Conflict in Cross Border Mergers
Effect in Firm and Market Size

Poonam Mehra

Conflict in Cross Border Mergers
Effect of Firm and Market Size[1]

Poonam Mehra

Indira Gandhi Institute of Development Research (IGIDR)
General Arun Kumar Vaidya Marg
Goregaon (E), Mumbai- 400065, INDIA
Email (corresponding author): poonam@igidr.ac.in

Abstract

This paper tries to analyze the interrelationship between possibilities of conflict in cross border mergers and acquisitions and firm and market characteristics in a two country three firm model. We show that in general an increase in asymmetry across firms reduces the possibility of conflict between jurisdictions over merger review decisions. We also show that possibility of conflict increase with the increase in market asymmetries across countries. We also discuss interaction of asymmetry in firm and market size with the distribution of firms across countries and its effect on the possibilities of conflict.

Key words: Conflict, Cross border mergers, Firm size, Market Size

JEL Code(s): F51, L11, L40

Conflict in Cross Border Mergers
Effect of Firm and Market Size

Poonam Mehra

1.0 Introduction

Cross border merger and acquisitions affect markets of more than one country. Consequently, the review of such mergers involves multiple jurisdictions. The assertion of jurisdiction by any country in such cases is usually determined by the "effects doctrine" (Mavroidis and Neven 1999). According to this doctrine, a country can claim antitrust jurisdiction over any anticompetitive activity that affects their domestic markets, irrespective of the location or nationality of the participants involved (Bode and Budzinski 2005). While this arrangement provides a safeguard to the domestic markets, the interests of the global economy and international competition are adversely affected since national regulatory authorities take into account the effect of the merger or acquisition on their home country only disregarding its effect on foreign countries or the world economy as a whole (Evenett and Hijzen 2006). This in turn increases the scope of conflict between jurisdictions over merger reviews (Klien 2000).

Although the issue of cross border merger conflict got much highlighted after the GE/Honeywell merger case in 2001, instances of differences between international authorities over assessment of merger effects leading to potential conflicts can be traced back to early 1990s[2]. For instance, in the Ciba-Geigy and Sandoz merger case in 1996 the EU member states were not adversely affected by the deal while the U.S market faced a more anti-competitive situation. Consequently, the European Union did not propose any remedial measures but U.S authorities demanded divestitures in all the product categories. This shows that when countries are concerned with their national markets only and a merger affects different countries differently the outcome of its review is likely to differ across jurisdictions. The nature of the effect of a merger on a particular

---

[2] Conflict between jurisdictions occurred in de Havilland/Aerospatiale/Alenia acquisition (1991), Boeing McDonnell Douglas merger (1996), Ciba-Geigy and Sandoz merger (1996) and Gencor and Lonrho merger (1999).

country depends on the characteristics of the national firms, markets and the distribution of the merging and rival firms across the countries, etc. For instance, in the 1996 Boeing McDonnell Douglas merger, one of the concerns of the authorities was related to the effect on efficiencies in the presence of high market concentration and high market shares (Stock 1999). This has important implications in the context of mergers across advanced and developing countries where the firms belonging to the two sets of countries are different in terms of the cost structures and at the same time there is a marked difference between country characteristics.

In this paper we attempt to analyze the possibilities of conflict between jurisdictions over mergers involving firms with either asymmetric costs or market sizes. We also take into account the effect of the interplay of the distribution of firms across countries with firm and market size. Finally, we analyze the possibilities of conflicts between firms located in the same country having international effects.

The rest of the paper is organized as follows. In Section 2 we discuss the related literature. The general model is developed in Section 3. In Section 4 and 5, we analyze the results for asymmetry in firm size and market size in a two country three firm framework. The case of merger of national firms with international effect is discussed in Section 6. This is followed by concluding remarks in Section 7.

2.0 Background literature

Cross border mergers and acquisitions account for a significant share (25%) of the total merger and acquisition activity worldwide, of which horizontal mergers account for 70% (UNCTAD 2000). Horizontal merger involves two major issues. First of all, these mergers tend to be anti-competitive, particularly in the absence of efficiency gains as they lead to increased industry concentration and increase in prices for consumers (Farrell and Shapiro 1990). Secondly, a merger may allow firms to realize synergies which in turn make them efficient. These synergies might help the merging firms to outweigh the

4

advantage which accrues to the rival firm via the "merger paradox[3]" effect. Thus, firms will merge only if the synergies are sufficiently large to offset the competitive disadvantage. Further, if the efficiencies are very large they can also lead to decrease in prices faced by the consumers. But even if they do not, competition authorities may approve a horizontal merger if the efficiency gains outweigh the losses resulting to the merging firms. This issue is crucial in cross border mergers and acquisitions where the authorities are generally concerned with the efficiency gains accruing to their domestic residents, both firms and consumers (Evenett and Hijzen 2006).

Thus, differences in the distribution or characteristics of the firms and consumers across different countries may lead to conflict in jurisdictions with one of the countries approving a merger and the other blocking it which is the focus of this paper. To the best of our knowledge, this issue has not been dealt in the literature so far. However, there have been discussions on the possible effects that firm and market characteristics might have on mergers, which we discuss next.

For an industry, consisting of almost symmetric firms, there is little potential gain from merger since mergers have zero effect as the firms are equally efficient (Barros 1998). On the other hand, in case of industries with asymmetric firm sizes and efficiency, there is potential for gain through shifting of production. Froeb, Timothy and Werden (1998) examine the welfare effects of merger in an industry characterized by Demsetz postulate, which holds that the growth of large firms is attributed to cost and product advantages over their rivals. He argues that in such a setting if a firm's marginal cost advantage is shared with its merging partner, mergers would lead to cost savings. This in turn would make mergers welfare enhancing. Welfare gains arise because a merger leads to a shift in production from merging to non-merging firms. When small or medium sized firms merge, there is a shift in production to the larger firms, which in turn has lower costs. Welfare gains can also arise because merger allows firms to shift production from

---

[3] Salant et al (1983) showed that under Cournot Competition, merger between a subset of firms always benefits the rival firms at the cost of the merging firms unless at least 80% of the firms in the market merge, when the mergers involve no efficiency gain. This phenomena is referred to as merger paradox

one firm to another. For instance, merger between a large and small firm might shift production from the small to the large firms.

In Cournot equilibrium, as Farrell and Shapiro (1990) argue large firms have lower marginal cost; so welfare is enhanced if a fixed total output is shifted towards them and away from smaller, less efficient firms. Large firms may be large because they are efficient. If so, then economic welfare may be enhanced if these efficient firms acquire more of the industry's productive capital and thus increase their market share. They further argue that the larger the market share of the participating firms, or the smaller is the industry elasticity of demand, the greater must be the learning effects or scale economies in order for price to fall.

In an asymmetric industry with different capital levels, production is carried out inefficiently since marginal costs are not equal. This provides scope for merger to increase welfare, since it can lead to more efficient production by making the industry "more symmetric". However, mergers will diminish industry output, thereby reducing consumer surplus (McAfee and Williams 1992). This leads to the possibility of conflict between jurisdictions if they have an asymmetric distribution of the market or firms.

The location of headquarter of firms across the countries with jurisdiction also determines the way a merger would affect the welfare of a country (Head and Reis 1997), whenever the assertion of jurisdiction depends on the presence of firm headquarters. Neven and Roller (1999) illustrate this problem with the help of an extreme example. They argue that if there are two countries, hosting one firm each and there is a third country with all consumers then no merger would be blocked by authorities even if they do not involve efficiency. In this context, Mehra (2008) shows that distribution of firms across jurisdictions influences the impact of a merger on the welfare of the countries and thereby on the possibilities of conflict even when the allocation of jurisdiction is determined by the "effect doctrine".

Market size also plays an important role in determining the effect of mergers. Qiu (2006) has shown that large markets are a pre-condition to form alliances which in turn facilitate inflow of FDI. Head and Reis (1997) determine the critical share of consumers that should be present in a country to ensure that it rejects world welfare reducing mergers. They find that when there is no cost savings involved in a merger, only countries with low share of world consumption would clear world welfare reducing mergers. On the other hand, when merger involves cost savings, if any country with jurisdiction represents more than half of world consumption, it would clear only mergers which lead to increase in welfare. Analyzing the effect of market size on conflicts between jurisdictions, Neven and Roller (2000) find that difference in market size between two countries becomes relevant when the countries define the relevant market differently. And in such a case the possibility of conflict between cross border mergers and acquisitions is reduced with the increase in the inequality in sizes when market shares are positively correlated across markets.

In this paper as mentioned earlier, we try to analyze whether firm and market characteristics have an effect on conflicts between jurisdictions over international merger reviews. In particular we are concerned with the firm characteristics, as captured by cost structure and consumer heterogeneity captured by market size. We also discuss the interaction between these factors and the distribution of firms across countries.

3.0 General Model:

Following Gibbons (1992), we develop a two country model with firm and market asymmetry. Consider two countries $i = A, B$ with N_i firms. Firm j belonging to country i sells an amount h_{ji} in the home country and exports an amount e_{ji} to the other country. The demand function for Firm j in Country i is given by

$$P_i = a_i - \left(\sum_{j=1}^{N_i} h_{ji} + \sum_{j=1}^{N_k} e_{jk} \right) \text{ where } i, k = A, B, i \neq k \tag{1}$$

The profit of Firm j belonging to Country i is given by

$$\pi_{ji} = \left(a_i - c_j \right) h_{ji} + \left(a_k - c_j \right) e_{ji} \tag{2}$$

Where c_j is the marginal cost in firm j. In this paper, we assume that there are no fixed costs and hence marginal cost is equal to average cost. This is a simplifying assumption to avoid complications in calculations.

Welfare of Country i is given by

$$W_i = \frac{1}{2} Q_i^2 + \sum_{j=1}^{N_i} \pi_{ji} \ \forall \ \ l \neq j, \ i \neq k \tag{3}$$

where consumer surplus in Country i is

$$CS_i = \frac{1}{2} Q_i^2 \tag{4}$$

World Welfare is given by the sum of welfare of all countries and the consumer surplus.

Assume that the firms choose their quantities simultaneously. Then the optimal quantities under Cournot competition is given by,

$$h_{ji}^* = \frac{a_i - Nc_j + \sum_{l=1}^{N-1} c_l}{N+1} \vee i, j \text{ where } N = N_A + N_B \tag{5}$$

$$e_{ji}^* = \frac{a_k - Nc_j + \sum_{l=1}^{N-1} c_l}{N+1} \vee i, j \text{ where } N = N_A + N_B \tag{6}$$

Suppose now two firms belonging to two different countries merge. The incentive to merge arises from cost savings in terms of a decrease in post merger marginal cost for the merging firms. The post-merger marginal cost is given by c_M. We assume that c_M is at least less than the marginal cost of the high cost firm, otherwise merger will not take place. The post merger marginal cost c_M can be interpreted as the measure of efficiency. Higher the value of c_M, i.e. closer the value of the post-merger marginal cost, lower will be the efficiency and vice-versa. By efficiency in this case we mean technical efficiency which in turn is defined as lower input cost to obtain the same level of output. The demand function for each country can be expressed as

$$P_A = a_A - b\left(\sum_{j=1}^{N_A-1} h_{jA} + h_{MA} + \sum_{j=1}^{N_B-1} e_{jB} \right) \tag{7}$$

$$P_B = a_B - b\left(\sum_{j=1}^{N_B-1} h_{jB} + h_{MB} + \sum_{j=1}^{N_A-1} e_{jA} \right) \tag{8}$$

where $h_M = h_{MA} + h_{MB}$ is the total output of the merged firm. We assume that when firms from two different countries merge the merged firm operates in both countries as a domestic firm, implying $e_M = 0$. The profit of the merged firm is given by

$$\pi^M = \left(P_A - c_M \right) h_{MA} + \left(P_B - c_M \right) h_{MB} \tag{9}$$

In this case, both the firms are located in different countries. We assume that the firms divide their profit using the symmetric Nash bargaining solution where the disagreement points are given by the pre-merger profit levels. The profit of each merging partner after merger is given by $\pi_i^M, i = A, B$.

The profit of a representative non-merged Firm j in Country i after merger of the two firms is given by

$$\pi_{ji}^{M} = \left(P_i - c_j \right) h_{ji} + \left(P_k - c_j \right) e_{ji} \, , \ j \neq M \tag{10}$$

The welfare of Country i will then be:

$$W_i^{M} = \frac{1}{2} Q_i^{M2} + \sum_{j=1}^{N_i-1} \pi_{ji}^{M} + \pi_i^{M} \tag{11}$$

Assuming that the merged and rival firms choose their quantities simultaneously after firms merge the optimal quantities of the non merged firms under Cournot competition are as follows:

$$e_{ji}^{M^*} = h_{ji}^{M^*} = \frac{a_i - 2\sum_{j=1}^{N-2} c_j + c_M}{N} \vee i,j \, , \ j \neq M \tag{12}$$

And the output of the merged firm is given as:

$$h_{Mi} = \frac{a_i - 2c_M + \sum_{j \neq A,B} c_j}{N} \, , \ i = A, B \tag{13}$$

Substituting these values in the expression for profit, welfare and consumer surplus for the pre and post-merger cases, we obtain their optimized values.

Next, in order to compare the pre and post-merger situations of the firms, consumers and the countries we define a variable

$$X^D = X^M - X \, , \ \text{where} \ X = \pi, CS, W \tag{14}$$

We set $X^D = 0$, to determine the value of the post-merger marginal cost $\left(\tilde{c}_M\right)$ which corresponds to the point of indifference between the pre and post-merger levels. We refer to them as the threshold level of each of the parties concerned.

In the rest of the paper we consider the case of three firms $\left(N = 3\right)$. Firm 1 belongs to Country A and Firm 2 and 3 belong to Country B $\left(N_A = 1, \ N_B = 2\right)$. Throughout the paper we assume that Firm 1 and Firm 2 merge. We assume three firms to simplify our analysis. It must be noted here that our results are not completely driven by the number of firms. The number of firms would affect the results only in the case when we assume that the firms are identical and their distribution across the countries is equal (in case of even number of firms), given that both the countries have identical market size. Next, consider some special cases.

4.0 Asymmetric costs - Two country three firm model

Assume $a_A = a_B = 1$, i.e. both the countries have the same market size, which in turn is normalized to one. We determine the value of the post merger marginal cost of the merging firm which makes each country indifferent between the pre and post-merger welfare levels of their respective countries. The expression for post merger marginal cost corresponding to the point of indifference turns out to be complicated and intractable. Hence, the values are approximated to their nearest squares to draw implications about the marginal cost. We obtain two values for the threshold level of post merger marginal cost. We consider only those values which satisfy the condition: c_M should be at least less than the pre-merger marginal cost of the highest cost firm. The approximation procedure is discussed in the *Appendix I* for one case. The rest of the cases follow similarly[4].

We compare the post-merger marginal cost corresponding to the point of indifference of the merging firms and the two countries to draw implications about the

---

[4] Details are available on request.

11

possibilities of conflict. The merging firms will propose a merger so long as the actual post-merger marginal cost is less than or equal to the post-merger marginal cost corresponding to the point where the pre-merger and post-merger profits of the merging firm become equal. Similarly, each country will approve a merger if the corresponding post-merger marginal cost is either less than or equal to their respective threshold levels. Then we discuss the results and summarize them in the form of propositions. The proofs of the same are given in *Appendix I*.

To illustrate the case of asymmetric cost firms we assume three relationships

1. Two high cost firms merge. $c_1 - 2\Delta = c_2 - \Delta = c_3$ where $\Delta > 0$ is the measure of asymmetry. Higher the value of Δ (with a positive sign), higher is the asymmetry, where $\Delta < \dfrac{c_1}{2}$

In this case, we get,

$c_M^M < c_M^A < c_M^B$: when $\Delta < \dfrac{161\alpha''}{124}$ and $c_1 - \Delta < \dfrac{285}{644}$ i.e. for very low asymmetric

firms, where $\alpha'' = c_1 - \Delta - \dfrac{285}{644}$

And

$c_M^A < c_M^M < c_M^B$: when $\Delta \le \dfrac{25\alpha'}{13}$ and $c_1 - \Delta > \dfrac{285}{644}$ or $\dfrac{161\alpha''}{124} < \Delta < \dfrac{25\alpha'}{13}$, and

$c_1 - \Delta < \dfrac{285}{644}$ i.e. for low to moderate asymmetry across firms, where $\alpha' = c_1 - \Delta - \dfrac{1}{25}$

Comparing the lower bounds of the post merger marginal costs, we observe that when firms are nearly symmetric i.e. when Δ is very low as compared to c_1, possibilities of conflict do not exist, since no merger proposed by the merging firms would be blocked by authorities in either Country A or Country B. On the other hand, when the firms are asymmetric, i.e. Δ is moderately large then the merging firms require relatively

less incentives to merge. In this case, there is possibility of some conflict between the two jurisdictions over merger review, since any merger proposed by the merging firms would be approved by Country B but blocked by Country A. Comparing the position of Country A and B, it is observed that the threshold level of Country B lies to the right of that of Country A. This could be attributed to the presence of rival firm in Country B. The rival firm's profit is directly proportional to the post-merger marginal cost of the merged firm. When the firms are low to moderately asymmetric, the effect of the profit of the rival firm dominates over the effect of the profit of one of the merging firms and the consumer surplus in Country B. Hence the efficiency requirement of Country B is low as compared to Country A, implying that Country B approves mergers involving relatively higher post merger marginal cost. This, in turn, leads to conflict between the two authorities. However, since the efficiency requirement of the merging firms is higher than that of country B, the conflict region would be small.

These results are illustrated in Figure 1a and 1b. In the figures W^A and W^B represent the difference between pre and post-merger welfares of country A and B respectively. π_M^* represents difference between the pre and post-merger profit for the merging firm. The points at which the respective curves intersect the horizontal axis represent the threshold level of the post merger marginal cost for both the countries and the merging firm. In Figure 1a, there would be no conflict since the firms would propose mergers if the post-merger marginal cost lies to the left of AA' and in this region both the countries would approve the merger. In Figure1b, on the other hand, the merging firms do not propose any merger if the post merger marginal cost of the merged firm lies to the right of the region FF'. Any merger to the left of EE' will be cleared by both countries and there would not be any conflict. However, any merger for which the post merger marginal cost of the merged firm lies in the region between EE' and FF', there would be conflict where Country B approves the merger but Country A would block it.

2. Two low cost firms merge $c_1 - 2\Delta = c_2 - \Delta = c_3, \Delta < 0$:

    Here, since $\Delta < 0$, the asymmetry increases, as Δ (with the negative sign) decreases.

When two low cost firms merge, we get

$$c_M^M \left(\cdot\right) < c_M^A \left(\cdot\right) < c_M^B \left(\cdot\right), \text{ when } \Delta \leq \frac{61\alpha''''}{176} \text{ i.e. the firms asymmetry is low, where}$$

$$\alpha'''' = \left(c_1 - \Delta - \frac{76}{61}\right)$$

$$c_M^A \left(\cdot\right) < c_M^B \left(\cdot\right) < c_M^M \left(\cdot\right), \text{ when } \Delta > \frac{161\alpha''}{198} \text{ i.e. the firms are highly asymmetric}$$

When two low cost firms merge, the post merger marginal cost corresponding to the point of indifference for the merging firms is less than that of both Country A and Country B. Thus, in this case there is no conflict as in Case 1. We observe that the acceptance region of Country B lies to the right of Country A. Following the reasoning of Case 1, this can be attributed to the presence of rival firm in Country B. The rival firm's profit is positively related to the post merger marginal cost of the merging firm and hence it drives down the efficiency requirement. For Country B, the welfare effect of the rival firm dominates over that of the consumer and the merging firm and hence we observe that Country B is willing to clear the merger even at a higher post merger marginal cost or low efficiency. In this case, the possibility of conflict increases as the asymmetry between the firms increases. As the asymmetry across the firms increase, it becomes more beneficial for the merging firms to merge. This can be attributed to the fact that when a high cost and low cost firm merge, the firms can benefit by transferring the production from the relatively high cost to the least cost firm. This in turn reduces the efficiency requirement of merging firms and hence they find the incentive to merge even at low levels of efficiency as captured by higher post-merger marginal cost of the merging firm. Further, with the increase in asymmetry across firms, the effect of the rival firm's profit in the welfare of Country B reduces.

3. The highest cost and least cost firms merge $(c_1 - \Delta = c_2 + \Delta = c_3)$ where $\Delta > 0$,

Again, comparing the point of indifference of the merging firms, Country A and Country B, we get,

$$c_M^M \, (\,) \, c_M^A \, (\,) \, c_M^B \, (\,), \text{ when } \alpha < 0 \text{ i.e. } (c_1 - \Delta) \, \frac{3}{8} \text{ and } \Delta \leq \frac{8\alpha}{51} \text{ i.e. for low asymmetric}$$

firms, where $\alpha = \left(c_1 - \Delta - \dfrac{3}{8} \right)$

However, when firms are more asymmetric, we get

$$c_M^A \, (\,) \, c_M^M \, (\,) \, c_M^B \, (\,), \text{ otherwise.}$$

When a high cost firm merges with the low cost firm, there is a low incentive for the firms to merge. The firms will merge only when the merger involves high efficiency gains as captured by a low post merger marginal cost. For Country A, both consumer welfare effect and the effect of the profit of one of the merging firms require higher efficiency as compared to Country B, where it is the effect of the profit of the rival firm which dominates the welfare effect of the consumers and profit of one of the merging firms. In this case there exists no possibility of conflict between the jurisdictions owing to the high threshold level of the merging firms. Hence in this case, any merger proposed by the merging firms will be cleared by both countries. However, when the firms are more asymmetric, the merging firms take advantage of shifting production from higher to lower cost firm, assuming that there is no capacity constraint. This in turn reduces the efficiency requirement of the merging firms but increases the possibility of conflict between jurisdictions. Here again we find Country B has a greater acceptance region as compared to Country A. As the asymmetry increases, the efficiency requirement of Country A increases, in this case.

Combining the results of the above three cases we obtain the following two propositions.

Proposition 1: With the increase in asymmetry across firms, the efficiency requirement of the merging firms

      a. Increases when two high cost firms merge

      b. Decreases when two low cost firms merge

      c. Increases in absolute terms and relative to the requirement of the Country, where the rival firm resides, but decreases relative to the requirement of the other country, when a high and a low cost firm merge.

Proposition 2: With the increase in asymmetry across firms, the possibility of conflict between jurisdictions over the review of a cross border merger increases irrespective of the cost structure of the two merging firms.

We further observe that when two least cost firms merge, then an increase in the asymmetry between the firms leads to a reduction in the efficiency requirement of the merging firms. However, when two highest cost firms or a high cost and low cost firm merge, the efficiency requirement increases with the increase in asymmetry between the firms. This can be attributed to the fact that as the asymmetry across the firms increase, the rival firm which has lesser cost than at least one of the merging firm in this case will derive more advantage from the merger. Hence in order to gain profits, the merging firms need more and more incentives in the form of efficiency gains to merge. In other words, in case of a merger involving at least one cost firm, when the asymmetry becomes very high, merging firms gain from merger only at high levels of efficiency or low levels of c_M. This, in turn implies that the incentive to merge for two firms will depend on their relative positions in terms of the cost structure. These two implications are summarized in terms of the following propositions:

Proposition 3: Efficiency requirement of merging firms decreases with the increase in asymmetry across all firms, when merger occurs between two low cost firms. But the opposite holds when at least one of the merging firms is the highest cost firm.

Proposition 4:

a. Irrespective of the firm and market size, the two highest cost firms have the least incentive to merge.

b. When the firm and market size are comparable, the two least cost firms have the highest incentive to merge but when the market is very large as compared to the firm size, the highest cost and least cost firms have the highest incentive to merge.

5.0 Market Size or Consumer Heterogeneity

In the previous section we assumed homogeneous equal sized markets. In this section we relax this assumption. Let $a_i\ (= A, B)$ denote the market size country i. Further assume that $c_1 = c_2 = c_3 = c$ to focus on our key concern. In this case, the point of indifference between the pre and post-merger level of profit for the merging firm is given by:

$$c_M = \frac{1}{8}\left(2a_A + 2a_B + 4c - \sqrt{5\left(a_A - c\right)^2 + 5\left(a_B - c\right)^2 + 8\left(a_A - c\right)\left(a_B - c\right)} \right) \qquad (15)$$

We observe $\dfrac{\partial c_M}{\partial a_i} < 0$, holds definitely for $a_i > or = or < a_j$ while

it does not hold for $a_j \gg a_i \, or \, a_i \gg a_j, \ \vee i, j \ \ i \neq j$

Thus, as market size increases, the incentive to merge as measured by the decrease in post-merger marginal cost of the merging firm should increase. In other

17

words, as market size increases, the efficiency or cost savings as measured by a decrease in c_M increases. This in turn increases the incentive to merge for the merging firms. This holds so long as one of the markets is not very large. However, if one of the markets is very large as compared to the other, then a unit increase in the size of the other market would require less efficiency incentive for firms to merge. Next, we discuss the possibilities of conflict. We consider two cases. In order to simplify our analysis, we assume the following:

1. $a_A = 1$ and $a_B = 1 - \delta, \ \delta > 0$

We get,

$$c_M^M > c_M^A > c_M^B$$

Possibility of conflict exists, since some of the mergers cleared by country A (country with large market size) would be blocked by Country B. The possibility of conflict increases with the increase in the difference in the market size between the markets of the two countries. Further, there are some mergers which would not be cleared by either country. Moreover, larger the market size, lesser is the efficiency requirement to clear a merger in a cross border merger. If we take $\delta < 0$, we obtain the case $a_A < a_B$. In this case also we obtain the same relationship between the threshold post merger marginal cost of the two countries and the merging firm. We then obtain the following proposition.

Proposition 5: When two firms belonging to two different countries merge,
   a. Possibilities of conflict between the jurisdiction of two countries increase with increase in the gap between the market sizes of two countries.
   b. The decision of the firms and the two countries with regard to merger is independent of the relative size of the markets.

18

Next, we discuss the response of the post merger welfare levels of the two countries to a change in market size in either country and the change in post-merger marginal cost of the merged firm. For country A, we observe that for a given level of efficiency, as the market size in its own country or the other country increases post-merger welfare would increase. Further, for a given market size, if the efficiency falls, the welfare would fall. For Country B, though the effect of a change in market size of either country is same as in case of Country A, the effect of change in efficiency depends on the market size of Country A and post merger cost differential between the merging and rival firms. In particular, if the market size in country A is very large and/or a very low cost differential exists, i.e. c_M is very close to c, the welfare of Country B after merger increases with a fall in efficiency. In this case, it's the rival's profit which dominates the welfare of Country B. On the other hand, if there are high efficiency gains involved and the consumer surplus effect dominates, Country B's welfare responds positively to efficiency gains. In other words in this case, the post merger marginal cost of the merged firm is very low as compared to the pre merger cost, this in turn adversely affects the rivals. This also implies that Country A's market is not very large. Interestingly, we observe that in case of the welfare of Country B, its own market size does not play any role. This comparative static result is shown in the Appendix II.

6.0 Other Distributions of Firms

So far we have assumed that the merging firms are located in different countries i.e. we have considered cross border mergers. Next, we assume that the merging firms are located in the same country. We consider two separate distributions of the rival firm. First, we assume that the rival firm belongs to the second country. The second case is one where all firms belong to the same country but still the other country has jurisdictions following the "effects doctrine" as discussed in the Introduction. The general model is discussed in the Appendix III.

6.1 Firm Size

When the merging firms belong to Country A and rival firms belong to Country B, we observe that if two high cost firms merge, in case of symmetric to moderately asymmetric firms, the possibility of conflict exists since there are some mergers which would be proposed by the merging firm and would be cleared by Country A, but will be blocked by Country B. However, when firms are highly asymmetric, there is no conflict between the jurisdictions involved, since here the two highest cost merging firms have a very low incentive to merge and the rival firm would enjoy most being an outsider as it is already the low cost firm. If, on the other hand, two least cost firms merge, then $c_M^A < c_M^M < c_M^B$. This implies that, in this case the possibility of conflict exists when Country A blocks the merger but Country B clears it. However, in this case the possibility of conflict is smaller than the case when the two high cost firms merge. If instead, the high cost firm merges with the low cost firm, then possibility of conflict exists. When the firms are asymmetric, then mergers cleared by Country A are blocked by Country B, while the reverse occurs when the firms are not very asymmetric.

Consider the case when all firms belong to Country A and two high cost firms merge. We observe that in this case there is a possibility of conflict, when Country B blocks the mergers that are proposed by the merging firms, but Country A would clear it. Similar results follow for the case of two least cost firms merging and when a high cost and low cost firm merge. The results are summarized in Table 1.

Thus, we observe that in case of mergers between firms belonging to the same country with international effects, conflicts between jurisdictions increase with the increase in asymmetry in cost. This is similar to the case of cross-border mergers.

6.2 Market Size

When we consider the interaction between the distribution of firms and relative market size, we observe that in case the merging firms and rival firm belong to different countries, possibility of conflict increases when the market size of Country B (where the rival firm is located) is higher than the market size of Country A. When Country B has a higher market size, it will clear a merger only when there are substantial efficiency gains, since a larger share of consumers get affected by the merger in a country characterized by a large market size. When both the merging and rival firms belong to the same country, we find that no merger is cleared by either country. In this case, the post merger marginal cost of the merging firm is not sufficient to make the countries indifferent between the pre and post-merger situations. On the other hand, when the market size in Country A is larger, any merger proposed by the merging firms would be cleared by both countries, hence there would not be any conflict. The results are summarized in Table 2. Thus the relative market size of the two countries has an impact on conflict possibilities when the merging firms are located in the same country but does not make any difference in case of cross border mergers as seen in Section 5.

7.0 Conclusion

In the paper, we analyze the interrelationship between firm and market size and the distribution of firms to determine their effect on the possibility of conflict between jurisdictions over international mergers. We find that in case of cross border mergers the possibilities of conflict would always increase with the increase in asymmetry across the firms. This holds in case of merger between national firms with international effects as well. The size of the zone of conflict depends on the location of the rival firm. Thus possibilities of conflict across jurisdictions are same irrespective of whether dissimilar firms belonging to the same country merge rather than when dissimilar firms across countries merge.

In case of market size, the greater the difference between the markets of the two countries with jurisdiction, higher is the possibility of conflict. However, we also observe that the relative market size of both countries does not make any difference in the possibilities of conflicts between jurisdictions. In other words, in a two country three firm model with difference in market size, whether the rival firm is located in a country with bigger or smaller market size does not have any effect on the possibilities of conflict. On the other hand, in case of mergers between firms located in the same country, the relative market size of the two countries becomes a decisive factor in determining the possibilities of conflict across countries.

Since asymmetry in firm and market size involve tedious calculations it becomes difficult to obtain accurate results. However, these approximations do not affect the general direction of the results and thus we can draw implications from it. Our results hold significance for issues of convergence in regulations across countries over merger review.

Reference

Barros, P.P. (1998), Endogenous Mergers and Size Symmetry of Merger Participants, *Economic Letters*, 60:113-119

Evenett, S.J. (2003), "The Cross Border Mergers and Acquisitions Wave of the Late 1990s", in R.E Baldwin and L.A. Winters (eds), *Challenges to Globalization*, University of Chicago Press for the NBER

Evenett, S. J and A. Hijzen. (2006), "Conformity with International Recommendations on Merger Reviews: An Economic Perspective on "Soft Law"", *University of Nottingham Research Paper No. 2006/04*

Farrell, J and C.Shapiro. (1990), Horizontal Mergers: An equilibrium Analysis, *American Economic Review,* 80: 107-126

Froeb, L, M, T. J.Timothy and G.J Werden (1998) "The Demsetz Postulate and the Welfare Effects in Differentiated Product Industries" in McChesney, F. (eds). *Economic Inputs, Legal Outputs, The Role of Economists in Modern Antitrust,* John Wiley and Sons

Levin, D. (1990) "Horizontal Mergers: The 50-Percent Benchmark" *The American Economic Review*, 80 (5): 1238-1245

Neven, D.J and L. H Roller (2000), "The Scope of Conflict in International Merger Control" *CEPR Discussion Paper No.* 2621

Gibbons, R. (1992), *A Primer in Game Theory*, Harvester Wheatsheaf

Head, K and J. Reis. (1997), International Mergers and Welfare under Decentralized Competition Policy, *Canadian Journal of Economics*, XXX: 1104-1123

Klien, J. (2000), "Time for a Global Competition Initiative?" *Mimeo*, Department of Justice, Washington D.C

Mavroidis, P and D.J. Neven. (1999) "Some Reflections on Extraterritoriality in International Economic Law. A Law and Economic Analysis" *Melanges Offerts a Michel Waelbroeck, Brussels*, 1: 1297-1325

McAfee, R.P and M.A. Williams. (1992) "Horizontal Mergers and Antitrust Policy" *Journal of Industrial Economics*, 40 (2):181-187

Mehra, P. (2008), "Supranational Agency: A Solution for Conflict in International Mergers?", *Available at SSRN*: http://ssrn.com/abstract=1094568 [02.01.2008]

Qiu, L. D. (2006) "Export, FDI and Cross Border Strategic Alliances" *paper available at* http://www.econ.hit-u.ac.ip/~trade/apts/2006/pdf/Larry_Qiu.pdf [22.10.2006]

Salant, S.W, S. Switzer and R.J. Reynolds. (1983), Losses from Horizontal Merger: the effects of an Exogenous Change in Industry Structure on Cournot-Nash Equilibrium, *Quarterly Journal of Economics*, 98: 185-199

Stock, E.J. (1999), "Explaining the differing EU and US positions on the Boeing/McDonnell Douglas Merger: Avoiding another Near-Miss" *University of Pennsylvania Journal of International Law*, 20: 825-878

UNCTAD (2000),"Cross-border Mergers and Acquisitions and Development" *United Nations Conference on Trade and Development. World Investment Report 2000*, Geneva

Appendix I

The post merger marginal cost which makes the merging firms indifferent between the pre and post-merger situation is given by

$$c_M^M = \frac{-64(a-c)\pm 8\sqrt{12(c^2+c_3^2)-112ac_3-36(c_1+c_2)(a+c_3)+18(c_1^2+6c_1c_2+5c_2^2)}}{128}$$

Substituting $a=1$ and $c_1-2\Delta=c_2-\Delta=c_3$ where $\Delta>0$, we get,

$$\frac{-64+64c_1-128\Delta\pm 8\sqrt{(2+180c_1^2+306\Delta^2-184c_1+260\Delta-396c_1\Delta)}}{128}$$

We express the term inside the square root in terms of its nearest square, $(-13c_1+17\Delta)^2$. Comparing the term inside the square root with the $(-13c_1+17\Delta)^2$, we find, $(2+180c_1^2+306\Delta^2-184c_1+260\Delta-396c_1\Delta)>(-13c_1+17\Delta)^2$
Thus, we get,

$$c_M^M \approx \frac{-64+64c_1-128\Delta\pm 8(-13c_1+17\Delta)}{128}$$

In particular,

$$c_M^M > \frac{-40c_1+8\Delta}{128} \text{ or } c_M^M < \frac{-128+168c_1-264\Delta}{128}$$

Similarly, we determine the approximate values of the post merger marginal costs for the rest of the cases[5]. The values are summarized in the following table.

Table 1: Value of the threshold post merger marginal cost for merging firm, Country A and B

Case (X)*	$X=1$	$X=2$	$X=3$
$c_M^M(X)\approx$	$\frac{-128+168c_1-264\Delta}{128}$,	$\frac{-128+168c_1-264\Delta}{128}$	$\frac{-1+c_1-\Delta}{2}$
$c_M^{\frac{1}{2}M+CS}(X)\approx$	$\frac{-2-14c_1-32\Delta}{20}$	$\frac{-2-14c_1-32\Delta}{20}$	$\frac{-2-14c_1-37\Delta}{20}$
$c_M^{\frac{1}{2}M+3+CS}(X)\approx$	$\frac{-1+11c_1-70\Delta}{20}$	$\frac{-1+11c_1-70\Delta}{20}$	$\frac{-1+29c_1-74\Delta}{28}$

* In cases $X=1,3$ $\Delta>0$ and in Case $X=2$, $\Delta<0$

---

[5] The solutions are available on request from the author.

24

Proof of Proposition 1

To prove proposition 1, we take the threshold post-merger marginal cost of the merging firms and differentiate it with respect to Δ, the measure of asymmetry in cost across firms.

Part a

$$\frac{\partial c_M^M \left(\right)}{\partial \Delta} \approx \frac{-264}{128} = \frac{-33}{16} < 0,$$ this proves part a of proposition 1

Part b

To prove part b of proposition 1 we take $\Delta < 0$ in the proof of part a.

$$\frac{\partial c_M^M \left(\right)}{\partial (-\Delta)} = -\frac{\partial c_M^M \left(\right)}{\partial \Delta} \approx \frac{33}{16} > 0,$$ this proves part b of proposition 1

Part c

$$\frac{\partial c_M^M \left(\right)}{\partial \Delta} \approx \frac{-1}{2} < 0,$$ this implies that the efficiency requirement increases in absolute terms.

To prove the second part of part c in proposition 1, we compare the threshold level of post merger marginal cost of the merging firm $\left(c_M^M \right)$ with that of Country A $\left(c_M^A \right)$ and Country B $\left(c_M^B \right)$.

$$c_M^A \left(\right) - c_M^M \left(\right) = \frac{8 - 24c_1 - 27\Delta}{20}$$
$$= 8 - 8 - 8\left(c_1 - \Delta - \frac{3}{8} \right) - 51\Delta = -8\alpha - 51\Delta$$

$c_M^A \left(\right) - c_M^M \left(\right) > 0$ when $\alpha < 0$ i.e. $c_1 - \Delta < \frac{3}{8}$ and $\Delta \le \frac{8\alpha}{51}$ i.e. asymmetry across firms

is very low

25

$$c_M^A(\,) - c_M^M(\,) < 0 \text{ , otherwise}$$

$$c_M^B(\,) - c_M^M(\,) = \frac{13 + 15c_1 - 60\Delta}{28}$$

$$c_M^B(\,) - c_M^M(\,) > 0 \text{ always}$$

Thus, as Δ increases, the efficiency requirement of the merging firm as compared to that of country A falls but rises as compared to Country B, i.e. the country where the rival firm resides. This proves part c of proposition 1.

Proof of Proposition 2:

To prove proposition 2, we compare the threshold post-merger marginal cost of the merging firms $c_M^M(X)$ and the two countries $c_M^A(X)$ and $c_M^B(X)$ as given in Table 1 separately for each of the cases $X = 1, 2, 3$, dividing it into part a, b and c respectively.

Part a

$$c_M^A(\,) - c_M^B(\,) = \frac{-1 - 25c_1 + 38\Delta}{20}$$

$$= \frac{-1 + 1 - 25\left(c_1 - \Delta + \frac{1}{25}\right) + 13\Delta}{20} = \frac{-25\alpha' + 13\Delta}{20}$$

$$c_M^A(\,) - c_M^B(\,) < 0, \text{ when } \Delta \leq \frac{25\alpha'}{13} \text{ asymmetry across firms is low}$$

$$c_M^A(\,) - c_M^B(\,) > 0, \text{ Otherwise, i.e. when firms are highly asymmetric}$$

Again,

$$c_M^A(\,) - c_M^M(\,) = \frac{570 - 1288c_1 + 296\Delta}{640}$$

$$\text{Numerator} = 570 - 570 - 1288\left(c_1 - \Delta - \frac{285}{644}\right) - 992\Delta$$

$$= -1288\alpha'' - 992\Delta$$

$$c_M^A(\,) - c_M^M(\,) < 0, \text{ when } c_1 - \Delta > \frac{285}{644} \text{ or } c_1 - \Delta < \frac{285}{644} \text{ and } \Delta > \frac{161\alpha''}{124}$$

$$c_M^A(\,) - c_M^M(\,) > 0, \text{ when } \Delta \leq \frac{161\alpha''}{124} \text{ and } c_1 - \Delta < \frac{285}{644}$$

And $c_M^B(\cdot) - c_M^M(\cdot) = \dfrac{608 - 488c_1 + 920\Delta}{640} > 0$

$\Rightarrow c_M^B(\cdot) - c_M^M(\cdot) > 0$

Therefore,

$c_M^A(\cdot) < c_M^M(\cdot) < c_M^B(\cdot)$ when $\Delta \leq \dfrac{25\alpha'}{13}$ and $c_1 - \Delta > \dfrac{285}{644}$ or $\dfrac{161\alpha''}{124} < \Delta < \dfrac{25\alpha'}{13}$, and

$c_1 - \Delta < \dfrac{285}{644}$ i.e. for low to moderate asymmetry across firms

$c_M^M(\cdot) < c_M^A(\cdot) < c_M^B(\cdot)$, when $\Delta < \dfrac{161\alpha''}{124}$ and $c_1 - \Delta < \dfrac{285}{644}$ for very low asymmetry

This proves part a of Proposition 2

Part b

For proof b, we take $\Delta < 0$ in proof of part a of proposition 2.

$c_M^A(\cdot) - c_M^B(\cdot) < 0$, Irrespective of the value of c_1 and Δ

$c_M^A(\cdot) - c_M^M(\cdot) < 0$ When $c_1 - \Delta > \dfrac{285}{644}$ or $c_1 - \Delta < \dfrac{285}{644}$ and $\Delta > \dfrac{161\alpha''}{198}$

$c_M^A(\cdot) - c_M^M(\cdot) \geq 0$ When $\Delta \leq \dfrac{161\alpha''}{198}$ and $c_1 - \Delta < \dfrac{285}{644}$

$c_M^B(\cdot) - c_M^M(\cdot) < 0$ when $c_1 - \Delta < \dfrac{76}{61}$ and $\Delta > \dfrac{61\alpha''''}{176}$

$c_M^B(\cdot) - c_M^M(\cdot) \geq 0$ When $c_1 - \Delta < \dfrac{76}{61}$ and $\Delta \leq \dfrac{61\alpha''''}{176}$

Therefore, $c_M^M(\cdot) < c_M^A(\cdot) < c_M^B(\cdot)$, when $\Delta \leq \dfrac{61\alpha''''}{176}$ the firms are less asymmetric

$c_M^A(\cdot) < c_M^B(\cdot) < c_M^M(\cdot)$, when $\Delta > \dfrac{161\alpha''}{198}$ i.e. the firms are highly asymmetric.

Comparing these two results, we can say that as the firm asymmetry increases, the possibility of conflict increases from a situation of no conflict.

This proves the part b of the proposition 2

Part c:

$$c_M^A(\cdot) - c_M^B(\cdot) = \frac{-9 - 341c_1 + 111\Delta}{2}$$

$$\Rightarrow c_M^A(\cdot) - c_M^B(\cdot) < 0$$

$c_M^A(\cdot) - c_M^M(\cdot) > 0$ when $\alpha < 0$ i.e. $(c_1 - \Delta) < \frac{3}{8}$ and $\Delta \leq \frac{8\alpha}{51}$ i.e. asymmetry across firms is very low

$c_M^A(\cdot) - c_M^M(\cdot) < 0$,otherwise

Therefore, using the second part of the proof of Part c in Proposition 1 we get,

$c_M^M(\cdot) < c_M^A(\cdot) < c_M^B(\cdot)$, for low asymmetry

However, when firms are moderate to highly asymmetric, we get

$$c_M^A(\cdot) < c_M^M(\cdot) < c_M^B(\cdot)$$

Proof of Proposition 3:

Proof follows directly from proposition 1.

Proof of Proposition 4:

We denote the post merger marginal cost of the merging firms corresponding to the threshold level corresponding to each of the three cases as $c_M^M(\cdot)$, $c_M^M(\cdot)$ and $c_M^M(\cdot)$ respectively. To prove proposition 4, we compare the threshold post-merger marginal cost of the merging firms of the three cases.

$$c_M^M(\cdot) = \frac{-128 + 168c_1 - 264\Delta}{128}$$

$$c_M^M\left(\overline{\Delta}\right) \approx \frac{-128+168c_1-264\left(\overline{\Delta}\right)}{128}$$

$$c_M^M\left(\underline{\Delta}\right) \approx \frac{-1+c_1-\Delta}{2}$$

$$c_M^M\left(\Delta\right)-c_M^M\left(\overline{\Delta}\right) \approx \frac{-128+168c_1-264\Delta}{128}-\frac{-128+168c_1-264\left(\overline{\Delta}\right)}{128}=\frac{-528}{128}<0$$

$$c_M^M\left(\overline{\Delta}\right)-c_M^M\left(\underline{\Delta}\right) \approx \frac{-128+168c_1-264\left(\overline{\Delta}\right)}{128}-\frac{-1+c_1-\Delta}{2}=\frac{-64+104c_1+328\Delta}{128}$$

$$=-64+64+104\left(c_1-\Delta-\frac{8}{13}\right)+224\Delta$$

$$c_M^M\left(\overline{\Delta}\right)-c_M^M\left(\underline{\Delta}\right) \lessgtr 0 \text{, when } \Delta \leq \frac{13\alpha'''}{28} \text{ and } c_1-\Delta < \frac{8}{13}$$

$$c_M^M\left(\overline{\Delta}\right)-c_M^M\left(\underline{\Delta}\right) > 0 \text{, otherwise}$$

and

$$c_M^M\left(\Delta\right)-c_M^M\left(\underline{\Delta}\right) \approx \frac{-128+168c_1-264\Delta}{128}-\frac{-1+c_1-\Delta}{2}=\frac{-64+104c_1-200\Delta}{128}<0$$

Therefore,

$$c_M^M\left(\Delta\right) < c_M^M\left(\overline{\Delta}\right) < c_M^M\left(\underline{\Delta}\right) \text{, when } \Delta \leq \frac{13\alpha'''}{28} \text{ and } c_1-\Delta < \frac{8}{13}$$

$$c_M^M\left(\Delta\right) < c_M^M\left(\underline{\Delta}\right) < c_M^M\left(\overline{\Delta}\right) \text{, otherwise}$$

This proves Proposition 4.

Proof of Proposition 5:

When the market size of the two countries differs, the threshold post merger marginal cost of the merging firm is given as:

$$c_M^M \approx \frac{-4\delta+c}{8}$$

For Country A and B, the post-merger marginal cost which makes the authorities indifferent between the pre and post-merger situation are respectively given as:

$$c_M^A > \frac{-399 - 399c - 8\delta}{288}$$

$$c_M^B > \frac{-621 - 621c - 404\delta}{416}$$

We have, $c_M^A - c_M^B = \frac{5082 + 5082c + 3532\delta}{416} > 0$

$$\frac{\partial \left(c_M^A - c_M^B \right)}{\partial \delta} = \frac{3532}{416} > 0$$

This proves part a of proposition 5.

Further, $c_M^A - c_M^M = \frac{-399 - 435c + 136\delta}{288} < 0$

and $c_M^B - c_M^M = \frac{-621 - 673c - 196\delta}{416} < 0$

Hence, $c_M^M > c_M^A > c_M^B$. This holds for both $\delta >$ or < 0. Hence part b of proposition 5 is proved.

Appendix II

Comparative Statics:

In the product heterogeneity case, the point of indifference between the pre and post-merger level for the merging firm is given by:

$$c_M = \frac{1}{8}\left(2a_A + 2a_B + 4c - \sqrt{5\left(a_A - c\right)^2 + 5\left(a_B - c\right)^2 + 8\left(a_A - c\right)\left(a_B - c\right)} \right)$$

$$\frac{\partial c_M}{\partial a_A} = \frac{1}{8}\left(2 - \frac{10a_A + 8a_B - 18c}{2\sqrt{5a_A^2 + 8a_A a_B + 5a_B^2 - 18a_A c - 18a_B c + 18c^2}} \right)$$

$$= \frac{4\sqrt{5\left(a_A - c\right)^2 + 5\left(a_B - c\right)^2 + 8\left(a_A - c\right)\left(a_B - c\right)} - 10\left(a_A - c\right) - 8\left(a_B - c\right)}{16\sqrt{5\left(a_A - c\right)^2 + 5\left(a_B - c\right)^2 + 8\left(a_A - c\right)\left(a_B - c\right)}}$$

< 0 , unless $a_B \gg a_A$

Welfare of country A:

$$W_A = \frac{(a_A - 2c_M + c)^2}{9b} + \frac{(a_B - 2c_M + c)^2}{9b} + \frac{(2a_A - c - c_M)^2}{18b}$$

$$\frac{\partial W_A}{\partial a_A} = \frac{8(a_A - c) + 10(c - c_M)}{18b} > 0$$

$$\frac{\partial W_A}{\partial a_B} = \frac{2(a_B - c) + 4(c - c_M)}{9b} > 0$$

$$\frac{\partial W_A}{\partial c_M} = \frac{-4(a_A - 2c_M + c)}{9b} + \frac{-4(a_B - 2c_M + c)}{9b} + \frac{-2(2a_A - c - c_M)}{18b} < 0$$

Welfare of Country B

$$W_B = \frac{(a_A - 2c + c_M)^2}{9b} + \frac{(a_B - 2c + c_M)^2}{9b} + \frac{(2a_B - c - c_M)^2}{18b}$$

$$\frac{\partial W_B}{\partial a_A} = \frac{2[(a_A - c) - (c - c_M)]}{9b} > 0$$

$$\frac{\partial W_B}{\partial a_B} = \frac{12(a_B - c)}{18} > 0$$

$$\frac{\partial W_B}{\partial c_M} = \frac{4(a_A - c) - 10(c - c_M)}{18b}$$

Appendix III

General model when firms belonging to the same country merge

In particular, suppose two firms in Country A merge to form Firm M. Then the demand function can be written as

$$P_A = a_A - b\left(\sum_{j=1}^{N_A-2} h_{jA} + h_M + \sum_{j=1}^{N_B} e_{jB} \right)$$

$$P_B = a_B - b\left(\sum_{j=1}^{N_B} h_{jB} + \sum_{j=1}^{N_A-2} e_{jA} + e_M \right)$$

Where h_M, e_M represent the domestic consumption and export share of the merged firm's output.

The post merger marginal cost of the merged firm is given by $c_M \prec c$. The profit of the merged firm is given as

$$\pi^M = \left(P_A - c_M \right) h_M + \left(P_B - c_M \right) e_M$$

The welfare of Country A and B will then be:

$$W_A^M = \frac{1}{2} Q_A^{M2} + \sum_{j=1}^{N_A-2} \pi_{jA}^M + \pi^M$$

$$W_B^M = \frac{1}{2} Q_B^{M2} + \sum_{j=1}^{N_B} \pi_{jB}^M$$

The output of the merged firm is given as:

$$h_M = e_M = \frac{a_i - 2c_M + \sum_{j=1}^{N-2} c_j}{N}, j \neq M$$

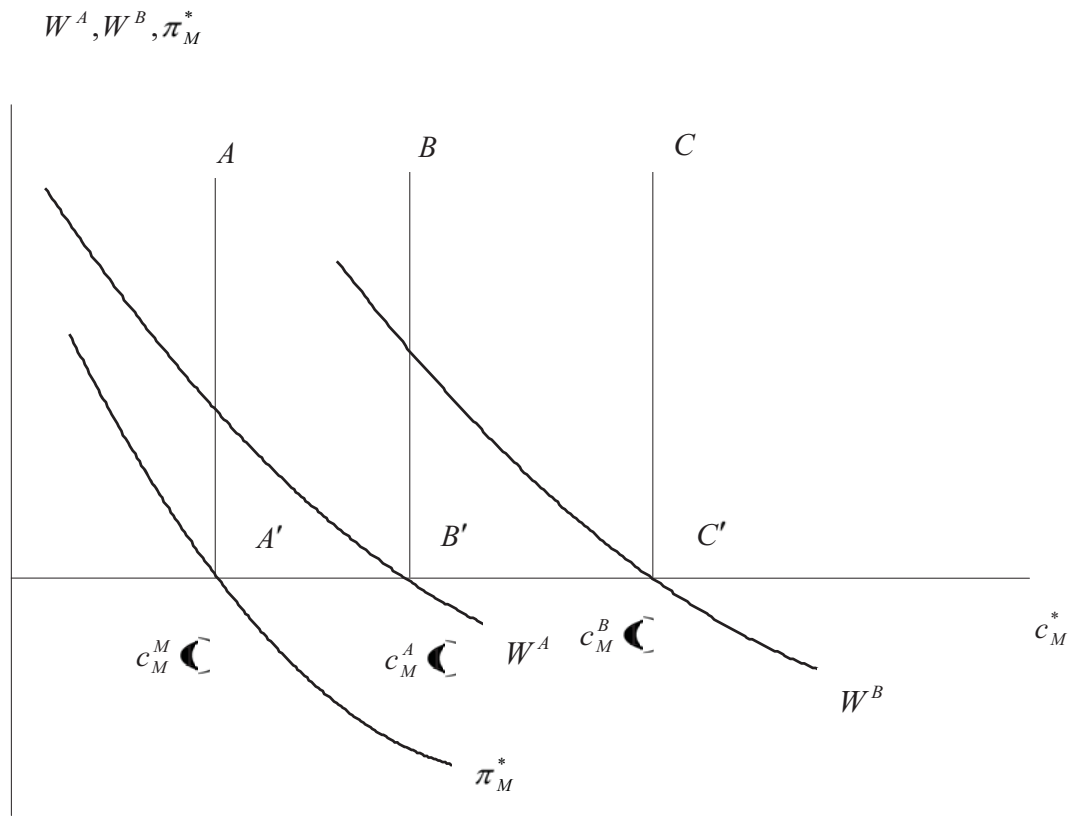The output of the non-merged firm is given by (12) in the text in Section 3.0

Figure 1a: Distribution of threshold post merger marginal cost when the two high cost firms merge and the firms are very less asymmetric

W^A, W^B, π_M^*

E   F   G

E' F' G'

c_M^*

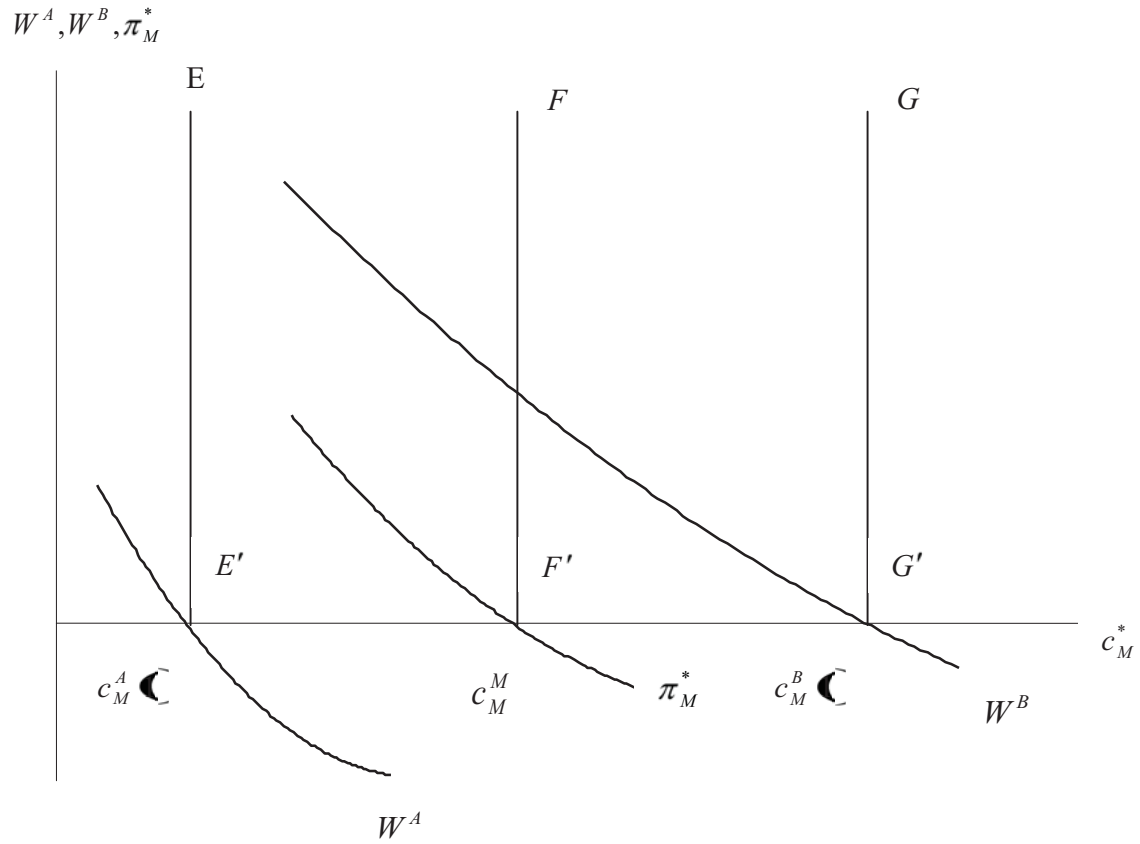c_M^A c_M^M π_M^* c_M^B W^B

W^A

Figure 1b: Distribution of threshold post-merger marginal cost when the two high cost firms merge and the firms are small to moderately asymmetric

Table 2: Possibilities of conflict between the two jurisdictions, when merging firms belong to the same country

	Firm 1 and 2 belong to country A, Firm 3 belongs to Country B		All firms belong to Country A
Firm Size	Symmetric	Asymmetric	
Two high cost firms merge	$c_M^B < c_M^A < c_M^M$	$c_M^A > c_M^B > c_M^M$	$c_M^B < c_M^M < c_M^A$
	More Conflict	No Conflict	Less Conflict
Two low cost firms merge	$c_M^B < c_M^M < c_M^A$		$c_M^B < c_M^M < c_M^A$
	Less Conflict		Less Conflict
One high cost and one low cost firms merge	$c_M^A < c_M^M < c_M^B$	$c_M^A > c_M^M > c_M^B$	
	Less Conflict	Less Conflict	

Table 3: Relative position of the point of indifference between the pre and post-merger situations of the merging firms and the two countries

	Firm 1 and 2 belong to country A, Firm 3 belongs to Country B	All firms belong to Country A
$a_B > a_A$	$c_M^M > c_M^A > c_M^B$	$c_M^M > c_M^A > c_M^B$
	More Conflict	No Merger
$a_B < a_A$	$c_M^B > c_M^M > c_M^A$	$c_M^M < c_M^A < c_M^B$
	Less Conflict	No Conflict