p_N) = \frac{1}{N}(\alpha - p_i - \gamma(p_i - \frac{1}{N}\sum_{j=1}^{N} p_j)) \qquad (2.1)$$

where p_i is the price charged by firm i and q_i its sales and N denotes the number of firms in the market. The parameter $\gamma \geq 0$ is a measure of the substitutability of the goods. When γ approaches zero, goods become unrelated and as it approaches infinity, goods become perfect substitutes. Note that the degree of product differentiation between any two goods is the same.

The effect of trade liberalization on the equilibrium market structure can be examined by assuming exogenous tariff levels faced by exporting firms and then lowering those tariffs. Given these tariff levels, the origin of merging firms becomes crucial. If asset owners from different countries merge, the resulting firm is an international firm having the advantage of avoiding tariff levels in both markets. By contrast, national firms (either non merged units or constructed by merging owners from

the same country) have trade protection in their own country but face a tariff disadvantage when exporting. Throughout the paper, we exclude prohibitive tariff levels since such tariffs are rarely witnessed under trade environment.

Since markets are segmented, firms' decisions concerning one market do not affect their decisions in other markets. We first take the industry structure as given and analyze the product market equilibrium (second stage of the game) for home firms. Similar optimization procedures apply for foreign firms. We denote the tariff levels in the home and foreign country by t_h and t_f respectively.

In fully decentralized market structure (no mergers), each non-merging home firm chooses its price to maximize its profit taking other firms' prices as given:[8]

$$\max_{\{p_i\}} \pi(p_1,...,p_4) = \frac{1}{4} p_i(\alpha - p_i - \gamma(p_i - \frac{1}{4}\sum_{j=1}^{4} p_j)) \tag{2.2}$$

While exporting, each non-merging home firm faces the tariff t_f:

$$\max_{\{p_i\}} \pi(p_1,...,p_4) = \frac{1}{4}(p_i - t_f)(\alpha - p_i - \gamma(p_i - \frac{1}{4}\sum_{j=1}^{4} p_j)) \tag{2.3}$$

where i =1, 2

When merging, firms are allowed to shut down the operation of some plants, but may not alter the characteristics of their products. Each nationally merging home firm in its own market solves the following problem:

[8] In our computations we assume that $c = 0$. This is without loss of generality, as we can always transform variables as follows: $\alpha^* = \alpha - c$, $p^* = p - c$.

$$\max_{\{p_1,p_2\}} \pi(p_1,...,p_4) = \sum_{i=1}^{2} \frac{1}{4} p_i(\alpha - p_i - \gamma(p_i - \frac{1}{4}\sum_{j=1}^{4} p_j)) \tag{2.4}$$

Nationally merging firms face a disadvantage of the tariff cost while exporting:

$$\max_{\{p_1,p_2\}} \pi(p_1,...,p_4) = \sum_{i=1}^{2} \frac{1}{4} (p_i - t_f)(\alpha - p_i - \gamma(p_i - \frac{1}{4}\sum_{j=1}^{4} p_j)) \tag{2.5}$$

The tariff cost can be avoided by merging with local producers in the export market. Thus, internationally merged firms (for example: firm 1 and firm 3) solve the same problem in both markets:

$$\max_{\{p_1,p_3\}} \pi(p_1,...,p_4) = \sum_{i=1,3} \frac{1}{4} p_i(\alpha - p_i - \gamma(p_i - \frac{1}{4}\sum_{j=1}^{4} p_j)) \tag{2.6}$$

Thus far, we have taken the industry structure as given. We now turn to the first stage of interaction. In determining industry structure, there are several modeling choices. The traditional merger literature considers mergers between exogenously chosen groups of firms. The criterion for merger incentives in this literature focuses on two market structures where one is a strict concentration of the other. Firms are said to have incentives to merge if the profits of the merged unit is higher than the combined pre-merger profits of merging units. However it does not seem reasonable when there is a ranking structure, which involves many feasible market structures some of which are not strict concentration of others. To deal with this problem, there are two main alternative approaches to endogenize merger formation.[9]

[9] Chatterjee et al. (1993) and Ray and Vohra (1998) treat the merger formation as a non-cooperative bargaining game and also belong to in this literature.

First, Kamien and Zang (1990) offered an acquisition process modeled as follows: Each owner makes offers or bids for every other firm and announces an asking price for her own simultaneously. Equilibrium market structure is determined following a general allocation scheme once all bids and asking prices are known. Simultaneity of the bidding process implies that there are no negotiations between firms. This approach applies to situations where there are many firms and owners. In contrast, our focus is on minimal symmetric oligopoly model where firms are able to communicate and sign binding contracts.

Our model is built on the endogenous merger formation approach developed by Horn and Persson (2001). Based upon the earlier literature on mergers, and on actual observations of firm behavior, they take the view that merger formation can be treated as a cooperative game since parties involved in the formation process are free to communicate and sign binding contracts.[10] This approach is a generalization of traditional merger analysis since comparisons are made between all feasible market structures rather than two exogenously given market structures one of which is a strict concentration of the other.

In this model, an important concept is the dominance relation, which implies that if a market structure M^j is dominated by another market structure M^i, the former will not be the outcome of the merger formation since it is in the interest of firms who have the power of enforcing M^i over M^j. These firms are called to be "decisive firms" and

[10] Ray and Vohra (1998) portray the merger formation as a non-cooperative extensive form bargaining game. In their model, market structure and payoff distribution are simultaneously determined. The prediction about which mergers are formed is highly sensitive to the order of offers and counter-offers. However, the present model indicates that, if any binding agreement can be renegotiated, this sensitivity problem vanishes.

they are directly involved in the process of merger formation and break-up.[11] Two assumptions are made in the merger formation process. First, any payments between coalitions are not allowed. Second, when forming a merger, participating firms can choose any payoff distribution among themselves subject to the constraint that the total payoff distributed be exactly equal to the merged unit's total profit in the second stage of the game.

The idea behind this concept can be seen more clearly in the following example in which there are four firms and four market structures: $M^A = \{\{12\},\{3\},\{4\}\}$, $M^B = \{\{13\}\{2\},\{4\}\}$, $M^C = \{\{1\},\{2\},\{3\},\{4\}\}$, and $M^D = \{\{12\},\{34\}\}$. First consider the first two market structures. Firm 4 does not change its behavior in M^A and M^B in the sense that it stays as a competing unit in both structures. Since payments between firms are not allowed, firm 4 cannot influence the ranking of market structures M^A and M^B. Alternatively stated, firm 4 is not "decisive" with respect to these two market structures. Now turn to firms 1, 2, and 3. If the market structure M^A is formed, firm 3 will not participate in any merger. In order to prevent this, if firm 3's profit is higher under M^B, it may offer to firm 1 a larger share of payoff of the merger under the market structure M^B. On the other hand, firm 2 may make a counter-offer to induce a merger with firm 1 if its profit is higher under M^A. As a result, by being linked to firm 1 in the market structure M^B, firm 3 is able to bargain with firm 2 over firm 1's participation in a merger. This bargaining process implies that firms 1, 2, and 3 have the ability to affect

[11] Formal definition of a decisive group and further detailed discussion can be found in Horn and Persson (2001).

the ranking of market structures M^A and M^B. Therefore, these firms are "decisive" with respect to these two market structures.

Decisive firms can be redefined as follows: except for the firms belonging to the same coalitions in two different market structures, all remaining firms are decisive. Note that there may be more than one group of decisive firms. Consider now the ranking of last two market structures M^C and M^D. Firms 1 and 2 participate in a merger under M^D as do firms 3 and 4 even though they are competing units under M^C. Therefore all four firms are decisive with respect to these two market structures. However, merger formation processes are not linked so that there are two decisive groups of firms. The first decisive group is composed of firm 1 and firm 2 and the second one includes firm 3 and firm 4. As in Horn and Persson (2001), the decisive group of owners with respect to two different market structures M^i and M^j will be denoted as $D_g^{i\&j}$ where g represents the number of the group of decisive firms.

Given the definition of the concept of decisive firms, dominance relations work as follows: If there is only one decisive group of firms between two market structures M^i and M^j, M^i dominates M^j if and only if the combined profit of the decisive group $D^{i\&j}$ is larger in M^i than M^j. If there are two decisive groups of firms, it is required that domination holds for each of them. It is important to note that the dominance relation is not transitive if decisive group(s) of firms is (are) not the same. In other words, in the above example, if M^A dominates M^B and M^B dominates M^C, one can not infer that M^A dominates M^C since decisive firms with respect to M^A and M^B are not the same as decisive firms with respect to M^B and M^C (M^A and M^C). Furthermore, it is clear that

M^i and M^j cannot dominate each other simultaneously. As a result, the dominance relation is asymmetric.

Having identified the decisive firms and described how we rank any pair of market structures using dominance relation, the next question is: How can we find the equilibrium market structure? An equilibrium market structure is defined to be the one that is undominated by any other feasible market structure. The model has the feature that firms merge all the way to monopoly, if permitted. This is because the combined profits of all firms in other market structures are smaller than monopoly profits and all parties are involved in the merger formation process. Since the focus is on the distinction between national and international mergers, highly concentrated market structures (monopoly and the duopoly with international merger of three firms) will be excluded within the equilibrium market structures.[12]

The symmetry of the model indicates that there are 10 possible ownership structures that can be represented by 5 market structures:[13]

1-) Fully Decentralized Market structure (No mergers):

$M^O = \{\{1\},\{2\},\{3\},\{4\}\}$

2-) Triopolies with one national merger:

$M^H = \{\{12\},\{3\},\{4\}\}$, $M^F = \{\{1\},\{2\},\{34\}\}$

[12] We can rule out these market structures simply by assuming that the competition authority sets a maximum of Herfindahl-Hirschman index (HHI) level. Since HHI is a convex function of shares, it increases both as the number of firms in the market decreases and as the disparity in size between those firms increases. Using this feature of HHI, duopoly with international merger of three firms can be differentiated from duopoly with two mergers of equal size.

[13] This approach follows the partition function form games developed by Thrall and Lucas (1963).

3-) Triopolies with one international merger (M^{1I}):

$$M_1^{1I} = \{\{13\},\{2\},\{4\}\}\ M_2^{1I} = \{\{1\},\{23\},\{4\}\}$$

$$M_3^{1I} = \{\{14\},\{2\},\{3\}\}\ M_4^{1I} = \{\{1\},\{3\},\{24\}\}$$

4-) The duopoly with two national mergers:

$$M^N = \{\{12\},\{34\}\}$$

5-) Duopolies with two international mergers (M^I):

$$M_a^I = \{\{13\},\{24\}\}\ M_b^I = \{\{14\},\{23\}\}$$

In order to save on notation, later on in this paper, each market structure is referred to its first ownership structure as far as this is possible.

In order to capture the seemingly complicated dominance relation, consider the following example. For market structure M^I to dominate M^H , firm 1 and firm 2 should be able to convince firm 3 and firm 4 respectively to merge with them internationally. It implies that the profit gain for firm 1 and firm 2 should be enough to cover any possible loss of firm 3 and firm 4. Furthermore, firm 1 and firm 2 have to make sure that they will earn more profits by breaking up a national merger and moving to the market structure with two international mergers. These conditions can be captured by following inequalities:

$$\pi_1^{M^I} - \pi_1^{M^H} > \pi_3^{M^H} - \pi_3^{M^I} \tag{2.7}$$

$$\pi_2^{M^I} - \pi_2^{M^H} > \pi_4^{M^H} - \pi_4^{M^I} \tag{2.8}$$

Addition of (3.7) and (3.8) and rearrangement yield that all firms are decisive and combined profit of the decisive group $D^{I\&H}$ is larger in M^I than in M^H for market

structure M^I to dominate M^H:

$$M^I \text{ dominates } M^H \text{ iff } \pi_1^{M^I} + \pi_2^{M^I} + \pi_3^{M^I} + \pi_4^{M^I} > \pi_1^{M^H} + \pi_2^{M^H} + \pi_3^{M^H} + \pi_4^{M^H} \quad (2.9)$$

The following decisive groups are relevant for the comparison of the market structures defined above:

A-) no mergers & triopolies with one national merger: one decisive group comprising two owners:

$$D^{O\&H} = \{1, 2\},\ D^{O\&F} = \{3, 4\}$$

B-) no mergers & triopolies with one international merger: one decisive group comprising two owners:[14]

$$D^{O\&1I} = \{1, 3\}$$

C-) no mergers & duopoly with two national mergers: two symmetric groups of decisive owners:

$$D_1^{O\&N} = \{1, 2\},\ D_2^{O\&N} = \{3, 4\}$$

D-) no mergers & duopolies with two international mergers: two symmetric groups of decisive owners:[15]

$$D_1^{O\&I} = \{1, 3\},\ D_2^{O\&I} = \{2, 4\}$$

E-) triopolies with one national merger & triopolies with one international merger: one decisive group comprising three owners:

$$D^{H\&1I} = \{1, 2, 3\},\ D^{F\&1I} = \{1, 3, 4\}$$

[14] Note that {13, 2, 4} is taken as a representative ownership structure for M^{1I}.

[15] Note that {13, 24} is taken as a representative ownership structure for M^I.

F-) triopolies with one national merger & duopoly with two national mergers: one decisive group comprising two owners:

$$D^{H\&N} = \{3, 4\},\ D^{F\&N} = \{1, 2\}$$

G-) triopolies with one national merger & duopolies with two international mergers: one decisive group comprising all owners:

$$D^{H\&I} = D^{F\&I} = \{1, 2, 3, 4\}$$

H-) triopolies with one international merger & duopoly with two national mergers: one decisive group comprising all owners:

$$D^{1I\&N} = \{1, 2, 3, 4\}$$

I-) triopolies with one international merger & duopolies with two international mergers: one decisive group comprising two owners:

$$D^{1I\&I} = \{2, 4\}$$

J-) duopoly with two national mergers & duopolies with two international mergers: one decisive group comprising all owners:

$$D^{N\&I} = \{1, 2, 3, 4\}$$

3. Results: Trade Liberalization and Equilibrium Market Structures

Our aim is to identify the effects of unilateral and bilateral trade liberalization on the equilibrium market structure in a concentrated international oligopolistic market. Therefore, we exclude prohibitive tariff levels in the following corollary to highlight how the incentives to form national and international mergers are influenced by tariff levels. Basically, we examine a situation where countries cannot shut out their markets in any market structure.

Corollary 3.1 *The prohibitive tariff levels in each market structure are as follows:*

$$\overline{t^N} = \overline{t_h^F} = \overline{t_f^H} \geq \overline{t_h^H} = \overline{t_f^F} = \overline{t^O} \geq \overline{t^{1I}}$$

where subscripts (h for home country, f for foreign country) of t represents the country in which tariff is imposed while superscript denotes the market structure.

Note that for symmetric market structures (M^O, M^{1I}, and M^N) there is no need for a subscript. As it is seen clearly from the above ranking structure, the same concentration level of importing firms results in the same prohibitive tariff level irrespective of domestic concentration. Moreover, the duopoly with two international mergers inherently eliminates tariff protection. Hereafter $\overline{t^{1I}}$ indicates the upper limit of tariff protection:

$$\overline{t^{1I}} = \frac{4\alpha(3\gamma+4)(7\gamma+8)}{23\gamma^3+152\gamma^2+256\gamma+128} \tag{3.10}$$

3.1. Unilateral Trade Liberalization

Here, we examine the effect of unilateral trade liberalization by assuming exogenous tariff levels (t_h and t_f) faced by exporting firms in both markets, and then lowering one of the tariff levels keeping the other unchanged.[16] To this end, a function called relative gain from international mergers ($g^{I\&j}(.)$) is defined as the difference of the

[16] As it is indicated in the introduction, only unilateral home trade liberalization is examined. Due to symmetry, same results will apply to the case of unilateral foreign trade liberalization.

combined profit of the decisive firms between the duopoly with two international mergers (M^I) and any other market structures compared with it. Using results from traditional criterion for merger incentives, it is well known that merger profitability increases with merger size. Therefore, our focus will be on concentrated market structures. Given the tariff saving assumption, the comparison of duopoly with two international mergers (M^I) with other market structures is taken as a base scenario. The relative gain from international mergers ($g^{I\&j}(.)$) is defined as follows:

$$g^{I\&j}(t_h, t_f) = \sum_{i \in D^{I\&j}} \pi_i^I(t_h, t_f) - \sum_{i \in D^{I\&j}} \pi_i^j(t_h, t_f) \tag{3.11}$$

where j represents market structures other than M^I.

Since the combined profits of the decisive firms under M^I are not affected by any change in the tariff levels, we need to focus on the combined profit of the decisive firms under other market structures compared with M^I. In these comparisons, in each decisive group (if there is more than one), there is an equal number of decisive firms either protected for or against with home tariffs. Given this fact, we need to identify the decisive forces in the merger formation process.

3.1.1. Role of Trade Protection and Tariff Saving

There are two counteracting effects in the merger formation stage of the game. First of them is the protection gain which represents the anti-competitive impact of the trade policy. This effect arises when firms are formed as national units. The second effect

is the tariff savings that creates incentives to merge internationally in order to avoid tariffs in the export market.

In order to capture the idea behind these two effects, consider the dominance function with respect to international duopoly (M^I) and national duopoly (M^N). As noted above, there is only one decisive group composed of all four firms with respect to these two market structures. Therefore, industry profit levels are compared under these market structures. It is obvious that the industry profit under international duopoly (M^I) does not depend on home and foreign tariffs (t_h and t_f respectively) since firms avoid tariffs by merging internationally, whereas the tariff level affects industry profit under the national duopoly (M^N). It implies that any profit difference is due to home and foreign tariffs:[17]

$$M^I \ \textit{dominates} \ M^N \text{ if and only if } \quad \pi_{13}^I + \pi_{24}^I > \pi_{12}^N(t_h, t_f) + \pi_{34}^N(t_h, t_f)$$

Aggregate profits earned by home national merger can be written as follows:

$$\pi_{12}^N(t_h, t_f) = \pi_{12}^N(t_h = t_f = 0) + \int_0^{t_h} \frac{\partial \pi_{12}^N(t_h, t_f)}{\partial t_h} dt_h + \int_0^{t_f} \frac{\partial \pi_{12}^N(t_h, t_f)}{\partial t_f} dt_f - t_f q_{12}^e \quad (3.12)$$

where q_{12}^e represents the amount of output exported by a home merger.

First term in (3.13) represents the home merger's profit in the absence of home and foreign tariffs. The second and third terms measure the change in the home merger's aggregate profits net of tariff payment relative to a situation in which both countries

[17] Naturally, aggregate profits are the same when $t_h = t_f = 0$.

practice free trade ($t_h = t_f = 0$). It stems from the fact that the tariff protection leads to an increase in the home and foreign merger's price level. The foreign price level exceeds the home price level since the home merger's reaction function has a slope uniformly less than one. This results in an increase in the home merger's market share as well. It can be shown that, under non-prohibitive tariff levels, aggregate profit in both countries net of tariff burden increases in the tariff levels. Therefore, the addition of second and third terms has a positive sign unless products are highly differentiated. These two terms indicate protection gain, which captures the anti-competitive effect of tariffs. The last term, the tariff burden for home firms, lowers the home merger's aggregate profit relative to free trade.

Similarly, foreign merger's profit can be written as follows:

$$\pi_{34}^{N}(t_h, t_f) = \pi_{34}^{N}(t_h = t_f = 0) + \int_0^{t_h} \frac{\partial \pi_{34}^{N}(t_h, t_f)}{\partial t_h} dt_h + \int_0^{t_f} \frac{\partial \pi_{34}^{N}(t_h, t_f)}{\partial t_f} dt_f - t_h q_{34}^{e} \quad (3.13)$$

where q_{34}^{e} represents the amount of output exported by a foreign merger.

Since $\pi_i^N(t_h = t_f = 0) = \pi_j^I(t_h = t_f = 0)$, relative gain from international mergers is found as follows:

$$\mathrm{g}^{\mathrm{I\&N}}(t_h, t_f) = t_h q_{34}^{e} + t_f q_{12}^{e} - \int_0^{t_h} \sum_{i=12,34} \frac{\partial \pi_i^{N}(t_h, t_f)}{\partial t_h} dt_h - \int_0^{t_f} \sum_{i=12,34} \frac{\partial \pi_i^{N}(t_h, t_f)}{\partial t_f} dt_f \quad (3.14)$$

Whether M^I *dominates* M^N or not depends on the balance between the tariff savings incentive of firms to form international duopoly (M^I) in order to avoid the tariff burden and the protection gain to form national duopoly (M^N). The former incentive is

captured by the first two terms in (3.14), while the latter is captured by the last two terms in (3.14). Since we examine unilateral home trade liberalization, our focus is on the first term and the third term in the equation (3.14).[18] The balance between the tariff savings and the protection gain is characterized in the following proposition:

Proposition 3.1 *Given the foreign tariff (t_f),* $g^{I\&j}(t_h, t_f)$ *is a concave function of the home tariff (t_h).*

As noted above, the anti-competitive impact of tariff protection increases in the home tariff level. For lower home tariffs, the tariff savings dominates the protection gain. However, under a very protectionist home trade policy regime, the former effect is dominated by the latter. It implies that unilateral home trade liberalization results in an increase in the dominance of international duopoly over other market structures for higher home tariff levels and a decrease for lower ones.

It is important to emphasize that the degree of product differentiation is also an important determinant of the relative strengths of these two counteracting effects. The level of competition among firms is directly affected by the substitutability level (γ) among products. When products are close substitutes, competition is severe and firms are close to the Bertrand paradox. In that case, tariff protection provides room for national firms to enjoy profits in highly competitive trade environment so that the protection gain is more pronounced when substitutability level (γ) is high. For highly differentiated

[18] Note that any dominance function analysis would yield the same results since there is an equal number of decisive firms either protected for or against with home tariffs.

products, firms have some market power resulting from different characteristics of their products so that marginal benefit of tariff protection is relatively low.

The symmetry of the model implies that same results apply for unilateral foreign trade liberalization. Therefore, two extreme foreign tariff levels are taken into consideration since the dominance function takes lowest values at these tariff levels and this helps us to generalize the result for unilateral trade liberalization. Consider first the case that foreign country practices free trade so that t_f=0.[19] Later on, we will also discuss the case where foreign country practices very restrictive trade policy regime ($t_f = \overline{t^{1I}}$) in order to fully capture the effects of unilateral home trade liberalization.

3.1.2. Free Trade Abroad and Unilateral Trade Liberalization

Since exporting home firms face a zero tariff abroad, only the tariff savings in the home country is relevant and it can arise via an international merger. The following characterization of the set of equilibrium market structure (EMS) supports the idea that unilateral trade liberalization yields more cross-border mergers when the trading partner is a free trade country:

Proposition 3.2 *Given that the foreign country practices free trade* $(t_f = 0)$*, the equilibrium market structure (EMS) characterization is as follows:*

i-) International duopoly (M^I) *is the EMS if* $\gamma < 5.88$ *for all* t_h.

ii-) International duopoly (M^I) *is the EMS if* $\gamma > 5.88$ *and* $t_h < t_{cr}^{I\&N} < \overline{t^{1I}}$.

[19] Due to symmetry, analogous results apply for the foreign country.

iii-) National duopoly (M^N) is the EMS if $\gamma > 5.88$ and $t_{cr}^{I\&N} < t_h < \overline{t^{1I}}$

where $t_{cr}^{I\&N}$ represents the critical tariff level which equates the aggregate profits under national duopoly (M^N) and international duopoly (M^I):

$$t_{cr}^{I\&N} = \frac{4\alpha(3\gamma+4)^2}{\gamma^4+10\gamma^3+42\gamma^2+64\gamma+32}$$

and where $\overline{t^{1I}}$ represents the upper limit on the non-prohibitive tariff levels given in (3.10).

As it is seen from the above result, the home tariff level (t_h) and the level of substitutability among products (γ) together act as crucial determinants of the relative strengths of the protection gain and the tariff savings. When substitutability level is low, there is a little competition among firms since they have some market power stemming from different characteristics of their products. Therefore, tariff protection does not have a great impact on the demand for home products. Moreover, it can be easily verified that the critical tariff level ($t_{cr}^{I\&N}$) increases in the degree of product differentiation. When products are highly differentiated, the critical tariff level ($t_{cr}^{I\&N}$) exceeds the upper limit of non-prohibitive tariff levels ($\overline{t^{1I}}$) so that the tariff savings dominates the protection gain for every non-prohibitive tariff levels. As a result, the duopoly market structure with international mergers dominates market structures with national mergers. On the other hand, when products are close substitutes, product market experiences severe competition that makes the protection gain more decisive in determining industry structure. Combined

with high substitutability levels, protective home trade policy regime gives firms more incentives to form national mergers.

Moreover, the equilibrium set of market structures is non-empty for all non-prohibitive tariff levels irrespective of the degree of product differentiation. In this sense, the model is well behaved.[20] This pattern of market structures yields the result that as the home country gets unilaterally liberalized, given that the foreign country practices free trade, international mergers become the mode of industry structure.

The next question is what if the foreign country uses very restrictive trade protection. In other words, next section tries to answer the same question as in the Proposition 2 under a more protectionist trade environment.

3.1.3. Restrictive Trade Policy Abroad and Unilateral Trade Liberalization

Recall that concavity of the function called relative gain from international mergers indicates that it is minimized at two limit points first of which was discussed in the previous section. Now suppose that the tariff level in the foreign country is very high:

$$t_f = \overline{t^{1I}}$$

where $\overline{t^{1I}}$ is the upper limit of non-prohibitive tariff levels.

This assumption makes the trade environment more protectionists so that the protection gain is expected to dominate the tariff savings on a broader range of tariff and substitutability levels. Intuitively, extra profits needed to transfer to foreign firms in order to convince them to get involved in an international merger depend not only on the home

[20] As it has been shown in Horn and Persson (2000), the number of firms is immaterial to the result.

tariff level but also on the substitutability levels. Equilibrium characterization represents the balance between these two determinants:

Proposition 3.3 *Given that the foreign country practices restrictive trade ($t_f = \overline{t^{1I}}$), the equilibrium market structure (EMS) characterization is as follows:*

i-) International duopoly (M^I) is the EMS if $\gamma < 5.88$ for all t_h.

ii-) International duopoly (M^I) is the EMS if $8.06 > \gamma > 5.88$ and $t_{cr1}^{I\&N} < t_h < t_{cr2}^{I\&N}$.

iii-) National duopoly (M^N) is the EMS if $8.06 > \gamma > 5.88$ and $t_h < t_{cr1}^{I\&N}$ and $t_{cr2}^{I\&N} < t_h < \overline{t^{1I}}$.

iv-) National duopoly (M^N) is the EMS if $\gamma > 8.06$ for all t_h

where $t_{cr1}^{I\&N}$ and $t_{cr2}^{I\&N}$ are critical home tariff levels which equate the aggregate profits under national duopoly (M^N) and international duopoly (M^I) so that firms are indifferent between these two market structures.

There are several significant insights provided by this proposition. Our first observation is that, as under free trade, the set of equilibrium market structures is non-empty for every tariff and substitutability levels.

Second, in comparison to the case where the foreign country practices free trade, a more protectionist trade environment induces firms to merge nationally unless products are highly differentiated. When product substitutability is low, weak competition yields greater tariff savings through international merger than the protection gain, which arises due to a national merger. It is a result of the fact that the anti-competitive effects of tariff protection is less important since firms already have market power stemming from

product differentiation. Therefore, duopoly with two international mergers survives as the dominant market structure for all home tariff levels when products are highly differentiated.

For intermediate substitutability levels, the equilibrium characterization is more complicated: relatively high and low home tariff levels result in a national duopoly as the equilibrium market structure. Intuitively, since the tariff level is very restrictive in the foreign country and kept fixed within the unilateral home trade liberalization process, home firms are ready to transfer a larger share of profits to foreign firms to form an international merger if the protection in the home country is not very high. However, at the same time, as the home tariff level falls too much and substitutability level increases, it becomes harder to convince foreign firms to give up the protection gain and get involved in an international merger since the tariff savings incentives of foreign firms fall and the protection gain rises even further. On the other hand, when the home country's trade policy is restrictive as in the foreign country, it creates a very protective trade environment encouraging national market structures. When products are close substitutes, national duopoly becomes the only equilibrium market structure irrespective of home tariff levels. This is because it is no longer possible to convince foreign firms to form international merger since the difference between the protection gain and the tariff savings is greater than what home firms are able to offer for any home tariff levels.

If these two extreme foreign trade policy cases are compared, the biggest difference occurs when the products are relatively close substitutes. Different trade policy regimes in the rival country reverse the effects of unilateral trade liberalization. A liberal trade environment in the foreign country yields the result that unilateral home trade

liberalization induces firms to form international market structure irrespective of the degree of product differentiation. However, if foreign country practices very restrictive trade policy, national ownership structure happens to be equilibrium when products are close substitutes.

Given these unilateral incentives, it is natural to ask: What are the effects of bilateral trade liberalization on industry restructuring? This interaction is examined next.

3.2. Bilateral Trade Liberalization

The effects of bilateral trade liberalization on the equilibrium market structure can be examined by assuming a common exogenous tariff level $(t_h = t_f = t)$ in both markets and then lowering it. The difference from the case of unilateral trade liberalization is that the reduction in tariffs is realized in both markets so that both the tariff savings and the protection gain from tariffs decline. Because of market segmentation, the same prohibitive tariff levels are valid in both markets so that the upper limit of tariff levels is again $\overline{t^{1I}}$. In order to identify forces, which have impacts on the ranking of market structures, we can compare aggregate profits under international and national duopolies (M^I and M^N) as in (3.14) by replacing home and foreign tariffs (t_h and t_f) by a common tariff (t). The following result supports the idea that cross border mergers become a major mode of industry restructuring following bilateral trade liberalization:

Proposition 3.4 *Given* that the home and foreign tariff levels are equal to t $(t_h = t_f = t =)$, *the set of the equilibrium market structure (EMS) is as follows:*

i-) International duopoly (M^I) is the EMS if $\gamma < 5.88$ for all t.

ii-) International duopoly (M^I) is the EMS if $\gamma > 5.88$ and $t_h < t_{cr}^{I\&N}$.

iii-) National duopoly (M^N) is the EMS if $\gamma > 7.12$ and $t_{cr}^{I\&N} < t < \overline{t^{1I}}$

where $t_{cr}^{I\&N}$ represents critical tariff level which makes decisive firms indifferent between the national duopoly (M^N) and international duopoly (M^I).

This proposition points to two important features. First, the set of the equilibrium market structures is non-empty for almost all tariff levels. The only exception occurs when substitutability levels (γ) are in the intermediate range and trade policy is restrictive. The intransitiveness of the dominance relationship becomes important for this range of tariff and substitutability levels ($7.12 > \gamma > 5.88$ and $t_{cr}^{I\&N} < t < \overline{t^{1I}}$). It can be shown that M^N dominates M^i where i=O, H, F, I in this given region. But it is also the case that, for the same region, M^N is dominated by M^{1I} which is dominated by M^I for all tariff and substitutability levels. Therefore, there is no equilibrium market structure in this region.

Secondly, the proposition seems to provide the opposite intuition to the tariff jumping argument in the FDI literature since higher protection yields nationally concentrated firms for close substitutes. This counterintuitive result is due to the endogeneity of the merger formation model. In the FDI literature, the tariff jumping argument is made for a single firm by focusing on two alternatives: export or FDI. These two options are compared under trade policy regime without changing the concentration level in the market. However it is important to note that, using the model specified in this paper, FDI occurs via an international merger and all decisive firms involved in the

merger formation process benefit from tariff savings and lose from tariff protection in their domestic markets. In the FDI literature, on the other hand, firms investing in the foreign country directly enjoy tariff savings without losing their gains from protection.

Actually, if one focuses on a single concentrative international merger, similar ideas in the FDI literature can be captured within this model as well. For instance, there are two decisive owners between market structures M^O and M^{1I}. These decisive owners save on tariffs via an international merger which is the dominant form of FDI. To understand the incentives to form an international merger (or to do FDI), the profit of nationally exporting firm under M^O can be compared with the profit of the internationally merging firm under M^{1I}. To this end, the following incentive function can be defined:

$$I^{FDI} = \pi_1^{1I} - \pi_1^O = \pi_3^{1I} - \pi_3^O \tag{3.15}$$

It can be easily verified that this incentive function is monotonically increasing in the common tariff level:

$$\frac{\partial I^{FDI}}{\partial t} > 0 \tag{3.16}$$

However the approach used in this paper is more general than the one employed above since it can be applied to situations with more than one concentrative merger and all feasible market structures can be compared with each other through dominance relationships. Given these differences between approaches, the counterintuitive result

stems from the tension between the tariff savings and the protection gain of decisive firms in the merger formation process.

3.4. Welfare Implications and Merger Policy

Throughout the paper, we assume that very concentrated market structures are excluded by setting an upper limit on HHI. An important question is whether the equilibrium market structures found above are the ones that are preferable from a welfare point of view or not. A country's aggregate welfare is defined as the sum of its consumer surplus, total profit earned by its firms in both markets and tariff revenue under different market structures:[21]

$$W_j^i = CS_j^i + PS_j^i + TR_j^i \text{ where i = O, H, F, 1I, I, N and j = h (HC), f (FC)}$$

Even though no specific payoff division in any merger is assumed, since the feasible market structures are completely symmetric from welfare point of view when $t_h = t_f$, it is reasonable to assume that profits are evenly divided between merging firms.

We can identify several forces that impact the welfare ranking of different market structures. First, as in the closed economy, there is standard trade-off between the impact of concentration on producer surplus and consumer welfare. In the open economy, part of the cost of domestic concentration is transmitted to foreign consumers. Second, domestic tariffs protect national firms in the domestic country whereas foreign tariffs punish them in the export market. Moreover, consumer welfare decreases in tariffs. Note that this

[21] Welfare ranking of different market structures is examined only for the home country. Due to the symmetry, same analysis will follow for the foreign country.

second source of tension vanishes completely under a duopoly with two international mergers and partly under a triopoly with one international merger. Third, under asymmetric market structures (M^H , M^F , and M^{1I}), a merger confers a large positive externality (free rider effect) on competing firms. The degree of the free rider effect can be measured by the amount by which the profits of a non-merging firm increase when a merger happens. As in Davidson and Deneckere (1985), the free rider effect of a merger is so strong that the profits of non-merging firms exceed those of the merged unit: $\pi_1^F + \pi_2^F \geq \pi_{34}^F$ and $\pi_3^H + \pi_4^H \geq \pi_{12}^H$. Similarly, under the triopoly with one international merger (M^{1I}), merging firms enjoy free rider effect that arises due to tariffs national competing firms face.

We first examine the case when the tariff rates are low. Under a relatively liberal trade environment, the anti-competitive effect of trade policy on consumer welfare and producer surplus is not very important from a welfare point of view. Also, when the level of product substitutability is low, the free rider effect under asymmetric market structures is not strong. Thus, in such a situation, the most important concern is the anti-competitive effect of market concentration on consumer welfare and producer surplus. As expected, the least concentrated market structure (M^O) is the most preferred market structure when products are highly differentiated. For close substitutes, however, there is a severe competition among firms so that the free rider effect of a foreign merger to home competing firms tips the balance in favor of the triopoly with foreign merger (M^F).

As the tariff level increases, the tariff savings of international mergers get more pronounced as do the anti-competitive effect of the trade policy on consumer welfare. For intermediate range of tariff levels, the free rider effect under international triopoly (M^{1I})

is the main reason why M^{1I} is the most preferred market structure. When trade policy is restrictive, the duopoly with two international mergers (M^I) is the most preferred market structure for all substitutability levels. Note that even though consumers lose from concentration and there is no tariff revenue, the tariff savings dominate the other counteracting effects.

Having identified the welfare ranking of different market structures, we now come to the second important question: Among equilibrium market structures (M^I and M^N), which one is the most preferable from a welfare point of view? The following result is immediate:

Proposition 3.5 *Given that the home and foreign tariff levels are equal to t ($t_h = t_f = t$), the duopoly with two international mergers (M^I) yields higher national and world welfare than the duopoly with two national mergers (M^N) for all tariff and substitutability levels.*

Since competition policy is assumed to allow two mergers consisting of two firms, firms' incentives are binding in this set-up. Given the above equilibrium market structures, it is clear that the duopoly with two international mergers (M^I) yields the same welfare level as the duopoly with two national mergers (M^N) when both countries practice free trade ($t_h = t_f = 0$):

$$W^I = W^N(t=0) = CS(t=0) + PS(t=0) \tag{3.17}$$

In order to rank these two market structures from a welfare point of view, we use differential techniques. The welfare under the duopoly with two national mergers (M^N) can be expressed as follows:

$$W^N(t) = CS(t=0) + PS(t=0) + \int_0^t \frac{\partial CS(t)}{\partial t} dt + \int_0^t \frac{\partial PS(t)}{\partial t} dt - tq^e + tq^i \qquad (3.18)$$

where $q^e(q^i)$ represents the amount of output exported (imported) by a national merger.

Equation (3.18) decomposes the welfare under M^N into six terms. The sum of the first and third components is the aggregate welfare when both countries practice free trade. The second and fourth terms measure the anti-competitive effect of the trade policy on consumer surplus and producer surplus (net of tariff payment) respectively. Last two terms measure the tariff payments on exports and tariff revenue, which arises due to imports.

As noted above, there is a complete symmetry under these two market structures (M^I and M^N) and same tariff level ($t_h = t_f = t$) is assumed in two markets. Therefore, tariff payments and tariff revenue are identical:

$$tq^e = tq^i \qquad (3.19)$$

Using the equations (3.17), (3.18), (3.19), we can compare the welfare level under M^I and M^N as follows:

$$W^N(t) - W^I = \int_0^t \frac{\partial CS(t)}{\partial t} dt + \int_0^t \frac{\partial PS(t)}{\partial t} dt \qquad (3.20)$$

First term in equation (3.20) measures the decrease in consumer welfare due to trade protection relative to free trade. Since prices increase due to tariffs, the first term has a negative sign. The second term, on the other hand, measures the change in aggregate profits net of tariff payment relative to a situation in which both countries practice free trade. As noted earlier, the second term has a positive sign unless products are highly differentiated. Thus, the welfare ranking of equilibrium market structures depends on the balance between the anti-competitive effect of the trade protection on the consumer welfare and producer surplus. Given the demand function in our model, the former effect dominates the latter so that M^I dominates M^N in terms of welfare for all substitutability and tariff levels:

$$W^I - W^N = \frac{(\gamma+2)t(t\gamma^2(\gamma+6)(\gamma+14)+64t(2\gamma+1)+8\alpha(3\gamma+4)^2)}{8(\gamma+4)^2(3\gamma+4)^2} \geq 0$$

Note that due to the symmetry of these two market structures, analogous results apply for the world welfare. The above welfare analysis points out that there is scope for welfare-enhancing merger policies. Along the line of the literature investigating international linkages between trade and merger policies, a frequent concern has been the possibility that trade liberalization may induce countries to use more lax competition policies, in narrower sense merger policies, to promote national interests at the expense of others. Incentives for a welfare maximizing government to make such a substitution can be examined by interpreting merger policy as a choice of degree of industrial

concentration.[22] Competition authorities have the ability to impact resulting equilibrium market structure characterization through merger policies specified in the merger guidelines.[23] Suppose that they can choose an upper limit of concentration level above which any merger proposal is blocked. The equilibrium market structure characterization in Proposition 4 and the above welfare ranking together imply that competition authorities have less incentive to block merger as trade gets liberalized if a duopoly of two mergers are permitted. Trade liberalization induces more cross border ownerships (M^I), which results in higher welfare than national market structures (M^N). In other words, social and private incentives converge to each other as trade gets bilaterally liberalized.

Next question is related with the equilibrium market structures under optimal tariff levels. To this end, one more step will be added to the original game employed so far in order to endogenize trade policy as well.[24]

3.5. Endogenous Trade Policy

Thus far, our analysis does not recognize the fact that trade policy in each country may respond to changes in market structure. To allow for this interaction, consider the following game. In the first stage, firm owners decide on the merger formation so that industry structure is determined. Next, each country chooses a specific tariff t on imports. In the last stage, firms compete in prices in the product market.

[22] This question is addressed in Richardson (1999), Horn and Levinsohn (2000), Saggi and Yildiz (2002).

[23] In the Horizontal Merger Guideline (1997), in part 1.43 it is indicated that market shares will be assigned to foreign competitors in the same way in which they are assigned to domestic competitors.

Each country chooses its tariff to maximize its welfare. The tariff ranking shows that as the market gets more concentrated nationally, higher tariff is imposed on the imports. The optimal tariff rate decreases in the number of international mergers so that lowest optimal tariff level is realized under international triopolies:[25]

$$t_h^{*N} > t_h^{*H} > t_h^{*F} > t_h^{*O} > t_h^{*1I} \text{ for } \gamma > 4.16 \tag{3.21}$$

and

$$t_h^{*N} > t_h^{*F} > t_h^{*H} > t_h^{*O} > t_h^{*1I} \text{ for } \gamma < 4.16 \tag{3.22}$$

This result argues that the interaction between the level of protection and the industry concentration depends on the nature of the mergers (national or international).[26]

Moreover, among national triopolies, the impact of the concentration of domestic firms on the optimal tariff is greater for high substitutability levels relative to the impact of concentration of foreign firms. This is because the protection gain increases with the degree of product substitutability.

Having ranked the optimal tariff rates, two immediate questions are: When countries can respond to mergers via optimal tariffs, what is the set of equilibrium market structures? Among these market structures, which are the ones that are preferred from a welfare point of view?

The following proposition is immediate:

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[25] It is clear that international duopoly inherently excludes tariff level in this model.

[26] There are number of empirical studies that explore the interaction between the industry concentration and the level of protection. The results are inconclusive. Whereas Trefler (1993), Gawande (1997), and Bandyopadhyay and Gawande (2000) found significant positive relationships between industry concentration and the level of protection, Baldwin (1985), and Anderson and Baldwin (1987) report a negative relationship. The present paper provides one explanation for this ambiguity in the sense that the nature of the concentration (national or international) is important in determining optimal trade policy.

Proposition 6 *Under optimal trade policy:*

i-) International duopoly (M^I) is the equilibrium market structure if $\gamma < 8.72$.

ii-) National duopoly (M^N) is the equilibrium market structure if $\gamma > 8.72$.

iii-) International duopoly (M^I) is the most preferred market structure from a welfare point of view for all substitutability levels (γ).

In terms of equilibrium market structures, optimal trade policy regime yields results similar to those obtained in our analysis of unilateral and bilateral trade liberalization. The first two parts of proposition 6 states that the protection gain dominates the tariff savings for close substitutes and vice versa if products are differentiated enough. Therefore, the equilibrium market structure is the duopoly with two national mergers (M^N) for higher substitutability levels and the duopoly with two international mergers (M^I) for lower ones.

Allowing for endogenous trade policy yields the duopoly with two international mergers (M^I) as the most preferred market structure from a welfare point of view for all substitutability levels. Since the optimal tariff levels change with the concentration of the industry, less concentrated market structures are dominated by the duopoly with two international mergers (M^I) in terms of welfare. One can easily confirm this result by using figure 4 since the lowest optimal tariff rate falls to the area where the duopoly with two international mergers (M^I) is the most preferred market structure. Whether optimal trade policy regime is welfare-enhancing or not depends on the substitutability level among products. For very close substitutes, optimal trade policy responses result in the

least desired market structure (M^N) as the equilibrium market structure. When the products are differentiated enough, private and social incentives tend to move together.

4. Summary and Conclusions

This paper explores the international linkages between industry structure and trade liberalization. The objective has been to ask how industry restructures following trade liberalization. This is a meaningful question because over the last two decades the world economy has experienced the largest ever merger movement with a high incidence of cross border mergers and acquisitions. Despite the increase in cross-border M&A's, the literature on international trade and FDI has paid little attention to this phenomenon.

The model endogenizes merger formation under price competition in an international oligopolistic market. We explore firms' incentives to form cross-border mergers and show that two effects play an important role in merger formation: protection gain and tariff savings. The former effect represents the anti-competitive impact of trade policy, which arises when firms are national whereas the latter captures the incentives to avoid trade costs via an international merger. An analysis of these two effects shows that the tariff level and the degree of product differentiation together create a trade-off between the relative attractiveness of national and international market structures to firms.

We find that when products are close substitutes, different trade policy regimes in the foreign country can reverse the effects of unilateral home trade liberalization. Furthermore, under bilateral trade liberalization, the tariff reduction is realized in both markets so that both the tariff savings and the protection gain are lower relative to

unilateral trade liberalization. Our main result is that, as trade gets bilaterally liberalized, the resulting equilibrium market structure is the one with international merger. This result fits well with the fact that global trade liberalization has been accompanied by an increase in international merger activity.

From a welfare perspective, international mergers are found to be preferable to national mergers due to the fact that they help avoid trade costs. This result provides support for the idea that there is scope for welfare-enhancing merger policies under a liberal trade environment. Interpreting merger policy as the choice of industrial concentration, we show that social and private incentives become aligned together as trade gets liberalized.

Following trade liberalization, other aspects of economic policy that are not harmonized have begun to receive more attention. The reduction in tariff rates has raised the issue of harmonization of competition policies. In policy making, national mergers are often viewed differently from cross-border mergers. Even though this study does not model harmonization explicitly, this discrimination can be captured simply through different fixed regulation fees imposed on national and international mergers. We intend to pursue this in future research.

5. Appendix

All supporting calculations not provided in text are given below.

Proof of Corollary 3.1

Prohibitive tariff level under a given Market structure equates the equilibrium quantity to zero. They are found as follows:

$$\bar{t}_h^{O} = \bar{t}_f^{O} = \frac{2\alpha(7\gamma+8)}{3\gamma^2+18\gamma+16}$$

$$\bar{t}_h^{H} = \bar{t}_f^{F} = \frac{2\alpha(3\gamma+4)}{\gamma^2+8\gamma+8}$$

$$\bar{t}_f^{H} = \bar{t}_h^{F} = \frac{2\alpha(7\gamma+8)}{3\gamma^2+18\gamma+16}$$

$$\bar{t}_h^{1I} = \bar{t}_f^{1I} = \frac{4\alpha(3\gamma+4)(7\gamma+8)}{23\gamma^3+152\gamma^2+256\gamma+128}$$

$$\bar{t}_h^{N} = \bar{t}_f^{N} = \frac{2\alpha(3\gamma+4)}{\gamma^2+8\gamma+8}$$

Ranking structure of prohibitive tariff level is as follows:

$$\bar{t}_h^{N} = \bar{t}_f^{N} = \bar{t}_h^{F} = \bar{t}_f^{H} \geq \bar{t}_h^{H} = \bar{t}_f^{F} = \bar{t}_h^{O} = \bar{t}_f^{O} \geq \bar{t}_h^{1I} = \bar{t}_f^{1I}$$

Proof of proposition 3.1

Concavity of dominance function is satisfied by second order differentiation:

a) M^I & M^O:

$$\frac{\partial^2 d^{I\&O}(t_h,t_f)}{\partial t_h^2} = -\frac{(9\gamma^4+66\gamma^3+218\gamma^2+288\gamma+128)(3\gamma+4)}{(7\gamma+8)^2(3\gamma+8)^2} < 0$$

b) M^I & M^H:

$$\frac{\partial^2 d^{I\&H}(t_h,t_f)}{\partial t_h^2} = -\frac{(5\gamma^4+42\gamma^3+168\gamma^2+256\gamma+128)(3\gamma+4)}{32(2\gamma^2+9\gamma+8)^2} < 0$$

c) M^I & M^F:

$$\frac{\partial^2 d^{I\&F}(t_h,t_f)}{\partial t_h^2} = -\frac{(15\gamma^4+128\gamma^3+436\gamma^2+576\gamma+256)(\gamma+2)}{32(2\gamma^2+9\gamma+8)^2} < 0$$

d) M^I & M^{1I}:

$$\frac{\partial^2 d^{I\&1I}(t_h,t_f)}{\partial t_h^2} = -\frac{(3\gamma+4)2\alpha(3\gamma^3+28\gamma^2+56\gamma+32)}{64t_1^{I\&1I}(2\gamma^2+9\gamma+8)^2} < 0$$

e) M^I & M^N:

$$\frac{\partial^2 d^{I\&N}(t_h,t_f)}{\partial t_h^2} = -\frac{(\gamma^4+10\gamma^3+42\gamma^2+64\gamma+32)(\gamma+2)}{(\gamma+4)^2(3\gamma+4)^2} < 0$$

Proof of proposition 3.2

Since the dominance relationship is one sided, it is sufficient to show that M^I and M^N dominate all other market structures in the specified region of tariff and substitutability levels. It implies that these market structures are undominated in this region as well. Consider the first two parts of the proposition:

a) M^I dominates M^O for all t_h and γ.

Since there are two completely symmetric groups of decisive firms, there are two symmetric dominance functions. It is easy to verify that:

$\pi_{13}^I > \pi_1^O + \pi_3^O$ and $\pi_{24}^I > \pi_2^O + \pi_4^O$ for all $t_h > \bar{t}^{1I}$

b) M^I dominates M^H if $\gamma < 20.8$ for all t_h.

M^I dominates M^H if $\gamma > 20.8$ for all $t_h < t_{cr}^{I\&H}$.

M^H dominates M^I ($M^{I\alpha}$ & M^{Ib}) if $\gamma > 20.8$ for $\bar{t}^{1I} > t_h > t_{cr}^{I\&H}$ where $t_{cr}^{I\&H}$ is the tariff level that equates $d^{I\&H}(t_{h,} t_f = 0)$ to zero. The decisive group comprises all owners. Total industry profit is compared under these two market structures.

c) M^I dominates M^F for all t_h and γ.

The decisive group comprises all owners. Total industry profit is compared under these two market structures.

d) M^I dominates M^{1I} for all t_h and γ.

The decisive group comprises two owners.

e) M^I dominates M^N if $\gamma < 5.88$ for all t_h.

M^I dominates M^N if $\gamma > 5.88$ for all $t_h < t_{cr}^{I\&N}$.

M^N dominates M^I if $\gamma > 5.88$ for $\bar{t}^{1I} > t_h > t_{cr}^{I\&N}$ where $t_{cr}^{I\&N}$ is the tariff level that equates $d^{I\&N}(t_{h,} t_f = 0)$ to zero

$$t_{cr}^{I\&N} = \frac{4\alpha(3\gamma+4)^2}{\gamma^4+10\gamma^3+42\gamma^2+64\gamma+32}$$

The decisive group comprises all owners. Industry profit is compared under these two market structures.

To complete the first two parts of the proposition we need to compare $t_{cr}^{I\&N}$ and $t_{cr}^{I\&H}$. It is found to be:

$t_{cr}^{I\&N} > t_{cr}^{I\&H}$ for all $\gamma > 0$

Combining a, b, c, d, e and 21, it is trivial to show that:

Given that $t_f = 0$, the equilibrium market structure is:

i. M^I if $\gamma < 5.88$ for all t_h.

ii. M^I if $\gamma > 5.88$ and for $t_h < t_{cr}^{I\&N}$.

Now consider the last part of the proposition:

f) M^N dominates M^O for all t_h and γ.

Since there are two completely symmetric decisive groups comprising two owners, there are two symmetric dominance functions. It is easy to verify that:

$\pi_{12}^N > \pi_1^O + \pi_2^O$ and $\pi_{34}^N > \pi_3^O + \pi_4^O$ for all $t_h > \bar{t}^{1I}$

g) M^N dominates M^H (M^F) for all t_h and γ.

The decisive group comprises all owners. Total industry profit is compared under these two market structures.

This completes the proof of the last part and thus proof of Proposition 3.2.

Proof of Proposition 3.3

Same procedure is applied as in the proof of proposition 3.2. consider the first part of the proposition:

a) M^I dominates M^O if $\gamma < 18.02$ for all t_h.

M^I dominates M^O if $\gamma > 18.02$ for all $t_h < t_{cr}^{I\&O}$.

M^O dominates M^I if $\gamma > 18.02$ for all $\bar{t}^{1I} > t_h > t_{cr}^{I\&O}$ where $t_{cr}^{I\&O}$ is the home tariff level that equates $d^{I\&O}(t_{h,} t_f = \bar{t}^{1I})$ to zero. Since there are two completely symmetric groups of decisive owners, there are two symmetric dominance functions:

$\pi_{13}^I > \pi_1^O + \pi_3^O$ and $\pi_{24}^I > \pi_2^O + \pi_4^O$ for all $t_h < \bar{t}^{1I}$

b) M^I dominates M^H if $\gamma < 8.66$ for all t_h.

M^I dominates M^H if $\gamma > 8.66$ for all $t_h < t_{cr}^{I\&H}$.

M^H dominates M^I if $\gamma > 8.66$ for $\bar{t}^{1I} > t_h > t_{cr}^{I\&H}$ where $t_{cr}^{I\&H}$ is the tariff level that equates $d^{I\&H}(t_{h,} t_f = \bar{t}^{1I})$ to zero. The decisive group comprises all owners. Total industry profit is compared under these two market structures.

c) M^I dominates M^F if $\gamma < 8.66$ for all t_h.

M^I dominates M^F if $\gamma > 8.66$ for all $t_h < t_{cr}^{I\&F}$.

M^F dominates M^I if $\gamma > 8.66$ for $\bar{t}^{1I} > t_h > t_{cr}^{I\&F}$ where $t_{cr}^{I\&F}$ is the tariff level that equates $d^{I\&F}(t_{h,} t_f = \bar{t}^{1I})$ to zero. The decisive group comprises all owners. Total industry profit is compared under these two market structures.

d) M^I dominates M^{1I} for all t_h and γ.

The decisive group comprises all owners.

e) M^I dominates M^N if $\gamma < 5.88$ for all t_h.

M^I dominates M^N if $8.06 > \gamma > 5.88$ for all $t_{cr1}^{I\&N} < t_h < t_{cr2}^{I\&N}$.

M^N dominates M^I if $8.06 > \gamma > 5.88$ for all $\bar{t}^{1I} > t_h > t_{cr2}^{I\&N}$ where $t_{cr1}^{I\&N}$ and $t_{cr2}^{I\&N}$ are critical the tariff levels that equate the industry profit under M^N and M^I. The decisive group comprises all owners. Total industry profit is compared under these two market structures:

$$d^{I\&N} = \frac{(t_h + t_f)(\gamma+2)(4\alpha(3\gamma+4)^2) - (\gamma+2)(t_h^2 + t_f^2)(\gamma^4 + 10\gamma^3 + 42\gamma^2 + 64\gamma + 32)}{2(\gamma+4)^2(3\gamma+4)^2}$$

Next step is to show that M^N dominates all possible market structures other than M^I for every substitutability and tariff levels.

f) M^N dominates M^O for all t_h and γ.

Since there are two completely symmetric decisive groups comprising two owners, there are two symmetric dominance functions. It is easy to verify that:

$\pi_{12}^N > \pi_1^O + \pi_2^O$ and $\pi_{34}^N > \pi_3^O + \pi_4^O$ for all $t_h < \bar{t}^{1I}$

g) M^N dominates M^H (M^F) for all t_h and γ.

The decisive group comprises two owners. Tariff level can be seen as a constant marginal cost. In this dominance relationship, movement from M^H to M^N implies a single concentrative merger which is always profitable under price competition.

h) M^N dominates M^{1I} for all t_h and γ.

The decisive group comprises all owners. Total industry profit is compared under these two market structures.

This completes the proof of the last part and thus the proof of Proposition 3.3.

Proof of Proposition 3.4

a) M^I dominates M^O if $\gamma < 18.02$ for all t.

M^I dominates M^O if $\gamma > 18.02$ for all $t < t_{cr}^{I\&O}$.

M^O dominates M^I if $\gamma > 18.02$ for all $\bar{t}^{1I} > t > t_{cr}^{I\&O}$ where $t_{cr}^{I\&O}$ is the home tariff level that equates $d^{I\&O}(t)$ to zero. Since there are two completely symmetric groups of decisive owners, there are two symmetric dominance functions:

$$\pi_{13}^I > \pi_1^O + \pi_3^O \text{ and } \pi_{24}^I > \pi_2^O + \pi_4^O \text{ for all } t < \bar{t}^{1I}$$

b) M^I dominates M^H (M^F) if $\gamma < 8.66$ for all t.

M^I dominates M^H (M^F)if $\gamma > 8.66$ for all $t < t_{cr}^{I\&H}$.

M^H (M^F) dominates M^I if $\gamma > 8.66$ for $\bar{t}^{1I} > t > t_{cr}^{I\&H}$ where $t_{cr}^{I\&H}$ is the tariff level that equates $d^{I\&H}(t)$ to zero. The decisive group comprises all owners. Industry profit is compared under these two market structures.

c) M^{I} dominates M^{1I} for all t and γ.

The decisive group comprises two owners.

d) M^{I} dominates M^{N} if $\gamma < 5.88$ for all t.

M^{I} dominates M^{N} if $\gamma > 5.88$ for all $t < t_{cr}^{I\&N}$.

M^{N} dominates M^{I} if $\gamma > 5.88$ for all $\bar{t}^{1I} > t > t_{cr}^{I\&N}$.

The decisive group comprises all owners. Industry profit is compared under these two market structures. Dominance function is as the following:

$$d^{I\&N}(t) = \frac{t(\gamma+2)(4\alpha(3\gamma+4)^2) - t(\gamma^4+10\gamma^3+42\gamma^2+64\gamma+32)}{2(\gamma+4)^2(3\gamma+4)^2}$$

$t_{cr}^{I\&O}$ is the critical tariff level that equates $d^{I\&N}(t)$ to zero.

$$t_{cr}^{I\&N} = \frac{4\alpha(3\gamma+4)^2}{\gamma^4+10\gamma^3+42\gamma^2+64\gamma+32}$$

Next step is to show that M^{N} dominates all possible market structures other than M^{I} for the region specified in the proposition:

e) M^{N} dominates M^{O} for all t and γ values:

Since there are two completely symmetric groups comprising two owners, there are two symmetric dominance functions:

$$\pi_{12}^{N} > \pi_{1}^{O} + \pi_{2}^{O} \text{ and } \pi_{34}^{N} > \pi_{3}^{O} + \pi_{4}^{O} \text{ for all } t < \bar{t}^{1I}$$

f) M^{N} dominates M^{H} (M^{F}) for all t and γ.

The decisive group comprises two owners. Tariff level can be seen as a constant marginal cost. In this dominance relationship, movement from M^H to M^N implies a single concentrative merger which is always profitable under price competition.

g) M^N dominates M^{1I} if $\gamma > 7.123$ for all t.

M^{1I} dominates M^N if $7.123 > \gamma > 5.88$ for $t_{cr}^{N\&1I} < t < \bar{t}^{1I}$ where $t_{cr}^{N\&1I}$ is the tariff level that equates $d^{N\&1I}(t)$ to zero. The decisive group comprises all owners. Total industry profit is compared under these two market structures.

This completes the proof of the last part and thus the proof of proposition 3.4.

Proof of Proposition 3.6

Under each market structure, optimal tariff levels are follows:

$$t^{*O} = \frac{8\alpha(\gamma+1)}{3\gamma^2+26\gamma+24}$$

$$t_h^{*H} = \frac{2\alpha(13\gamma^3+78\gamma^2+128\gamma+64)}{\gamma^4+10\gamma^3+42\gamma^2+64\gamma+32}$$

$$t_f^{*H} = \frac{2\alpha(39\gamma^3+198\gamma^2+288\gamma+128)}{27\gamma^4+340\gamma^3+1276\gamma^2+1728\gamma+768}$$

$$t^{*1I} = \frac{16\alpha(\gamma+1)(3\gamma+4)}{31\gamma^3+224\gamma^2+384\gamma+192}$$

$$t^{*1I} = \frac{4\alpha(\gamma+1)}{\gamma^2+12\gamma+12}$$

Given these optimal tariff levels:

a) M^I dominates M^O and M^{1I} for all γ.

b) M^I dominates M^H and M^F if $\gamma < 30.6$.

c) M^I dominates M^N if $\gamma < 8.72$.

Industry profits under these two duopoly market structures (M^N and M^I) are compared as follows:

$$d^{I\&N}(t^*) = -\frac{\alpha^2(\gamma+2)\gamma(\gamma^2+16\gamma+16)(\gamma^3-6\gamma^2-22\gamma-16)}{16(\gamma+1)^2(\gamma+4)^2(3\gamma+4)^2}$$

d) M^N dominates M^O, M^H and M^F for all γ.

e) M^N dominates M^{1I} if $\gamma > 4.73$.

As a result, equilibrium market structure (EMS) under optimal tariffs is:

The EMS is M^I if $\gamma < 8.72$, and M^N if $\gamma > 8.72$.

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