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Endogenous Mergers and Tariffs in an Integrated Market

by

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Abstract

The last few decades have seen a significant reduction in trade barriers, which has brought the international aspects of competition policies into greater prominence. In this paper we explore the effects of tariffs on the profitability and welfare consequences of mergers in a simple model of the integrated world market for a single homogeneous product in which firms differ in their levels of efficiency. We find that the tariff "protects" less efficient firms from closure through merger if they are import-competing, but makes such closure more likely if they are exporters. Thus a tariff is likely to generate mergers of exporting firms. The implications of the tariff for the global welfare consequences of mergers depend on the tariff's effects on total output. If the tariff reduces (increases) total output, mergers are less (more) likely to raise welfare.

JEL classification: F12, F13

Keywords: Endogenous Mergers, Tariffs

Outline

Non-Technical Summary

This paper is a theoretical exploration of the effects of tariffs on the profitability and global welfare consequences of endogenous mergers in an integrated world economy. The last few decades have seen a significant reduction in trade barriers, which has brought the international aspects of competition policies into greater prominence, and there now exists a literature dealing with mergers between firms located in different political jurisdictions. Two questions are of particular interest. First, what type of merger activity, if any, has been encouraged by this general process of trade liberalisation? Answering this question involves assessing the effects of trade policy on the *profitability* of mergers to their potential participants. Second, are competition authorities likely to view mergers more or less favourably in a more open economy? Answering this question involves consideration of the effects of trade policy on the *welfare* costs and benefits of mergers.

This paper employs a simple partial equilibrium model involving three Cournot oligopolists with different technologies to illustrate issues. Demand is linear. This structure allows for relatively simple solutions, where the effects of discrete changes in the number of firms on profits and welfare can be considered. Conditions for each merger to be profitable to participants and stable to offers from the outside firm are first derived in the free trade equilibrium. Conditions under which a global competition authority would approve each merger, and when it would prefer one merger to another, are also derived for this case. The effects of a tariff on merger proposals and approvals are then considered for four cases, which capture the range of possible outcomes in this model. The tariff further distorts an already distorted (by imperfect competition) market, and adds a revenue term to the welfare calculations.

Whether mergers are more or less likely to occur depends on where the least efficient firm is located. A merger is less likely if this firm is protected by the tariff, and more likely if it is not. So, *at this margin*, the tariff "protects" an inefficient import-competing firm, both in terms of increasing its output while producing and of reducing the likelihood that it will close down through merger. Conversely the tariff "harms" an inefficient exporting firm by reducing its output when producing and raising the probability that it will close down through merger. The implications of the tariff for which merger is likely to be proposed depend on whether the tariff has a "protective" role.

A global competition authority is less likely to approve either merger under the tariff, unless there is more than one import-competing firm. This reflects the direct effects of the distortion created by the tariff. The tariff reduces total output in all cases except where the

majority of firms are behind the tariff wall. There is a (weak) presumption that a merger involving the least efficient firm is more likely to be preferred if that firm is protected by the tariff, and less likely to be preferred otherwise. A merger involving the intermediate firm is less likely to be preferred where the least efficient firm is protected, and more likely to be preferred otherwise.

I Introduction

The objective of this paper is to explore the effects of tariffs on the profitability and global welfare consequences of mergers in open economies. The general reduction in trade barriers in the last few decades has brought the international aspects of domestic competition policies into greater prominence, and there now exists a significant literature dealing with mergers between firms located in different political jurisdictions[1]. Two questions have been of particular interest. First, what type of merger activity, if any, has been encouraged by this general process of trade liberalisation? Answering this question involves assessing the effects of trade policy on the *profitability* of mergers to their potential participants. But given that mergers are regulated in most states, a second element must also be considered. Are competition authorities likely to view mergers more or less favourably in a more open economy? Answering this question involves consideration of the effects of trade policy on the *welfare* costs and benefits of mergers.

The success of international agreements constraining the ability of governments to use trade policies because of their undesirable beggar-thy-neighbour consequences, has raised concern that some governments may be tempted to substitute other policies, competition policy in particular, with similar outcomes (Lloyd and Sampson, 1995). Should trade agreements be complemented by agreements on, or "harmonisation" of, competition policies, and what form should such agreements take (Lloyd, 1998)? This concern prompted research investigating the links between competition policy and trade policy, where the latter is broadly defined to include import and export taxes and subsidies, and domestic production subsidies. Because this literature focuses on the welfare effects of mergers, the competition policy decision is typically modelled as the choice of the number of identical domestic firms for simplicity[2].

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[1] See Horn and Levinsohn (1997) and WTO Annual Report 1997 for reviews of the literature investigating the links between trade policy and competition policy.

[2] In the standard "cross-hauling" trade model, increasing the number of domestic firms is both import-substituting and export-promoting (Bliss, 1996), and competition policy choices are then influenced by the range of trade policy options available and the sequences in which policy decisions are made. Where countries have symmetric exporting and import-competing interests in the same sector, Horn and Levinsohn (1997) show that there is no unambiguous answer to the question of whether increased foreign competition will lead governments to choose more or less domestic competition. They are able to rank the optimal numbers of firms for a variety of policy-constrained cases, and find that these rankings are broadly similar for tariff and export subsidy policies. A clearer picture emerges in less symmetric cases: for example the Brander-Spencer profit-shifting model (Rysman, 1999) or the interactions between the importing and the exporting governments in a single market (Cowan, 1989).

Where the decision by firms to merge has been the focus of analysis, it is typically modelled as motivated either by fixed cost savings or variable cost rationalisation. Salant, Switzer and Reynolds (1983) have shown that identical Cournot-competing firms with constant marginal costs have no incentive to merge in a closed market, unless the participants collectively have a large share of the market pre-merger, or the merger saves on fixed costs[3]. But small tariffs are likely to have rather a limited impact where the incentive to merge is avoiding fixed costs[4], and so the natural focus in this paper is on mergers motivated by rationalisation of production[5]. The simplest way to introduce inter-firm efficiency and size differences, is to suppose firms have different technologies, reflected in different (constant) marginal costs. In this context, Lahiri and Ono (1988) have shown that the exit of the most inefficient firm can be welfare improving. A merger with a more efficient firm is one mechanism through which this might occur, as long as the merger is also profitable to the participants. Head and Ries (1997) for example, use this model to investigate the potential conflicts that arise between national competition authorities if the effects of mergers spill over national borders[6].

In most of this literature, only a few of the potential mergers are considered, and they tend to be chosen exogenously. More recently some consideration has been devoted to examining the full constellation of merger possibilities, in order to predict which mergers are likely to be proposed in which circumstances. Horn and Persson (2001) have established some general results on "endogenous mergers" under both

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Richardson (1999) considers the advantages of harmonisation of competition policies, where different governments place different weights on the welfare of their producers and consumers in computing national welfare.

[3] This analysis has been extended to non-Cournot behaviour and non-linear demand. See, for example, Deneckere and Davidson (1985), Kwoka (1989) and Fauli-Oller (1997). If a merger is proposed it can be assumed to be profitable to its participants, and so Farrell and Shapiro (1990) focus on its effects on non-participants ("external effects"). Their work has been extended to a multicountry context by Barros and Cabral (1994), who derive conditions on the output shares of participants and non-participants sufficient for the external effects of the merger to be positive.

[4] Gaudet and Kanomi (2000) consider the incentive that different levels of the tariff provide for a fixed-cost saving domestic merger. The main impact arises when the tariff is large enough to influence the number of foreign competitors in the market.

[5] Perry and Porter (1985) introduce an explicit link between marginal cost and firm size through a tangible asset, assumed to be in fixed supply to the industry, whose quantity in the hands of a firm determines its unit costs. Then the merged firm has more of the asset and therefore lower costs. This approach has also been extended to a multi-country context. See Horn and Levinsohn (1997) for example. Kabiraj and Chaudhuri (1999) compare the relative profitability and welfare effects of national and cross-border mergers, and show that there exists a range of merger efficiency gains for which a cross-border merger would lead to higher domestic welfare than a national merger.

[6] They consider both fixed cost saving and variable cost rationalision motivations for mergers and relate the potential conflicts to the international distribution of consumption and ownership of firms.

fixed cost saving and variable cost rationalisation motives. We draw on the latter below.

Investigation of the effects of trade policy on mergers motivated by variable cost rationalisation are relatively scarce. Long and Vousden (1995) consider the effects of unilateral and bilateral trade liberalisation on the incentives for an exogenously chosen merger in a world composed of two countries with symmetric segmented markets. They characterise potential mergers in terms of the differences in the pre-merger marginal costs of the participants. For any given tariff only a range of cost differences generate profitable mergers, and this range shifts with changes in the tariff. They find that a unilateral tariff reduction will increase the profitability of mergers with small cost differences (mergers which "primarily concentrate on market power" in their terms). In contrast bilateral tariff cuts will increase the profitability of mergers with larger cost differences (mergers which "primarily reduce costs"). Horn and Persson (1999) consider equilibrium ownership structures in a model where international mergers can avoid trade costs. They assume two identical countries with segmented markets, each with two identical owners of an asset in fixed supply that can be used to produce a homogeneous good. They then show that international (rather than domestic) mergers are more likely when trade costs are low, and that this result holds when mergers generate either fixed cost savings or variable cost synergies.

This paper extends these results by considering the implications of tariffs for both the profitability and global welfare consequences of endogenous mergers, in an integrated international market, where countries and firms are not necessarily identical. We employ a simple model of the market for a single homogeneous product, in which firms are Cournot competitors and differ in their levels of efficiency. Demand is linear and firms have constant marginal costs. This structure allows for relatively simple solutions, where the effects of discrete changes in the number of firms (mergers) on profits and welfare can be considered. The impact of a small tariff change on these effects can then be derived. Horn and Persson (2001) discuss the relative merits of the various approaches to endogenising mergers. Here we adapt the approach of Barros (1998), who considers a market with three potential participants and shows that merger outcomes depend on technology differences,

which are assumed to be constant[7]. Assuming that merger to monopoly is precluded, he finds that if the technology difference is small there are no mergers. For intermediate technology differences the least and most efficient firms merge. For large technology differences, the two most efficient firms merge[8]. We retain the assumption of three firms, as this allows the full range of outcomes of interest[9], but we allow variable technology differences, and hence generate a wider range of outcomes, particularly with respect to welfare.

We begin by considering the global economy in free trade, in Section II, in order to illustrate the conditions for the merger to be privately profitable and socially desirable, before introducing the tariff. Which mergers will be proposed, if any, depend on relative firm efficiencies as reflected in relative firm outputs were they all to produce. Whether a merger would be approved by the global competition authority[10], depends on the relative size (market share) of the less efficient merger partner. In general any merger likely to be approved will be proposed. Section III considers the effects of a tariff by one (the home) country on the profitability of mergers, and their global welfare effects, when the world market is integrated. How firms are affected by the tariff depends on whether they are located inside or outside the protected market. This allows a range of cases to be considered. Because the tariff "distorts" the market, its implications for the welfare consequences of the merger are not confined to its effects on the market share of the less efficient merger partner. The final section presents a summary and conclusions.

[7] The marginal cost of firm j is $c_1 + [j-1]\Delta$, where c_1 is the marginal cost of the most efficient firm, and Δ is the technology difference.

[8] This outcome is generalised in Corollary 3 in Horn and Persson (2001).

[9] And may not even be that limiting in view of Proposition 2 in Horn and Persson (2001) which establishes, under not particularly restrictive conditions, that a duopoly is the equilibrium ownership structure when monopoly is precluded.

[10] We confine attention to the global welfare effects of these mergers, thereby avoiding modelling of the division of the gains from the merger between the participants. But as we note in the conclusions, in practice it is national competition authorities that approve or disapprove mergers, and their decisions are likely to be based on the merger's effects on national welfare.

II The Free Trade Economy[11]

Consider a world economy in which there are three (potential) producers of a homogeneous product. Each firm (j) has constant unit costs (c_j) and no fixed costs. Unit costs differ across firms, and firms are ordered so that k > j implies $c_k > c_j$. Competition in this market is assumed to be Cournot. There are two countries, home and foreign (whose variables are denoted with an asterisk), with demands respectively of

$$D = A - p \qquad \text{and} \qquad D^* = A^* - p^* \tag{1}$$

where A and A^* are positive constants, and p and p^* prices. In this section we assume free trade and no transport costs, implying that firms in this integrated market face world demand

$$\overline{D} = D + D^* = A + A^* - 2\overline{p} \tag{1'}$$

Each producing firm j therefore chooses its output (x_j) to $\max \boldsymbol{p}_j = [\overline{p} - c_j]x_j$, taking $d\overline{p}/dx_j = -1$. Solving the first order conditions for optimal firm output, summing these to obtain total output ($\overline{X}$), and then substituting in (1′), gives the equilibrium values:

$$\overline{p} = \frac{A + A^* + C}{2[n+1]}; \overline{x}_j = 2[\overline{p} - c_j]; \boldsymbol{p}_j = 2[\overline{p} - c_j]^2 = \overline{x}_j^2 / 2 \tag{2}$$

where $C = \sum_{j \in N} c_j$, and n is the number and N the set of producing firms.

When two firms in this market (k and j) "merge", they become a single decision making unit. Given that the merger itself is has no effect on the technology of the participants, cost minimisation by the new merged firm implies the abandonment of firm k's (relatively inefficient) technology, and the new market equilibrium is simply that which obtains with the closure of firm k[12]. Total output

[11] A general version of the model in this section (with exogenous mergers) is discussed in more detail in Falvey (1998).

[12] Note that by assuming a fixed number of firms we intend to preclude the divisionalisation process whereby firms may gain by splitting into separate identical production decision making units. Were divisionalisation possible, the merged firm might then increase its total profits by operating as two or more units, particularly if all had access to the technology of the more efficient partner. See Ziss (2001). In common with much of the literature in this area, we take the initial number of firms and their technologies as given. Such would be the case, for example, if the technology in this industry was

falls, the market price rises, the profits of the remaining firms rise and consumer surplus falls[13]. Consumers lose from the merger, and non-participating producers gain. The incentive to merge is the additional profits that may accrue to the merged firm as a result of the higher price. The shift to the new post-merger equilibrium (where Δy denotes the change in variable y as a consequence of the merger) has

$$\Delta\overline{p} = \frac{\overline{x}_k}{6}; \quad \Delta x_h = \frac{\overline{x}_k}{3}, h \neq k; \quad \Delta\overline{D} = \Delta\overline{X} = -\frac{\overline{x}_k}{3} \tag{4}$$

The closure of firm k results in an increase in the output of each of the remaining firms. Given our assumptions of linearity and constant marginal costs, their outputs rise by the same absolute amount, which is one third of the closing firm's original output. Since only 2 firms remain, total output falls (by $\overline{x}_k/3$), and price rises (by $\overline{x}_k/6$).

The change in profits of continuing firm h is the increased profits on its original output plus the profits from its increased output. This can be rearranged into three terms – a transfer from consumers, who are paying a higher price for the firm's output, a transfer of profits from the closing firm, and the increased profit resulting from the greater efficiency of this firm relative to the closing firm. Only the last term represents a social gain. Substituting from (4)

$$\Delta\pi_h = \frac{\overline{x}_k}{6}[2\overline{x}_h + \frac{\overline{x}_k}{3}] > 0 \tag{5}$$

This merger will have been profitable for the participants only if the increase in profits to firm j exceed the lost profits of the closed firm. Substituting from (5), this *Gain* is

$$G(j,k) = \Delta\pi_j - \pi_k = \frac{\overline{x}_k}{18}[6\overline{x}_j - 8\overline{x}_k] \tag{6}$$

Equation (6) provides a condition on relative firm sizes (or relative shares of output) for a profitable merger. Given $\overline{x}_k$, and the number of firms, the larger the initial output of the continuing partner the more likely the merger is to yield a net gain.

In his analysis of endogenous mergers in this type of market, Barros (1998) notes that there are two general conditions that the distribution of profits of the merged firm must satisfy in equilibrium. First, there are *participation constraints* that

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patentable, the existing firms held all the patents and there was little prospect of any firm inventing a viable new technology.

[13] Farrell and Shapiro (1990) provide the conditions for output to fall under more general assumptions.

limit the possible payoffs to the two partners. Consider again a merger between firms j and k. Let π^{jk} denote the total profits of the merged firm, and π_j^{jk} denote the "payoff" to partner j (so that $\pi^{jk} = \pi_j^{jk} + \pi_k^{jk}$). Then the participation constraint for this merger requires that

$$\pi^{jk} - \pi_k \geq \pi_j^{jk} \geq \pi_j \qquad (7)$$

The left side of this inequality indicates the largest payoff that can be made to partner j (i.e. the remainder after partner k is paid exactly what it would receive if their were no merger), while the right side indicates the minimum payoff to partner j (i.e. what it would receive if there were no merger). Satisfying these participation constraints requires that the merger be profitable (i.e. $\pi^{jk} \geq \pi_j + \pi_k$). Second, there are the *stability constraints*, which recognise that each merger partner may have the option of merging with the outside firm (h). These conditions require

$$\pi_j^{jk} \geq \pi^{jh} - \pi_h^{jk} \equiv o_j^{jk} \qquad \text{and} \qquad \pi_k^{jk} \geq \pi^{kh} - \pi_h^{jk} \equiv o_k^{jk} \qquad (8)$$

that is the payoffs to each partner be no less than the maximum offer that the outside firm h would be willing to make for their participation in the alternative merger[14].

We can now use these constraints to determine the conditions under which different mergers may occur. With three firms there are, in principle, three possible mergers. But since $\pi^{13} > \pi^{23} = \pi_2^{13}$, it is always more profitable for the smallest firm to combine with the largest firm rather than with the intermediate firm[15], and the intermediate firm would always prefer the {1,3} merger. Hence the potential mergers are {1,3} and {1,2} – i.e. firms 2 and 3 are "bidding" over a possible merger with 1. When both mergers are profitable, we follow Barros in assuming the one with the largest internal gain (taking account of the gains from being an outside firm) will occur. Thus merger {1,2}, ({1,3}) occurs if $\pi^{12} - [\pi_1 + \pi_2^{13}] > (<)\ \pi^{13} - [\pi_1 + \pi_3^{12}]$. This ranking corresponds to that based on outside offers, since the maximum outside offer each of the smaller firms will make to 1 are, respectively

[14] Note that the stability condition uses $\pi_h^{jk} > \pi_h$ reflecting that the outside firm is always better off from a merger.

[15] $G(1,3) - G(2,3) = \frac{\bar{x}_3}{3}[\bar{x}_1 - \bar{x}_2] > 0$

$$o_1^{12} = \pi^{12} - \pi_2^{13} > 0 \quad \text{and} \quad o_1^{13} = \pi^{13} - \pi_3^{12} > 0$$

Which of these is the greater depends on relative outputs, but since

$$o_1^{12} - o_1^{13} = \pi^{12} - \pi^{13} - \frac{8}{18}[(\bar{x}_2)^2 - (\bar{x}_3)^2] = \frac{[\bar{x}_2 - \bar{x}_3]}{18}\{6\bar{x}_1 - 7[\bar{x}_2 + \bar{x}_3]\} \qquad (9)$$

there will be cases where firm 3 makes the larger outside offer to 1, even though merger {1,3} is not the most profitable (i.e. $\pi^{12} > \pi^{13}$)[16].

The profitability conditions can be obtained from equation (6). Merger {1,2} is profitable if $6\bar{x}_1 \geq 8\bar{x}_2$, while merger {1,3} is profitable if $6\bar{x}_1 \geq 8\bar{x}_3$. If the former is profitable so is the latter. Consideration of the participation and stability constraints then leads to the following outcomes depending on the distribution of firm sizes:

(1) If $6\bar{x}_1 \leq 8\bar{x}_3$, then no merger is profitable and all three firms produce;

(2) If $8\bar{x}_3 < 6\bar{x}_1 \leq 8\bar{x}_2$, then merger {1,3} would be proposed, since it is the only profitable merger;

(3) If $8\bar{x}_2 \leq 6\bar{x}_1$, then both mergers {1,2} and {1,3} are profitable, and which is proposed depends on the stability conditions;

   (a) if $6\bar{x}_1 < 7[\bar{x}_2 + \bar{x}_3]$, then merger {1,3} is proposed; while

   (b) if $6\bar{x}_1 > 7[\bar{x}_2 + \bar{x}_3]$, then merger {1,2} is proposed.

Corresponding to each of these cases will be a distribution of the profits of any merged firm between the partners (i.e. specific values of π_j^{jk} etc). This distribution should reflect the outside opportunities of the partners, but is otherwise indeterminate.

These outcomes are illustrated in Figure 1a. Given the size of the largest firm (x_1), the requirement that $x_1 \geq x_2 \geq x_3$ constrains the range of feasible outputs for the other firms to the triangle OQx_1. The combinations of relative outputs (reflecting relative costs) that give rise to each of the cases are shown by the labelled areas. For example, if all outputs are sufficiently similar (region 1) no merger will be proposed; while if firm 1 is much larger than the others (region 3b) both mergers will be profitable, but merger {1,2} will be proposed.

[16] This outcome also follows from Proposition 2 in Horn and Persson (2001) which establishes, in this case, that the producing firms in equilibrium will be those that maximise total industry profits. One can readily show that total profits when only firms 1 and 2 produce are equal to total profits when only firms 1 and 3 produce if initially $6\bar{x}_1 = 7[\bar{x}_2 + \bar{x}_3]$.

Welfare Effects: Total benefits ($\tilde{W}$) from this market are the sum of consumer surplus (CS) and total profits (Π)

$$\tilde{W} = CS + \sum_j \boldsymbol{p}_j = \frac{D^2}{2} + \frac{D^{*2}}{2} + \frac{1}{2}\sum_{j\in N} x_j^2 \qquad (10)$$

The change in consumer surplus in any country as a consequence of the merger has two components, both negative. There is a *transfer* from consumers to firms as a result of the price rise, and a consumption *deadweight loss*. In examining the welfare effects of mergers it is useful to express equilibrium demands as functions of total output ($\bar{X}$). From (1') we have that $\bar{p} = [A + A^* - \bar{X}]/2$, and therefore we can write

$$D = \frac{A - A^* + \bar{X}}{2} \qquad \text{and} \qquad D^* = \frac{A^* - A + \bar{X}}{2} \qquad (11)$$

If we let $\bar{X}_m$ denote aggregate output after the merger, then the changes in consumer surplus in the two countries can be written as

$$\Delta CS = \frac{[\bar{X}_m - \bar{X}]}{4}\{A - A^* + \frac{[\bar{X}_m + \bar{X}]}{2}\}; \text{ and } \Delta CS^* = \frac{[\bar{X}_m - \bar{X}]}{4}\{A^* - A + \frac{[\bar{X}_m + \bar{X}]}{2}\}$$

The change in global consumer surplus is then

$$\Delta \tilde{CS} = \frac{[\bar{X}_m - \bar{X}]}{4}[\bar{X}_m + \bar{X}] < 0 \qquad (12)$$

and is negative since each merger results in a reduction in total output. The larger the output of the closing firm the larger the consumer surplus loss.

A positive gain to the merging firms is sufficient for total profits to rise since the outside firm's profits always increase. The overall change in profits has three components. There is the *transfer* from consumers, who are paying a higher price, and an *efficiency gain* from redistributing output to lower cost firms. Both of these are positive. But there is also the *lost profit* on the discontinued output.

The change in total welfare then reflects the balance between the consumption deadweight loss and the lost profits on the one hand and the efficiency gain on the other. Thus for merger {1,3} we find, using (12), (15) and (6) that

$$\Delta \tilde{CS}(1,3) = -\frac{\bar{x}_3}{12}\{2[\bar{x}_1 + \bar{x}_2] + \frac{5}{6}\bar{x}_3\} \quad \text{and} \qquad \Delta\Pi(1,3) = \frac{\bar{x}_3}{18}\{6[\bar{x}_1 + \bar{x}_2] - 7\bar{x}_3\}$$

Combining these we have

$$\Delta \tilde{W}(1,3) = \frac{\bar{x}_3}{36}[6\bar{X} - 25\bar{x}_3], \qquad (13)$$

Equation (13) provides a global competition authority with a simple condition for welfare improvement that depends only on the share of the closing firm. As Lahiri and Ono (1988) have pointed out, the elimination of a minor firm has two opposing effects on welfare in an oligopoly with different technologies. It improves average efficiency, yet at the same time creates a less competitive market structure. Provided the market share of the minor firm is not too large, net welfare can increase as a consequence of its closure.

The corresponding expressions for merger {1,2} show that this merger will raise welfare if $\bar{x}_2 / \bar{X} < 6/25$. Clearly if merger {1,2} raises welfare so does {1,3}. Since

$$\Delta\tilde{W}(1,2) - \Delta\tilde{W}(1,3) = \frac{[\bar{x}_2 - \bar{x}_3]}{36}[25\bar{x}_1 - 19\bar{X}] \qquad (14)$$

we conclude that merger {1,2} will yield a higher welfare change than merger {1,3} if the most efficient firm is sufficiently large (i.e. $\bar{x}_1 / \bar{X} > 19/25$), in which case both mergers are welfare improving.

These outcomes are illustrated in Figure 1b. No merger would be approved in area A. In area B, merger {1,3} would be approved[17], but {1,2] would not be. In area Ca either merger would be welfare improving, but merger {1,3} would give the greater welfare improvement[18]. In area Cb, either merger is welfare improving, but merger {1,2} yields the larger welfare gain.

The conditions for a global welfare improvement can be combined with the conditions for merger profitability and stability to derive the circumstances under which mergers will be proposed and approved. We assume, as seems reasonable, that a proposal is a precondition for approval, and that the competition authority is not in a position to "force" mergers.

In case (1), no merger is proposed if $6\bar{x}_1 \leq 8\bar{x}_3$;

In case (2), merger {1,3} is proposed when $8\bar{x}_3 < 6\bar{x}_1 < 8\bar{x}_2$ and approved if $25\bar{x}_3 < 6\bar{X}$, that is if $19\bar{x}_3 < 6[\bar{x}_1 + \bar{x}_2]$. Note that this merger will not be approved if it is just on the margin of profitability (i.e. $6\bar{x}_1 \approx 8\bar{x}_3$);

In case (3), both mergers are profitable, and

[17] Here $\bar{x}_3 < 6\bar{X}/25$ which can be written as $\bar{x}_3 < 6[\bar{x}_1 + \bar{x}_2]/19$.

[18] Here $\bar{x}_3 < 6[\bar{x}_1 + \bar{x}_2]/19$ and $\bar{x}_2 < 6[\bar{x}_1 + \bar{x}_3]/19$ but $25\bar{x}_1 < 19\bar{X}$.

(a){1,3} is proposed if $8\bar{x}_2 < 6\bar{x}_1 < 7[\bar{x}_2 + \bar{x}_3]$ and approved if $19\bar{x}_3 < 6[\bar{x}_1 + \bar{x}_2]$. Note that this merger will be approved at the upper margin (i.e, $6\bar{x}_1 \approx 7[\bar{x}_2 + \bar{x}_3]$); while

(b){1,2} is proposed if $8\bar{x}_2 < 6\bar{x}_1$ and $7[\bar{x}_2 + \bar{x}_3] < 6\bar{x}_1$; and approved if $19\bar{x}_2 < 6[\bar{x}_1 + \bar{x}_3]$.

Two points are worth noting, in particular. First, all mergers that would be approved would be profitable[19]. Second, there is a range of outputs[20] where merger {1,2} would be proposed, but merger {1,3} would lead to a higher welfare improvement. Whether a global competition authority could or should be able to reject one welfare improving merger on the grounds that an alternative, and also profitable, merger would raise welfare even further is an interesting policy issue.

III Tariffs and Mergers

The aim of this Section is to investigate the effects of tariffs on the incentives for and welfare consequences of the mergers considered above. We now construct the market equilibrium assuming a small specific tariff of t per unit is imposed by the home country, which we assume will continue to be an importer after any mergers. We continue to deal with an integrated world market, where there are no transport costs and costless arbitrage between markets is possible. Arbitrage activities will occur if the deviation in prices in the two markets ever exceeds the relevant tariff (i.e. if p > p*+t, or p* > p). A tariff will therefore affect the equilibrium in both markets[21].

The determination of the market equilibrium is modelled as a two-stage game. In the first stage, firms determine their sales in each market, taking each others' sales as given. In the second stage, arbitrage activity occurs if the first stage decisions generate a price differential between the two markets that exceeds the relevant tariff.

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[19] If $19\bar{x}_3 < 6[\bar{x}_1 + \bar{x}_2]$ then $8\bar{x}_3 < 6\bar{x}_1$, and if $19\bar{x}_2 < 6[\bar{x}_1 + \bar{x}_3]$ then $8\bar{x}_2 < 6\bar{x}_1$.

[20] That is $7[\bar{x}_2 + \bar{x}_3] < 6\bar{x}_1 < 19[\bar{x}_2 + \bar{x}_3]$.

[21] Our assumptions of linear demand and a specific tariff considerably simplify the analysis that follows. Collie (1998) shows that a specific or ad valorem tariff has an (indirect) demand induced rationalisation effect on production as it moves the industry up its demand curve thereby making demand flatter (steeper) if demand is concave (convex). This affects both domestic and foreign firms, with output of the jth firm increasing by more than the average if demand is concave (convex) and it is larger (smaller) than average. Ad valorem tariffs also have a direct rationalisation effect by making the foreign firms' perceived demand curves flatter. This does not affect domestic firms.

The activities of profit-seeking private arbitrageurs will generate a volume of arbitrage (R) which ensures that $p - p^* \leq t$.

Let h_j, f_j (h_j^*, f_j^*) denote the sales of home (foreign) firm j in the home and foreign markets respectively, and let N and N* be the sets of home and foreign firms. Market clearing in the second stage then requires that

$$p = A - [H + H^*] - R; \; p^* = A^* - [F + F^*] + R \qquad (15)$$

where $H = \sum_{j \in N} h_j$ etc. The non-profitability of further arbitrage in equilibrium (i.e. p = p*+t) implies that

$$R = \frac{A - A^* + [F + F^*] - [H + H^*] - t}{2} \qquad (16)$$

In the first stage, the jth home firm's optimisation problem, taking account of the possibility of arbitrage activity in the second stage, is:

$$\max_{h_j, f_j} \boldsymbol{p}_j = [p - c_j]h_j + [p^* - c_j]f_j$$

where p, p* and R are as determined by (15) and (16). Each firm takes the outputs of other firms as given, but recognises the implications of its own choices for (future) arbitrage activity. The first order conditions for this problem are:

$$h_j \geq 0; \frac{\partial \boldsymbol{p}_j}{\partial h_j} \leq 0; h_j \frac{\partial \boldsymbol{p}_j}{\partial h_j} = 0 \text{ and } f_j \geq 0; \frac{\partial \boldsymbol{p}_j}{\partial f_j} \leq 0; f_j \frac{\partial \boldsymbol{p}_j}{\partial f_j} = 0 \qquad (17)$$

As long as the tariff is below that which eliminates arbitrage we have:

$$\frac{\partial \boldsymbol{p}_j}{\partial h_j} = [p - c_j] - [\frac{h_j + f_j}{2}]; \quad \text{and} \quad \frac{\partial \boldsymbol{p}_j}{\partial f_j} = [p^* - c_j] - [\frac{h_j + f_j}{2}]$$

Since $p = p^* + t > p^*$, the solution to (17) is $h_j = 2[p - c_j]$, $f_j = 0$, with $\boldsymbol{p}_j = h_j^2 / 2$.

The corresponding optimisation problem for the jth foreign firm

$$\max_{h_j^*, f_j^*} \boldsymbol{p}_j^* = [p - t - c_j^*]h_j^* + [p^* - c_j^*]f_j^*$$

yields equivalent first order conditions, with

$$\frac{\partial \boldsymbol{p}_j^*}{\partial h_j^*} = [p - t - c_j^*] - [\frac{h_j^* + f_j^*}{2}]; \quad \text{and} \quad \frac{\partial \boldsymbol{p}_j^*}{\partial f_j^*} = [p^* - c_j^*] - [\frac{h_j^* + f_j^*}{2}]$$

Since $p - t = p^*$ these two conditions are identical, giving solution

$h_j^* + f_j^* = x_j^* = 2[p^* - c_j^*]$, and $\pi_j^* = [x_j^*]^2/2$.

Thus profit maximisation yields an equilibrium which has home firms selling only in the home market, while foreign firms are indifferent as to where they sell (in the absence of transport costs).

In addition to changing total outputs, the tariff also shifts the distribution of any given output between demands in the two markets. In place of (11) we now have

$$D = \frac{A - A^* - t + \bar{X}}{2} \quad \text{and} \quad D^* = \frac{A^* - A + t + \bar{X}}{2} \tag{18}$$

The tariff tends to reduce consumption in the tariff-imposing country and raise it in the exporting country.

The implications of the tariff for equilibrium prices and mergers will depend on where firms are located. To illustrate the possibilities we consider four alternative allocations of firms between countries, each of which is consistent with the home country being an net importer both in free trade and after any merger.

[A] ***All firms are located in the exporting country.***

In this case there are no domestic firms to protect, but the tariff could be imposed for revenue-raising or terms of trade reasons. The equilibrium prices under the tariff are given by $p = \bar{p} + 7t/8$ and $p^* = \bar{p} - t/8$, where $\bar{p}$ is the "free trade" price determined above. In the absence of a domestic supply, the main impact of the tariff is to raise the price in the importing country. The output of firm j is given by $x_j = 2[p^* - c_j] = \bar{x}_j - t/4$, where $\bar{x}_j$ denotes the free trade output of the firm[22]. Each firm's total sales fall by the same absolute amount as a result of the tariff.

The implications of the tariff for proposed mergers then follow directly –i.e.

(1) no merger is proposed if $6\bar{x}_1 + 0.5t \leq 8\bar{x}_3$;

(2) merger {1,3}is the only profitable merger if $8\bar{x}_3 < 6\bar{x}_1 + 0.5t < 8\bar{x}_2$;

(3) (a) both mergers are profitable, and {1,3} is proposed if

$8\bar{x}_2 < 6\bar{x}_1 + 0.5t$ and $6\bar{x}_1 + 2t < 7[\bar{x}_2 + \bar{x}_3]$

(3) (b) both mergers are profitable, and {1,2} is proposed if

[22] Note that the discussion below assumes that $t < 4\bar{x}_3$, so that all firms will produce in the absence of a merger.

$8\bar{x}_2 < 6\bar{x}_1 + 0.5t$ and $6\bar{x}_1 + 2t > 7[\bar{x}_2 + \bar{x}_3]$.

Since firms' outputs are reduced in the same amount by the tariff, the accompanying fall in profits is proportionately larger the smaller is the firm. This increases the likelihood that either merger will be profitable, and therefore that some merger will be proposed (as shown by (1)). These changes in relative outputs imply corresponding changes in relative outside offers when both mergers are profitable, that make merger {1,2} more likely to be preferred at the margin, as shown by case (3). Although the profits of merged firm {1,2} fall by more than the profits of merged firm {1,3}, the profits of outside firm 2 from merger {1,3} also falls by more than the profits of outside firm 3 from merger {1,2}. The net result of these changes is that 2 become relatively more interested in participating in a merger. These outcomes are illustrated by the shifts of the boundary lines in Figure 2a. The no merger area (1) contracts. The areas where{1,3} is profitable (2+3a+3b) and where {1,2} is profitable (3a+3b) both expand. But the areas where {1,3} is proposed (2 and 3a) contracts, while the areas where {1,2} is proposed (3b) expands.

Thus when the tariff-imposing country is a "pure" importer (i.e. has no domestic industry), the imposition of the tariff makes it more likely that there will be some merger between exporting firms, thereby reducing the supply of imports. It also makes it more likely that this merger will involve the two largest exporting firms, thereby giving a larger merger-induced reduction in the supply of imports.

When we consider the effects of mergers on global welfare in this tariff distorted world economy, we must take into account that the tariff has distributional (shown by (18)) and revenue implications, in addition to its effects on outputs. Now total welfare is

$$\tilde{W} = \frac{D^2}{2} + tD + \frac{D^{*2}}{2} + \Pi$$

Here the first two terms represent home welfare (home consumer surplus plus tariff revenue), while the remaining terms give foreign welfare (foreign consumer surplus plus all the profits). As before, a merger reduces consumer surplus in both countries, but increases aggregate profits. Now it also reduces tariff revenue[23]. Proceeding as before we find

[23] One can show that the loss due to the fall in tariff revenue more than exceeds the "benefit" that the tariff has given by reducing the consumer surplus loss from the merger.

$$\Delta\tilde{W} = \frac{[X_m - X]}{4}\{X_m + X + 2t\} + \Pi_m - \Pi \qquad (19)$$

The direct effect of the tariff (i.e. other than through its indirect effects on outputs, and hence also profits) is to increase the absolute value of the first (negative) term.

To proceed further we need to consider specific mergers. Under merger {1,3}, equation (19) becomes

$$\Delta\tilde{W}(1,3) = \frac{x_3}{36}[6X - 25x_3 - 6t] \qquad (20)$$

Before we can compare this with (13), we need to take into account the influence of the tariff on outputs, which gives

$$\Delta\tilde{W}(1,3) = \frac{x_3}{36}[6\bar{X} - 25\bar{x}_3 - \frac{17t}{4}] \qquad (21)$$

For this merger to generate a welfare gain in the presence of the tariff would require that the smaller partner have an even smaller share of the market in free trade. The tariff therefore makes this merger less likely to be approved by a global competition authority. This is not the outcome one would have expected based only on consideration of the (indirect) effects of the tariff on relative outputs. The tariff reduces the market share of the smallest firm, which would tend to render this merger more likely to be welfare improving. However, the direct effects of the tariff on aggregate welfare (through redistributing demand and generating revenue) lead to additional adverse welfare effects of the merger (as shown in (20)), and these latter consequences dominate in the aggregate.

Similarly for merger {1,2}, whose welfare implications follow analogously. Thus both mergers are less likely to be approved in general under the tariff. Comparing their relative welfare effects, we find that

$$\Delta\tilde{W}(1,2) - \Delta\tilde{W}(1,3) = \frac{[\bar{x}_2 - \bar{x}_3]}{36}[25\bar{x}_1 - 19\bar{X} + 2t]$$

Thus merger {1,2}gives the larger welfare gain for a wider market share of firm 1.

These outcomes are shown in Figure 2b. Area A, where neither merger would raise welfare is larger under the tariff. The areas where merger {1,3} would raise welfare (B+Ca+Cb) and the areas where merger {1,2}would raise welfare (Ca+Cb) both contract as a result of the tariff. However if both mergers are welfare improving the likelihood that {1,2} is preferred is increased (area Cb expands).

[B] ***The smallest firm is located in the importing country*****.**

An issue of interest here is whether the tariff "protects" domestic output, not only in the sense of raising the domestic firm's output (and profits) when it operates, but also in the sense of making it less likely to be "merged" with a foreign firm. Equilibrium prices under the tariff are given by $p = \bar{p} + 5t/8$ and $p^* = \bar{p} - 3t/8$, and outputs for the home and foreign firms respectively, by $h_3 = \bar{x}_3 + 5t/4$ and $x_j = \bar{x}_j - 3t/4$ (j=1,2)[24]. The home firm's output (and profits) rise as a result of the tariff, the foreign firms' outputs (and profits) fall.

The implications of the tariff for proposed mergers are again straightforward:

(1) no merger is proposed if $6\bar{x}_1 - 14.5t \le 8\bar{x}_3$;

(2) merger {1,3}is the only profitable merger if $8\bar{x}_3 < 6\bar{x}_1 - 14.5t < 8\bar{x}_2 - 16t$;

(3) (a) both mergers are profitable, and {1,3} is proposed if

$8\bar{x}_2 < 6\bar{x}_1 + 1.5t$ and $6\bar{x}_1 - 8t < 7[\bar{x}_2 + \bar{x}_3]$

(3) (b) both mergers are profitable, and {1,2} is proposed if

$8\bar{x}_2 < 6\bar{x}_1 + 1.5t$ and $6\bar{x}_1 - 8t > 7[\bar{x}_2 + \bar{x}_3]$.

The likelihood that some merger is proposed falls (area 1 expands in Figure 3a), and we now have the possibility that merger {1,2} is profitable while merger {1,3} is not (the shaded area)[25]. The likelihood that merger {1,3} alone is profitable contracts (case (2)), while the likelihood that both mergers are profitable expands (case (3)). An interesting feature is that the likelihood that merger {1,3} is preferred when both mergers are profitable (case (3a)) has increased. Both merged firms have lower profits, and the gain to outside firm 2 from merger {1,3} falls, while the gain to outside firm 3 from merger {1,2} rises. This would tend to suggest that firm 3 would become relatively less interested in a merger, however the fall in profits to merged

[24] In order to keep all firms producing in the absence of the merger, we assume that $t < 4\bar{x}_2/3$. We also assume that $t < c_3 - c_1$ (or equivalently that $t < \bar{x}_3 - \bar{x}_1$), so that, if merger {1,3] occurs, the merged firm does not face a "tariff-jumping" incentive to continue production using firm 3's technology for the home market.

[25] If the tariff has made firm 3 larger than firm 2 and $8x_2 < 6x_1 < 8h_3$. This requires that all outputs are quite similar in free trade, so that $8\bar{x}_2 < 6\bar{x}_1 - 1.5t < 8\bar{x}_3 + 16t$.

firm {1,2} is sufficiently large that firm 3 makes a relatively stronger offer at the margin.

Does the tariff "protect" the domestic output from disappearing in a merger? The answer may well be negative. While the likelihood of merger {1,3} is reduced at the margin where it is the only profitable merger, it is increased at the margin where both are profitable (i.e. in Figure 3a, 2 contracts but 3a expands).

The welfare effects of mergers in this case follow fairly directly from [A], except that the change in the domestic output of the tariff-imposing country has an impact on the implications of the merger for tariff revenue. Now the change in global welfare from a merger can be represented by

$$\Delta\tilde{W} = \frac{[X_m - X]}{4}\{X_m + X + 2t\} + \Pi_m - \Pi - t[h_3^m - h_3]$$

Merger {1,3} will see the cessation of domestic production and hence a boost to tariff revenue. The change in global welfare is

$$\Delta\tilde{W}(1,3) = \frac{h_3}{36}[6X - 25h_3 + 30t] \qquad (22)$$

We observe that the direct effect of the tariff is positive in this case, because of the boost this merger gives to tariff revenue. However, once we take into account the influence of the tariff on outputs, we find

$$\Delta\tilde{W}(1,3) = \frac{h_3}{36}[6\bar{X} - 25\bar{x}_3 - \frac{11t}{4}] \qquad (23)$$

Overall, the indirect effects of the tariff in increasing the market share of the smallest firm dominate the direct effects, and, as in the previous case, the tariff makes this merger less likely to be welfare improving.

The alternative merger will raise domestic production and hence have a negative impact on tariff revenue. The change in global welfare is given by

$$\Delta\tilde{W}(1,2) = \frac{x_2}{36}[6X - 25x_2 - 18t]$$

the direct effect of the tariff is negative. Once we take into account its indirect effects through the outputs (reducing the pre-merger share of firm 2 in particular), we find

$$\Delta\tilde{W}(1,2) = \frac{x_2}{36}[6\bar{X} - 25\bar{x}_2 - \frac{3t}{4}]$$

This merger is also less likely to be welfare improving. Thus both mergers are less likely to be approved in general under the tariff, as shown by the contraction in areas

B+Ca+Cb and Ca+Cb in Figure 3b. Comparing the relative welfare effects of the two mergers under the tariff when both are welfare improving is less straightforward in this case because the outputs of the two alternative merger partners do not change by the same magnitude. However, one can show that the (free trade) output combinations that would give each merger the same welfare change in free trade would give a relatively lower welfare gain from {1,2} under the tariff. Thus the likelihood of merger {1,2} being preferred is reduced by the tariff.

[C] ***The intermediate firm is located in the importing country.***

This case is very similar to [B], with firm 2 behind the tariff wall rather than firm 3. Equilibrium prices are as in [B], with firm 2's output increasing. The implications of for proposed mergers are:

(1) no merger is proposed if $6\bar{x}_1 + 1.5t \le 8\bar{x}_3$;

(2) merger {1,3}is the only profitable merger if $8\bar{x}_3 < 6\bar{x}_1 + 1.5t < 8\bar{x}_2 + 16t$;

(3) (a) both mergers are profitable, and {1,3} is proposed if

$8\bar{x}_2 < 6\bar{x}_1 - 14.5t$ and $6\bar{x}_1 - 8t < 7[\bar{x}_2 + \bar{x}_3]$

(3) (b) both mergers are profitable, and {1,2} is proposed if

$8\bar{x}_2 < 6\bar{x}_1 - 14.5t$ and $6\bar{x}_1 - 8t > 7[\bar{x}_2 + \bar{x}_3]$.

Considering profitability alone, the area where merger {1,3} is profitable expands, while the area where merger {1,2} is profitable contracts. The merger between the two exporting firms is more likely under the tariff (2+3a expands in figure 4a), while the merger involving the import-competing firm is less likely (3b contracts).

The welfare effects of mergers also follow fairly directly from [B]. Merger {1,3} will expand domestic production and hence reduce tariff revenue. The change in global welfare is

$$\Delta\tilde{W}(1,3) = \frac{x_3}{36}[6X - 25x_3 - 18t]$$

and the tariff has a negative direct effect. This is reduced, but not reversed, once we take into account the influence of the tariff on outputs

$$\Delta\tilde{W}(1,3) = \frac{x_3}{36}[6\bar{X} - 25\bar{x}_3 - \frac{3t}{4}]$$

The tariff makes this merger less likely to be welfare improving.

The alternative merger {1,2}, will reduce domestic production and hence boost tariff revenue. The change in global welfare is given by

$$\Delta\tilde{W}(1,2) = \frac{h_2}{36}[6X - 25h_2 + 30t]$$

the direct effect is positive, but once we take into account the indirect effects we find

$$\Delta\tilde{W}(1,2) = \frac{h_2}{36}[6\bar{X} - 25\bar{x}_2 - \frac{11t}{4}]$$

Thus both mergers are less likely to be welfare improving under the tariff. Comparing the relative welfare effects of the two mergers under the tariff is complicated for the same reasons as in case [B]. However, one can show that the (free trade) output combinations that would give each merger the same welfare change in free trade would give a relatively higher welfare gain from {1,2} under the tariff. Thus the likelihood of merger {1,2} being preferred is raised by the tariff (area Cb expands in Figure 4b).

[D] ***Only the largest firm is exporting*****.**

The issue of interest here is the effects of the tariff on the relative "protection" given to the two firms located in the tariff-imposing country. Equilibrium prices and outputs are $p = \bar{p} + 3t/8$ and $p^* = \bar{p} - 5t/8$, $h_j = \bar{x}_j + 3t/4$ (j = 2, 3) and $x_1 = \bar{x}_1 - 5t/4$ [26]. The implications of the tariff for proposed mergers are:

(1) no merger is proposed if $6\bar{x}_1 - 13.5t \le 8\bar{x}_3$;

(2) merger {1,3}is the only profitable merger if $8\bar{x}_3 < 6\bar{x}_1 - 13.5t < 8\bar{x}_2$;

(3) (a) both mergers are profitable, and {1,3} is proposed if

$8\bar{x}_2 < 6\bar{x}_1 - 13.5t$ and $6\bar{x}_1 - 18t < 7[\bar{x}_2 + \bar{x}_3]$

(3) (b) both mergers are profitable, and {1,2} is proposed if

$8\bar{x}_2 < 6\bar{x}_1 - 13.5t$ and $6\bar{x}_1 - 18t > 7[\bar{x}_2 + \bar{x}_3]$.

The outputs of both domestic firms are increased in the same amount by the tariff. This reduces the profitability of both mergers at the margin (cases (1) and (3)), making the likelihood that some merger is proposed lower (area 1 expands in Figure 5a). Moreover, the likelihood that {1,2} is the preferred merger (area 3b) falls. This time the tariff reduces the profits of both merged firms, and increases the gains from

being the outsider to both firms 2 and 3. But the fall in profits is larger for merged firm {1,2} and the gain from being the outsider increases more for firm 2. Thus firm 2 is relatively less interested in participating in a merger. Because of this effect, we can conclude that while a merger is less likely, the likelihood that merger {1,3} is proposed may rise or fall as a result of the tariff (areas 2+3a may expand or contract in Figure 5a).

The global welfare effects of mergers require only slight modification to previous cases. Now

$$\Delta\tilde{W} = \frac{[X_m - X]}{4}\{X_m + X + 2t\} + \Pi_m - \Pi - t\{[h_2^m + h_3^m] - [h_2 + h_3]\}$$

Either merger sees one home firm cease production, which tends to raise tariff revenue. The welfare effects of merger {1,3} are

$$\Delta\tilde{W}(1,3) = \frac{h_3}{36}[6X - 25h_3 + 18t]$$

which again reflects a positive direct effect of the tariff, which is reduced, but in this case not reversed, by the indirect effect, since

$$\Delta\tilde{W}(1,3) = \frac{h_3}{36}[6\bar{X} - 25\bar{x}_3 + \frac{3t}{4}]$$

The tariff makes this merger more likely to be welfare improving (area B+Ca+Cb expands in Figure 5b). The benefits of reducing the tariff-distorted domestic output outweigh the costs of removing a larger share of output from the market. Analogous arguments and results apply for merger {1,2}. It also is more likely to be welfare improving (area Ca+Cb expands).

Comparing the relative welfare changes of the two mergers is relatively straightforward since both alternative closing partners are affected symmetrically. Thus

$$\Delta\tilde{W}(1,2) - \Delta\tilde{W}(1,3) = \frac{[\bar{x}_2 - \bar{x}_3]}{36}[25\bar{x}_1 - 19\bar{X} - 6t]$$

Compared with free trade, merger {1,2} is less likely to give a larger welfare gain (area Cb contracts) Hence we conclude that merger {1,3} is more likely to be preferred.

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[26] Note that in this case the tariff raises world output. Again we assume that $t < \bar{x}_2 - \bar{x}_1$, so that either merger sees the domestic partner cease production.

The relevant features of the results for all of these cases are presented in Table 1 and are summarised in the next section.

IV Conclusions

This paper set out to investigate the implications of tariffs for endogenous mergers in an integrated world economy. A simple partial equilibrium model of Cournot oligopolists with different technologies was used to illustrate issues. Conditions for each merger to be profitable to participants and stable to offers from the outside firm were derived in the free trade equilibrium. Conditions under which a global competition authority would approve each merger, and when it would prefer one merger over the another, were also derived for this case.

The model was then extended to include a tariff. If one (the importing) country had a small tariff in place, its firms found it profitable to sell only in their home market, and the firms in the other (exporting) country received the same (net) price wherever they sold. We then looked at the effects of the tariff on merger proposals and approvals in four cases, which captured the range of possible outcomes in this model. The tariff introduces a further distortion into an already distorted (by imperfect competition) market, and introduced a revenue term into the welfare calculations. While the influence of the tariff on merger proposals could be determined straightforwardly from its influence on firm outputs, the tariff had additional (direct) affects on the welfare consequences of any merger.

Are mergers more likely to occur in the tariff-distorted global economy? This depends on where the least efficient firm is located. A merger is less likely if this firm is protected by the tariff, and more likely if it is not. So, *at this margin*, the tariff "protects" an inefficient import-competing firm, both in terms of increasing its output while producing and of reducing the likelihood that it will close down through merger (the profits of the owners are increased in each case of course). Conversely the tariff "harms" an inefficient exporting firm by reducing its output when producing and raising the probability that it will close down through merger.

How does the tariff affect which merger is likely to be proposed? From the Table we see that the answer depends on whether the tariff has a "protective" role. Merger {1,2} is less likely to be proposed as long as at least one firm is located in the protected market, and in these circumstances there is a (weak) presumption that

merger {1,3} is more likely to be proposed. The opposite is true when all firms are exporting.

How is a global competition authority likely to respond? Considering mergers individually, the competition authority is less likely to approve either merger under the tariff, unless there is more than one import-competing firm. This reflects the direct effects of the distortion created by the tariff. The tariff reduces total output in all cases except where the majority of firms are behind the tariff wall, and in that case the expansion of total output comes at the expense of the output of the most efficient firm. Considering mergers together, there is a (weak) presumption that the merger that closes the least efficient firm is more likely to be preferred if that firm is protected by the tariff, and less likely to be preferred otherwise. The merger that closes the intermediate firm is less likely to be preferred where the least efficient firm is protected, and more likely to be preferred otherwise.

While this tells us the impact of the merger on global welfare, it is important to note that in practice merger (dis)approvals are determined by national competition authorities and not by a global authority. It is reasonable to expect that national authorities will be primarily concerned with the effects of any proposed merger on national welfare. A merger that raises global welfare must improve the national welfare of at least one of the two countries, but not necessarily both. The distribution of national welfare depends on the distribution of demand, the location of firm ownership and the distribution of the gains from mergers between the merging parties. These are topics for future investigation. .

Table 1: **Summary of Outcomes**

	HOME		FIRMS	
	None [A]	Firm 3 [B]	Firm 2 [C]	Firms 2 and 3 [D]
Profitability:				
Merger {1,3}	More likely	Less likely	More likely	Less likely
Merger {1,2}	More likely	More likely	Less likely	Less likely
Proposed:				
Merger {1,3}	Less Likely	?	More likely	?
Merger {1,2}	More likely	Less Likely	Less Likely	Less Likely
Welfare Gain:				
Merger {1,3}	Less likely	Less likely	Less likely	More likely
Merger {1,2}	Less likely	Less likely	Less likely	More likely
Preferred:				
Merger {1,3}	Less likely	?	Less likely	More likely
Merger {1,2}	More likely	Less likely	More likely	Less likely

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Figure 1a: Merger Preferences in Free Trade

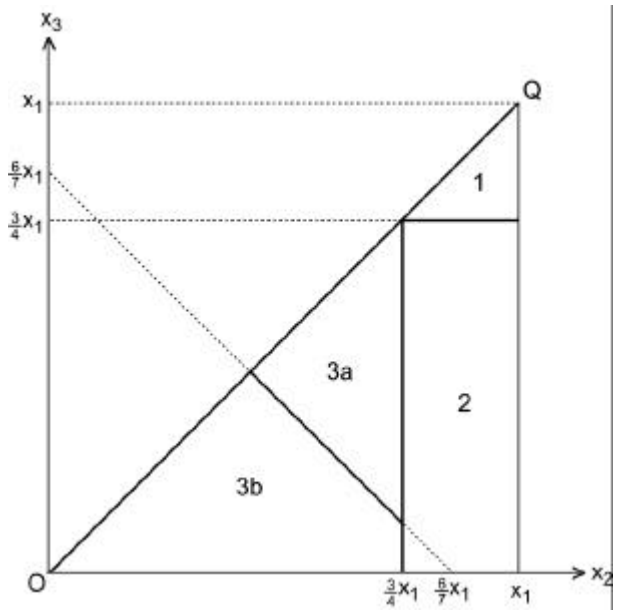

Figure 1b: Merger Approvals in Free Trade

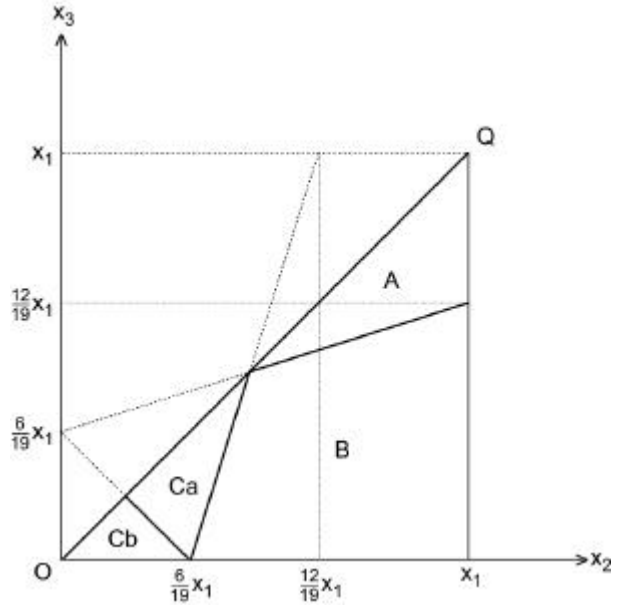

Figure 2a: Case [A] Merger Preferences

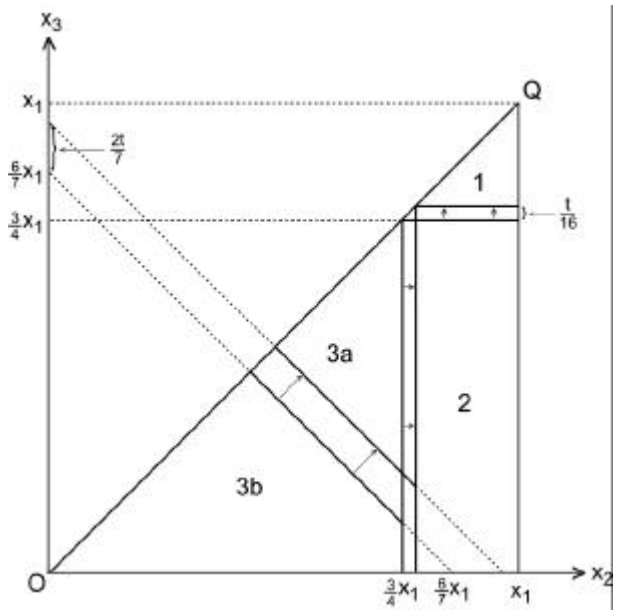

Figure 2b: Case [A] Merger Approvals

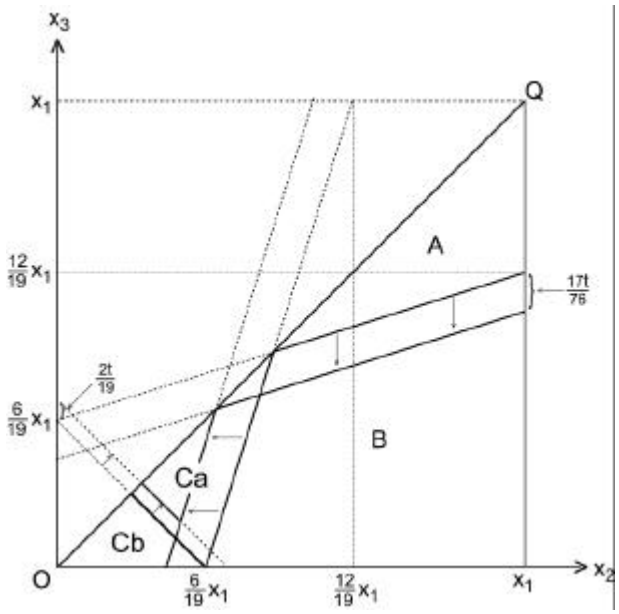

Figure 3a: Case [B] Merger Preferences

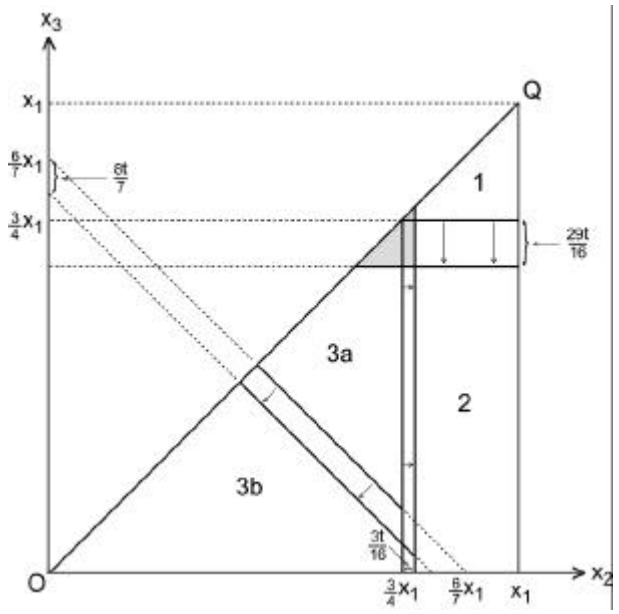

Figure 3b: Case [B] Merger Approvals

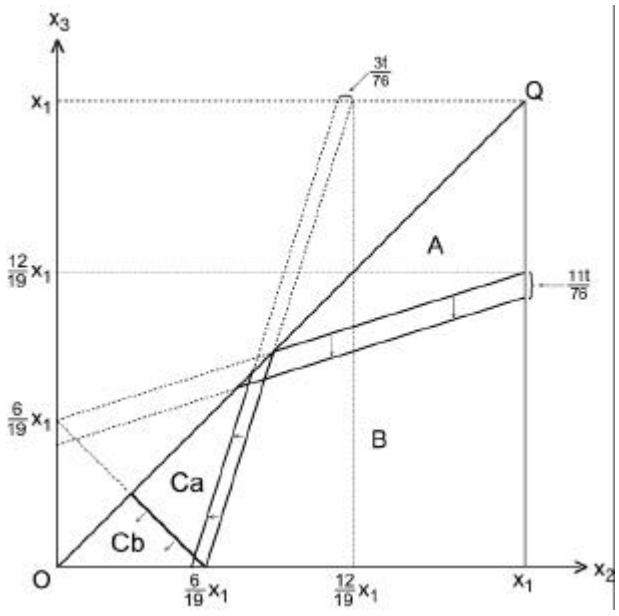

Figure 4a: Case [C] Merger Preferences

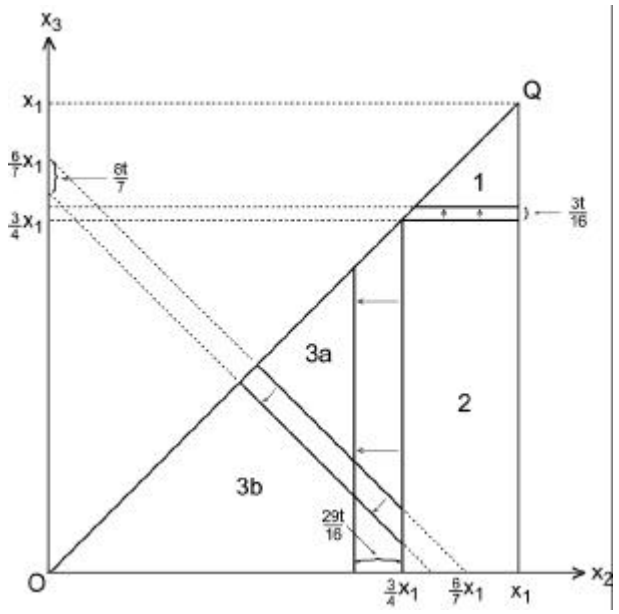

Figure 4b: Case [C] Merger Approvals

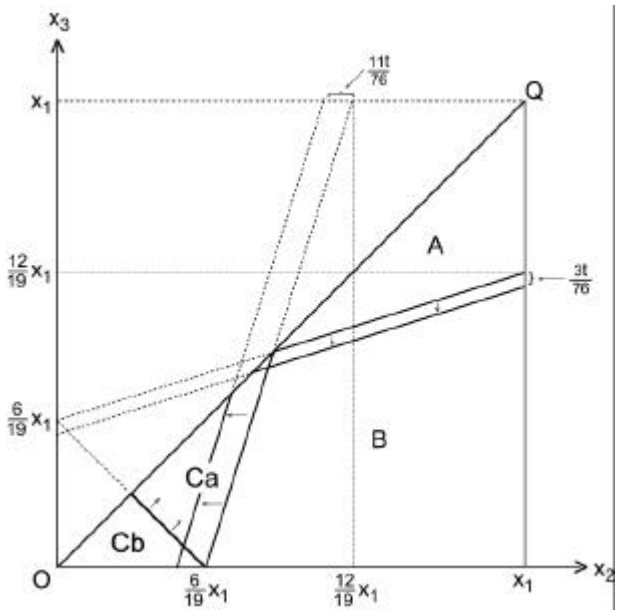

Figure 5a: Case [D] Merger Preferences

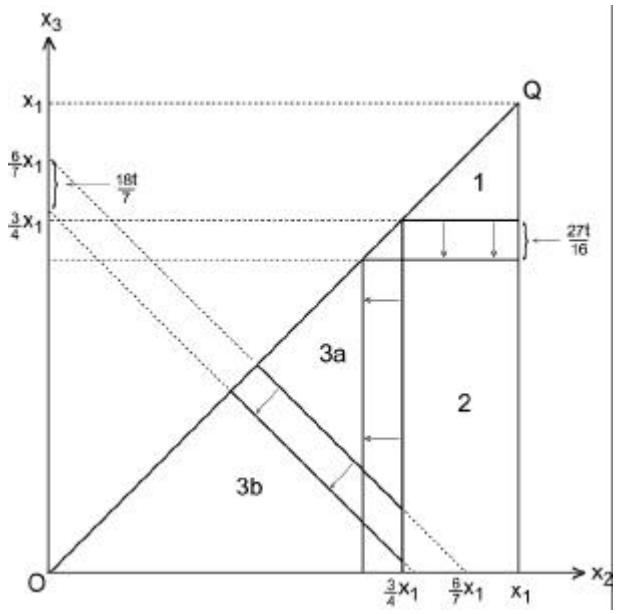

Figure 5b: Case [D] Merger Approvals