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Mergers in Open Economies

by

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Abstract

This paper explores the problems of merger policy in open economies, using a simple model of the market for a homogeneous product in which firms are Cournot competitors and differ in their unit costs. Mergers can take place within or across national boundaries, and may raise or lower global welfare. Their approval by national competition authorities will depend on their separate national welfare effects, however, which can lead to biases against socially desirable international mergers.

Outline

1. Introduction
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3. An Integrated World Market
4. Trade Policy: Segmented Markets
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1 Introduction

The objective of this paper is to explore the problems of merger policy in open economies. There now exists a considerable literature on mergers[1], some of it dealing with mergers between firms located in different political jurisdictions. International mergers raise the issue of co-ordination between competition authorities. Will authorities in one jurisdiction approve (or reject) a merger whose benefits (costs) to that jurisdiction are outweighed by costs (benefits) elsewhere. Should there be an international agreement establishing common rules for merger approval? Or should a world merger authority be established, and if so how should it operate?

Here we investigate these questions through a simple model designed to illustrate the issues involved. The model is 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. Unspecified barriers to entry allow the existence of economic profits in equilibrium. This allows for relatively simple solutions where the effects of discrete changes in the number of firms can be considered. In such a world the socially optimal outcome would have the most efficient (lowest cost) firm producing all the output and selling it at marginal cost. In practice there are then two distortions in the market – the inefficiency of the other firms and the imperfect competition that lets them survive.

As Lahiri and Ono (1988) have shown, in such circumstances 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, but this requires that the merger is also profitable to the participants[2]. The framework developed below is capable of generating all the relevant cases: (a) a merger that is both privately profitable and socially desirable; (b) a merger that is privately profitable but socially undesirable; and (c) a merger that would be socially desirable but is privately unprofitable. We are then able to consider how national competition authorities might react in each case.

[1] See Horn and Levinsohn (1997) for a review of the literature investigating the links between trade policy and competition policy.

[2] An alternative approach is to model merger policy as in effect determining the number of (often identical) firms in a market, without going into details of how this is achieved. Bliss (1996), Richardson (1996) and Lloyd (1997) are examples.

We begin by considering a closed economy in order to illustrate the conditions for the merger to be privately profitable and socially desirable, before introducing the complexities of international exchange. When more than one country is involved, the conditions derived for the closed economy apply only at the aggregate (world) level. Where mergers require approval at the national level it is their impact on national welfare that is relevant. Section III considers the welfare implications of mergers between firms in the same country (national mergers) and in different countries (international mergers). Potential conflicts between national welfare and world welfare as criteria for merger approval are highlighted. Section IV then turns to the effects of trade liberalisation on the incentives to merge. The final section presents a summary.

2 The Closed Economy

Consider an economy in which a small number ($n \geq 3$) of firms produce a homogeneous product. Each firm (j) faces constant unit costs (c_j) and no fixed costs[3]. Unit costs differ across firms with $c_k > c_j$ if $k > j$. Competition in this market is assumed to be Cournot[4]. Total demand is given by

$$D = A - p \tag{1}$$

where A is a positive constant, and p is price. Firm j therefore chooses its output (x_j) to

$$\max \pi_j = [p - c_j].x_j \text{ ;taking } dp/dx_j = -1.$$

Solving the first order conditions for optimal firm output, summing these to obtain total output (X), and then substituting in (1), gives the equilibrium values:

$$p = \frac{A+C}{n+1}; x_j = p - c_j; \pi_j = [p - c_j]^2 = x_j^2 \tag{2}$$

where $C = \sum_{j=1}^{n} c_j$. Total benefits (W) from this market is the sum of consumer surplus (CS) and firm profits (Π)

[3] The initial number of firms is assumed to be exogenous. Reduction in fixed costs provides an additional incentive for mergers, and could be included by modifying the "Gain" term below.

[4] Note that mergers are generally unprofitable in a Cournot oligopoly of identical firms, except where duopolists combine to form a monopoly (Salant *et al*. 1983). Our assumption that $n \geq 3$ ensures that the merged firm does not become a monopolist.

$$W = CS + \sum_j \pi_j = \frac{D^2}{2} + \sum_{j=1}^{n} x_j^2 \qquad (3)$$

Now suppose two firms in this market (k and j) merge – i.e. they become a single decision making unit. Given that $c_k > c_j$, and the merger itself 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. The new market equilibrium is simply that which would obtain in the absence of firm k[5]. Total output falls, the market price rises, the profits of the remaining firms rise and consumer surplus falls[6]. Consumers lose from the merger, and non-participating producers gain. The incentive to merge in this case is just the additional profits that may accrue to the merged firm as a result of the higher price (even though its output is less than the combined initial outputs of the partners). But mergers are not purely anti-competitive in their effects here. Production is rationalised so that mergers may also be socially beneficial.

To illustrate, consider the effects of a merger between firm 1 (that with the most efficient technology) and firm n (that with the least efficient). As will be shown below, this is the most profitable of the potential mergers. The new post-merger equilibrium (whose variables are denoted by sub- or super-script m, and with $\Delta p = p_m - p$ etc.) has

$$\Delta p = \frac{x_n}{n}; \quad \Delta x_j = \frac{x_n}{n}, \; j = 1,..n-1; \quad \Delta D = \Delta X = -\frac{x_n}{n} \qquad (4)$$

The departure of firm n from the market results in an increase in the output of each of the remaining (n-1) firms. Given our assumptions of linearity and constant marginal costs, in this case their outputs rise by the same absolute amount, which is one nth of the departing firm's original output. Since only n-1 firms remain, total output falls (by x_n/n), and price rises (also by x_n/n).

The change in profits of firm j ($j \neq n$) is given by

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[5] This type of merger is sometimes referred to as a "lockup". As we shall see, in the closed economy the post-merger equilibrium in this model depends only on the identity of the departing firm, and not on the identity of *both* participants to the merger. There is a parallel literature where firms are assumed to possess an asset in fixed supply to the industry, and where the merged firm's acquisition of the assets of its constituents determines the level of its marginal cost. In this way the identity of all participants in the merger will affect the post-merger equilibrium. See Perry and Porter (1985).

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

$$\Delta\pi_j = \Delta p.x_j + [p_m - c_j]\frac{x_n}{n}$$

which is the increased profits on the firm's original output plus the profits from its increased output. This can be rearranged to give

$$\Delta\pi_j = \Delta p.x_j^m + [p - c_n]\frac{x_n}{n} + [c_n - c_j]\frac{x_n}{n}$$

In this expression the first two terms are transfers (from consumers and profits from departing firm n respectively), while the third term is the increased profit resulting from the greater efficiency of this firm relative to firm n. Only this last term represents a social gain. Substituting from (4)

$$\Delta\pi_j = \frac{x_n}{n}[2x_j + \frac{x_n}{n}] = 2.\Delta p.\bar{x}_j > 0$$

where $\bar{y} = [y + y^m]/2$ denotes the average of the pre- and post-merger values of any variable y. Given x_n, the largest (most efficient) firm has the greatest increase in profits and hence the greatest incentive to initiate a merger.

This merger will have been profitable for the participants only if the *Gain* (G) is positive – i.e.

$$G = \Delta\pi_1 - \pi_n = \Delta p.x_1^m + [c_n - c_1]\frac{x_n}{n} - [p - c_n][n-1]\frac{x_n}{n} > 0$$

The increase in profits to firm 1 (from the price increase and the efficiency gain) must exceed the lost profits on the reduction in output of the merged firm. Substituting from (4)

$$G = 2.\Delta p.[\bar{x}_1 - x_n\frac{n}{2}] = 2.\Delta p.[x_1 - x_n g(n)] \qquad (5)$$

where $g(n) = \frac{n}{2} - \frac{1}{2n}$, and in the relevant range ($n \geq 3$), $g > 0, g' > 0$, and $g \to \frac{n}{2}$ from below.

Equation (5)[7] provides a condition on relative firm sizes (or relative shares of output) for a profitable merger

$$\frac{x_1}{x_n} > g(n) \qquad (6)$$

Given x_n, the larger is the number of firms the smaller the increase in output for the partner (and every other) firm and the smaller the price increase. Hence the larger the required initial output of the partner if the merger is to yield a net gain. In this type of model we therefore expect mergers to involve large and small firms; the largest and the smallest firms in particular.

The change in aggregate benefits (ΔW) as a result of the departure of the least efficient firm due to the merger can be derived from equations (3) and (4). Again, the objective here is to identify the individual components of this change, so that we can see later what determines their distribution across countries in the open market. The change in consumer surplus has two components, both familiar and both negative

$$\Delta CS = -\Delta p.D_m + \Delta p.\frac{\Delta D}{2}$$

The first term is the *transfer* from consumers to firms as a result of the price rise, and the second term is the consumption *deadweight loss*. Substituting from (4) gives an explicit solution in this case

$$\Delta CS = -\frac{x_n}{n}[D_m + \frac{x_n}{2n}] = -\Delta p.\overline{D} < 0 \qquad (7)$$

The larger is x_n the larger the consumer surplus loss[8]. The change in total profits is

$$\Delta\Pi = G + \sum_{j=2}^{n-1} \Delta\pi_j$$

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[7] As noted, $\frac{\partial G}{\partial x_1} = \frac{x_n}{n} > 0$, while $\frac{\partial G}{\partial x_n} = \frac{x_n}{n}[\frac{x_1}{x_n} - 2g(n)] \gtrless 0$.

[8] $\frac{d\Delta CS}{dx_n} = -\frac{D}{n} < 0$

A net gain to the merging firms (G > 0), is sufficient for total profits to increase (since $\Delta\pi_j > 0$; j + 2,..,n-1). The overall change in profits has three components

$$\Delta\Pi = \Delta p.X_m + \sum_{j=1}^{n-1} \frac{x_n}{n}[c_n - c_j] + [p - c_n]\Delta X$$

The first term is the *transfer* from consumers and the second term is the *efficiency gain* from redistributing output from firm n to lower cost firms.[9] Both these terms are positive. The final term captures the *lost profit* on the discontinued output. Substituting from (4) allows us to write

$$\Delta\Pi = \frac{x_n}{n} X_m + \frac{x_n}{n}[X - nx_n] - x_n[\frac{x_n}{n}] \quad = \Delta p\{2\overline{X} - x_n[1+n]\} \tag{8}$$

The change in total welfare is then

$$\Delta W = \Delta p[X_m - D_m] + \Delta p \frac{\Delta D}{2} + [p - c_n]\Delta X + \frac{x_n}{n}[X - nx_n]$$

The first term (the net transfer) is zero, the second term (the consumption deadweight loss) is negative, as is the third term (the lost profits). Only the final term (the efficiency gain) is positive. These are the general welfare effects that a competition authority would have to weigh up when deciding whether to allow the merger to proceed. In the specific model used here, substitution from (7) and (8) gives

$$\Delta W = \Delta p\{\overline{X} - x_n[1+n]\} = \Delta p.[X - x_n b(n)], \tag{9}$$

where $b(n) = 1 + n + \frac{1}{2n}$ and in the relevant range (i.e. n ≥ 3), $b(n) > n + 1$, and $b' > 0$.

Equation (9) provides the competition authority with a simple condition for welfare improvement that depends only on the share of the departing firm (S_n) and the number of firms – i.e.

[9] Recall that each of the remaining firms increases its output by x_n/n. The reduction in the total cost of producing this output is then

$$\Delta TC = \sum_{j=1}^{n-1} \frac{x_n}{n}[c_n - c_j] = \frac{x_n}{n}[nc_n - \sum_{j=1}^{n} c_j] = \frac{x_n}{n}\{\sum_{j=1}^{n}[p - c_j] - n[p - c_n]\} = \frac{x_n}{n}[X - nx_n]$$

$$\Delta W \gtrless 0 \text{ as } S_n \lessgtr \frac{1}{b(n)} \qquad (10)^{10}$$

As Lahiri and Ono (1988) have pointed out, in an oligopoly with different technologies, the elimination of a minor firm has two opposing effects on welfare. It improves average efficiency but at the same time creates a more oligopolistic market structure. Provided the market share of the minor firm is not too large, net welfare can increase as a consequence of its departure[11].

3 An Integrated World Market

We now suppose the world market is composed of two countries (home and foreign), both similar to the closed economy considered above, and where foreign variables are denoted with an asterisk. Market clearing requires

$$X + X^* = D + D^* = A + A^* - 2p$$

which, with $\frac{dp}{dx_j} = \frac{dp}{dx_j^*} = -\frac{1}{2}$, yields equilibrium solutions

$$\begin{aligned} &p = \frac{\bar{A} + C + C^*}{N+1}; x_j = 2[p - c_j]; x_j^* = 2[p - c_j^*]; \\ &\pi_j = \frac{x_j^2}{2}; \pi_j^* = \frac{[x_j^*]^2}{2} \end{aligned} \qquad (12)$$

where $\bar{A} = \frac{A + A^*}{2}$, and $N = n + n^*$. Total benefits are the sum of national benefits, and can be written as

$$B = W + W^* = CS + \sum_{j=1}^{n} \pi_j + CS^* + \sum_{j=1}^{n^*} \pi_j^*$$

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[10] Alternatively, one can follow Farrell and Shapiro (1990) and focus on the impact of the merger on the welfare of non-participants (consumers and other firms). Letting subscript o denote these outsiders, then $\Delta W_O = \Delta CS + \sum_{j=2}^{n-1} \Delta \pi_j = \frac{x_n}{N}\{X_O - [x_1 + x_n] + [2n-3]\frac{x_n}{2n}\}$. Assuming that the merger benefits the participants, then, as Farrell and Shapiro's results imply, a sufficient condition for total welfare to increase is that the initial output of the participants ($x_1 + x_n$) be less than the initial output of the non-participants (X_o).

[11] If n=2, the merged firm is a monopolist. Then $G = \frac{x_2}{2}[2x_1 - \frac{3}{2}x_2] > 0$, and $\Delta W = \frac{x_2}{2}[x_1 - 3x_2]$, so that even the formation of a monopoly in this way can be welfare improving, if the larger firm is at least three times the size of the smaller.

Again the most profitable merger will be between the most efficient and the least efficient firms. We therefore consider the effects on this equilibrium of a merger between home firm n and some other firm (which will be taken to be either home firm 1 or foreign firm 1 below). The new equilibrium values (notation as before) are now:

$$\Delta p = \frac{x_n}{2N}; \Delta x_j = \Delta x_j^* = \frac{x_n}{N}; \Delta D = \Delta D^* = -\frac{x_n}{2N}; \Delta X = -[n^* + 1]\frac{x_n}{N}; \Delta X^* = n^* \frac{x_n}{N} \quad (13)$$

World demand and output fall by x_n/N as before (distributed as an equal fall in consumption in both countries). The output of each remaining firm increases by x_n/N, which implies a fall in total home output (of $[n^* + 1]\frac{x_n}{N}$) and a rise in foreign output (of $n^* \frac{x_n}{N}$).

The condition for a profitable merger corresponds to that derived in the closed economy - i.e.

$$G = \frac{x_n}{N}[x_p - x_n g(N)] \quad (14)$$

where g( ) is as defined by (5), and x_p represents the output of the partner firm.

In discussing the welfare effects of this merger, we must now consider not only the change in aggregate (world) welfare, but also the changes in welfare in the two countries individually. Where mergers must be approved by individual competition authorities, it is primarily the changes in the relevant components of national welfare that will determine the outcome. Here we assume that harmonisation of merger policies has proceeded at least to the point where W and W* are the relevant criteria[12]. The country of origin of the other merging firm is also important. We consider the two cases separately.

[A] A National Merger

In this case both merging firms are from the same (home) country. We derive the welfare effects of the merger as above, to highlight how costs and benefits are distributed across countries.

The changes in consumer surplus are composed of the transfers to producers and consumption deadweight losses as before – i.e.

[12] See Richardson (1996) and Lloyd (1998) for further discussion on harmonisation.

$$\Delta CS = -\Delta p.D_m + \Delta p.\frac{\Delta D}{2} = -\Delta p.\overline{D}$$

$$\Delta CS^* = -\Delta p.D_m^* + \Delta p.\frac{\Delta D^*}{2} = -\Delta p.\overline{D}^*$$

The change in total home firm profits is the transfer from consumers to home firms plus the efficiency gain on output redistributed from firm n to other home firms, minus lost profit on discontinued home output (some of which has been redistributed to foreign firms) – i.e.

$$\Delta\Pi = \Delta p.X_m + \sum_{j=1}^{n-1}\frac{x_n}{N}[c_n - c_j] + [p - c_n]\Delta X = \Delta p.\{2\overline{X} - x_n[1+N]\}$$

The change in the total profits of foreign firms is the transfer from consumers to foreign firms, plus the efficiency gain on output redistributed from firm n to foreign firms[13], plus the transfer of profit on output redistributed to foreign firms

$$\Delta\Pi^* = \Delta p.X_m^* + \sum_{j=1}^{n^*}\frac{x_n}{N}[c_n - c_j^*] + [p - c_n]\Delta X^* = 2.\Delta p.\overline{X}^*$$

Combining these expressions, and letting $\overline{E}(= \overline{X} - \overline{D} = \overline{D}^* - \overline{X}^*)$ denote average home exports, the changes in national welfare in the two countries, and in global welfare are

$$\Delta W = \Delta p.\overline{E} + \Delta p\{\overline{X} - x_n[1+N]\} \quad (15A)$$

$$\Delta W^* = -\Delta p.\overline{E} + \Delta p\overline{X}^* \quad (15B)$$

$$\Delta B = \Delta W + \Delta W^* = \Delta p.\{\overline{X} + \overline{X}^* - x_n[1+N]\} \quad (15C)$$

Comparing these welfare changes, we note that the first terms in (15A) and (15B) represent *"terms of trade"* effects. These terms are redistributive in nature in that they do not generate a net change in welfare ands therefore do not appear in (15C). The terms of trade effect is positive (negative) for whichever country is the net exporter (importer) on average. The second terms in (15A) and (15B) indicate the distribution of the net welfare change between the two countries. This distribution depends on the average size of each country's

[13] Note that if some foreign firms are less efficient than home firm n the corresponding elements in this term will be negative.

industry, with the foreign (non-merger) country unambiguously gaining through this channel[14].

The change in aggregate welfare (15C), not surprisingly, corresponds exactly to equation (9). To determine the profitability of the merger and to assess its effects on world welfare one applies the criteria of the closed economy. Suppose both of these are met. Then an international competition authority that reviewed proposed (i.e. profitable) mergers on the basis of an aggregate welfare criterion would approve the merger. The complication introduced in a world of independent national competition policies, is that this purely national merger will be decided by the home competition authority alone, on the basis of its implications for home welfare. This raises the question of when (and whether) a decision made on the basis of the impact on home welfare will coincide with that made by an international competition authority. What factors might lead the home competition authority to reject (approve) a socially (un)desirable merger? Can the decision rules of national competition authorities be constrained in some relatively straightforward way to ensure consistency between the interests of the two countries?

One point that is clear is that it is not just the redistributive components that can create problems in achieving consistency between global and national objectives. Even if the terms of trade effects are negligible (i.e. $\overline{E} \approx 0$)[15] it is possible for the merger to yield a global welfare gain but a home welfare loss if

$$\overline{X} + \overline{X}^{*} > x_n.[1+N] > \overline{X}$$

Simply requiring that national competition authorities ignore international distribution effects is not a solution to the consistency problem.

If trade is roughly balanced on average, then the welfare effect in the home country is smaller than the aggregate welfare effect. Any national merger approved by the home competition authority will also be aggregate welfare improving, but this authority may

[14] These results are consistent with those in Collie (1997). His model has no intra-national cost differences among firms and consumption in only one country, but does allow for fixed costs and a more general demand specification. Under free trade, he finds that a merger in the consuming country will unambiguously increase the other country's welfare, and will only increase domestic welfare if fixed cost savings are high.

[15] $\overline{E} \approx 0$ implies $X - D \approx \frac{x_n}{4N}[2n^{*} + 1] > 0,$ so that in the initial equilibrium the home country is a net exporter, but the trade volume is less than the initial output of the closing firm.

disallow some profitable mergers that are aggregate (but not home) welfare improving. Where terms of trade effects are negligible, the other country unambiguously benefits from a national merger, and national competition authorities will be biased towards rejecting socially desirable mergers.

If the home country is a (significant) net importer (exporter) of this good then its terms of trade effect is negative (positive) and its competition authority will be more (less) likely to reject any proposed merger. We conclude that a net importer will be biased towards rejecting socially desirable national mergers, but that no prediction on bias can be made for a net exporter.

The same biases hold where the merger is privately profitable but socially undesirable. Here the concern is that a net exporter would approve such a merger if it were nationally beneficial. This would require a strong terms of trade effect that more than offsets the negative second term in (15A). If the objective of international monitoring is to achieve socially desirable mergers and to prevent socially undesirable mergers, then review of negative decisions by net importers and positive decisions by net exporters seems warranted[16].

[B] An International Merger

Where home firm n merges with foreign firm 1, the merger must be approved by *both* national competition authorities. Since $\Delta B = \Delta W + \Delta W^*$, if the merger is socially undesirable ($\Delta B < 0$), then it will make at least one country worse off and hence be rejected by that country's competition authority. More generally, a consensus approach that gives each relevant competition authority a veto over any merger will prevent mergers which are socially undesirable, but may exclude some that are socially desirable. Such an approach effectively applies the Pareto Principle – only mergers that make at least one country better off and no country worse off should proceed.

This case differs from that considered above in that the owners of the departing firm (home firm n) are assumed to receive a payment from their (foreign) partner of $\pi_n + \varepsilon,\ \varepsilon > 0$. The

[16] Barros and Cabral (1994) arrive at the same conclusions by considering only the "external effects" (i.e. effects on the non-participants) of a merger.

welfare effects are just as described above, except that now the foreign country carries the lost profits on discontinued output, part of which is redistributed to home firms. The changes in consumer surplus and the changes in profits are as before, except that $[p - c_n]x_n + \varepsilon$ must be added to the home profits and subtracted from the foreign. Net benefits are, of course, unchanged. Equations (15A) and (15B) are now replaced by

$$\Delta W = \Delta p.\overline{E} + \Delta p\{\overline{X} + x_n[N-1]\} + \varepsilon \qquad (16A)$$

$$\Delta W^* = -\Delta p.\overline{E} + \Delta p\{\overline{X}^* - x_n 2N\} - \varepsilon \qquad (16B)$$

Other things equal, home welfare is higher because the intra-partner transfer is now an international transfer. In a sense the two countries have reversed roles. In the absence of a significantly negative terms of trade effect, the home competition authority will approve the merger. If trade is approximately balanced, or the foreign country is a net importer, its competition authority will have a bias towards rejecting socially desirable mergers, while if it is a net exporter some socially undesirable mergers may be approved. The latter case is not of concern here, however, since the home country has a veto.

It is not clear whether the consideration of terms of trade effects makes a socially desirable outcome more or less likely. Suppose the second term in (16B) is negative, but the merger is socially desirable. Then if the foreign country is a net exporter it might still approve the merger. Alternatively if the second term in (16B) is positive (which implies the merger is also socially desirable), the foreign country could still reject the merger if it is a net importer.

4 Trade Policy: Segmented Markets

Suppose that the home country were to impose a small specific tariff of t per unit on imports of this product. This has the effect of separating the two markets, with all producers selling in each (depending on the height of the tariff). With constant marginal costs there are no production spillovers between markets, however. We begin this section by examining the effects of the tariff on the market equilibrium in the home country and derive its welfare effects. We then consider how the existence of a tariff affects the profitability of national and international mergers.

The tariff acts as a unit cost increase for foreign firms supplying the home market. Let p, p* denote prices in the two markets, and h_j, f_j (h_j^*, f_j^*) denote the sales of home (foreign) firm j in the home and foreign markets respectively. Market clearing then requires that

$$H + H^* = D = A - p; \quad F + F^* = D^* = A^* - p^*$$

where $H = \sum_{j=1} h_j$ etc. The profits of home and foreign firm j are given by

$$\pi_j = [p - c_j]h_j + [p^* - c_j]f_j : \ \pi_j^* = [p - c_j^* - t]h_j^* + [p^* - c_j^*]f_j^*$$

Profit maximisation then yields an equilibrium:

$$p = \frac{A + C + C^* + n^* t}{N+1}; \ p^* = \frac{A^* + C + C^*}{N+1}$$

$$h_j = p - c_j; \ f_j = p^* - c_j : h_j^* = p - c_j^* - t; \ f_j^* = p^* - c_j^* \qquad (17)$$

In order to focus on cases where consumer arbitrage is not profitable, we assume A ≅ A*[17]. Home welfare is now the sum of consumer surplus, home firm profits and tariff revenue (T = t.H*). Under our assumptions on unit costs, the home tariff will not affect home firm sales in the foreign market, and the effects of a small change in the tariff on home welfare are given by

$$dW = -D.dp + H.dp + \sum_{j=1}^{n} [p - c_j].dh_j + H^*.dt + t.dH^* \qquad (18)$$

Here the first term is the decline in consumer surplus, the next two terms are the changes in home firm profits (being the increased profits on existing domestic sales plus the profit on increased domestic sales), and the final two terms are the change in tariff revenue. Since D = H + H*, this can be rewritten as

$$dW = -H^*.d[p - t] + \sum_{j=1}^{n} [p - c_j].dh_j + t.dH^*$$

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[17] Profitable opportunities for consumer arbitrage will not exist if $t > p - p^* > 0$. Since $p - p^* = \frac{A - A^* + n^* t}{N+1}$, this requires $[n+1]t > A - A^* > -n^* t$.

where the first term is a terms of trade effect (H* is initial imports, and p-t is the price paid to the foreign firm). From the equilibrium conditions above, we have

$$dh_j = dp;\ dh_j^* = dp - dt;\ \text{dp} = \frac{n^*}{N+1}dt < dt$$

Thus the tariff reduces imports (dH* = -[n+1]dp) and total consumption (dD = - dp), but increases domestic output for the domestic market (dH = ndp). Rearranging (18), gives

$$dW = -H^*.d[p-t] + \sum_{j=1}^{n}[p - c_j - t].dp - t.dp$$

Added to the terms of trade effect we now have the net gain on production transferred from foreign to domestic firms, and the tariff revenue on lost consumption. If there are domestic firms whose profit margin [p-c_j] is less than the tariff, then their increased output at the expense of imports will involve a social loss.

At free trade (t = 0), both terms of trade and profit gains occur – i.e.

$$\frac{dW}{dt} = H^{.*}\frac{n+1}{N+1} + H\frac{n^*}{N+1} > 0$$

The home country therefore has an incentive to impose a tariff[18].

The tariff reduces foreign welfare through the lost profits of the foreign producers.

$$dW^* = H^*.d[p-t] + \sum_{j=1}^{n^*}[p - c_j^* - t].dh_j^* < 0$$

Both of these terms (the terms of trade effect and the lost profit on reduced output) are negative. This can be rewritten to facilitate comparison with the home welfare effect as

$$dW^* = H^*.d[p-t] + \sum_{j=1}^{n^*}[p - c_j^*].dh_j^* - t.dH^*$$

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[18] One can solve for the optimum home tariff t^o, assuming this tariff is not so high as to drive any foreign firms from the market, as $t^o = \frac{[n+1][\tilde{p} - \bar{c}^*] + n[\tilde{p} - \bar{c}]}{N + [2n+1][n+1]}$, where $\tilde{p}$ is the price in the absence of a tariff, and $\bar{c}$ ($\bar{c}^*$) is the (unweighted) average cost of home (foreign) firms – i.e. C/n (C*/n*). So the optimum intervention depends positively on the average markups from the two sources.

The effects of the tariff on world welfare then simplify to

$$dB = dW + dW^* = \sum_{j=1}^{n} [p - c_j].dh_j + \sum_{j=1}^{n^*} [p - c_j^*].dh_j^*$$

which is the change in pre-tax profits as a result of the changes in output in the two countries. Substituting from (17)

$$dB = \frac{n^*}{N+1}\{n[\bar{c}^* - \bar{c}] - [p - \bar{c}^*]\}$$

where $\bar{c}$ and $\bar{c}^*$ are the unweighted average costs of production in the home and foreign countries respectively. The first term in this expression is the average efficiency gain/loss on output transferred from foreign to home producers as a result of the tariff increase. The second term is the lost (foreign) profits on the discontinued sales to the home market. The net welfare effect therefore can be positive if home firms are sufficiently more efficient on average. But a tariff is not the first best intervention to exploit such efficiency effects, however.

We are now in a position to investigate the effects of a tariff on the profitability of a merger between the least efficient home firm (n), and the most efficient home or foreign firms. Taking the tariff as exogenous, we look at the implications of changes in the tariff for the profits of the merging firms, before and after the merger[19].

For a national merger, the tariff has increased both partner's outputs and profits in the pre-merger, but post tariff, equilibrium. The (potential) gains from the merger now arise from sales in two markets. The relevant expression is, from (5):

$$G(1,n) = \Delta\pi_1 - \pi_n = \frac{2h_n}{N}[h_1 - h_n g(N)] + \frac{2f_n}{N}[f_1 - f_n g(N)]$$

Only the first term (the gain in the home market) is affected by the tariff, with

$$\frac{dG(1,n)}{dt} = \frac{2}{N}\{h_1 - h_n[2g(N) - 1]\}\frac{dp}{dt}$$

[19] Collie (1997) considers the interactions between (exogenously given) mergers and optimal tariff and subsidy policies, while Horn and Levinsohn (1997) investigate the interactions between trade and merger policies, where the latter consists of the government choosing the optimal number of (identical) domestic firms.

Since g(N) > 1 for N ≥ 3, a higher tariff reduces the profitability of any merger for which $h_1 < h_n[2g(N)-1]$. This includes all *marginal* mergers (i.e. those for which G(1,n) is approximately zero initially), except where the "gains" in the two markets are significant in magnitude and opposite in sign, circumstances ruled out by our assumption that the markets are similar in size. Because the tariff generates the same increase in the outputs of both firms, what would have been a marginally profitable merger prior to the tariff becomes unprofitable. We conclude that a tariff discourages national mergers at the margin. But mergers which were more than marginally profitable (i.e. for which $h_1 > h_n[2g(N)-1]$) may find their profitability increased with a higher tariff.

For an international merger, the tariff has increased the output of the less efficient firm and decreased the output of the more efficient foreign firm. Clearly this makes an international merger less profitable at the margin, as confirmed by

$$G(1^*,n) = \Delta\pi_1^* - \pi_n = \frac{2h_n}{N}[h_1^* - h_n g(N)] + \frac{2f_n}{N}[f_1^* - f_n g(N)]$$

$$\frac{dG(1^*,n)}{dt} = \frac{2}{N}\{h_1^* - h_n[2g(N)-1]\}\frac{dp}{dt} - \frac{2h_n}{N}$$

which is again negative at the margin ($h_1^* = h_n g(N)$). A tariff also discourages marginal international mergers involving inefficient home firms, though again it is possible that the profitability of some already profitable mergers involving this firm could increase.

While a tariff seems to discourage mergers involving inefficient firms in the protected market, the opposite is true where an efficient firm from a protected market (home firm 1) is to merge with foreign (unprotected) firm n*. In this case

$$G(1,n^*) = \frac{2h_n^*}{N}[h_1 - h_n^* g(N)] + \frac{2f_n^*}{N}[f_1 - f_n^* g(N)]$$

$$\frac{dG(1,n^*)}{dt} = \frac{2}{N}\{[h_1 - h_n^* 2g(N)].[\frac{dp}{dt} - 1] + h_n^* \frac{dp}{dt}\}$$

which is positive at the margin (since the domestic price increases by less than the tariff). A marginally unprofitable merger of this type becomes profitable under a tariff. A marginal merger between two foreign firms would also be encouraged by the tariff, since both outputs fall by the same amount – i.e.

$$\frac{dG(1^*, n^*)}{dt} = \frac{2}{N}\{h_1^* - h_n^*[2g(N) - 1]\}.[\frac{dp}{dt} - 1]$$

The tariff thus "protects" domestic firms, particularly inefficient domestic firms, in two senses. By raising the domestic price, and increasing their equilibrium output, the tariff increases these firms' profits and renders them less "attractive" as a merger partner to other firms, both domestic and foreign. It has precisely the opposite effect for the corresponding foreign firms, which are now more attractive as merger partners[20].

The effects of trade liberalisation on the profitability of national and international mergers follows directly from this[21]. Tariff reductions by the home country make its less efficient firms more attractive as merger partners to more efficient firms, both domestic and foreign. Such mergers may or may not be desirable from a national or world welfare perspective. Interestingly, trade liberalisation has the effect of reducing the profitability of mergers involving the less efficient foreign firms. The compensation that the owners of these firms may have received as merger partners may now be less than the profits they could receive producing in the new equilibrium. If re-entry is possible, then divestments may follow. Thus trade liberalisation could lead to both mergers and divestments.

5 Conclusions

This paper set out to investigate the role of merger policy in an open economy. A simple partial equilibrium model of Cournot oligopolists with different technologies was used to illustrate issues. Conditions for a merger to be profitable to participants and socially desirable were derived for a closed economy, in terms of general effects and their particular

[20] Long and Vousden (1995) reach the same conclusions on the effects of unilateral tariff liberalisation on the profitability of mergers. They show that multilateral tariff liberalisation can lead to different outcomes. Interestingly these conclusions are opposite to those in Ross (1988), and Neven and Seabright (1997). Ross' model is identical to that here, except that he allows more general conjectures (i.e. not just Cournot), but requires all firms of the same national origin be identical. His criterion for the attractiveness of mergers is the effects of a change in the number of firms on price, and he concludes that a tariff reduction will discourage mergers between domestic firms and encourage them between foreign firms serving the market. Neven and Seabright show that the increase in profits of domestic firms induced by a tariff increase is proportional to their initial output, as it is here. They conclude that because the larger firm's profits increase more than the smaller firm's, the tariff reduces the incentives for merger. However, a more relevant comparison is between the increased profits of the merged firm with the increased profits of its constituents. Since the output of the merged firm is less than the combined outputs of its components, the merged firm's profits increase by less than the combined profits of the components, hence the tariff can reduce the incentive for merger.

[21] Interactions between trade and merger policies have been considered elsewhere. For example Richardson (1996) considers the effects of harmonisation and trade liberalisation.

values in the model. It was noted that these conditions would continue to apply in an open economy viewed at the aggregate level.

An open economy complicates the analysis in two ways. First the existence of multiple political jurisdictions introduces national competition authorities with a more limited welfare focus. Second, mergers can take place within or across national boundaries, and although the mergers themselves may have the same effect on world welfare, their approval will depend on their separate national welfare effects and on which competition authorities are involved in the decision.

For a national merger, only one competition authority is involved. If this country is a net importer, any bias will be towards rejecting mergers that have positive external effects for the rest of the world. If this country is a net exporter there is no obvious bias overall, but mergers that that have negative external effects may be approved. Any proposal for international constraints on national merger authorities should take these biases into account. For an international merger both competition authorities are involved, and so no merger that is socially undesirable will be approved (by both). In this case the system is biased against socially desirable mergers.

Trade liberalisation has two main implications for the profitability of potential mergers. First, relatively inefficient firms in the formerly protected market now become more attractive as merger partners. Second, mergers involving relatively inefficient firms elsewhere become less attractive, and may fail to materialise altogether, or, if the have already occurred, lead to divestments. Either way trade liberalisation will generate merger related activity, not all of which need be socially desirable. Ensuring that merger policy does not become a surrogate trade policy, administered with one eye on terms of trade gains, is now a task for the international trading community.

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