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Tariffs, Quotas and Mergers

By R. Falvey and M. Nathananan

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Abstract

In this paper we analyse and compare the effects of tariff and quota restrictions on the incentives for national and international mergers in a segmented oligopolistic market of Cournot-competing firms. We confirm previous results that tariffs tend to discourage (encourage) mergers involving small firms based in the protected (non-protected) market, at the margin. But we find that quotas tend to discourage similar mergers involving small firms from both locations. Where a ranking can be made, mergers are more profitable under a quota than under the "equivalent" tariff. These outcomes provide a further instance of the non-equivalence of tariffs and quotas in imperfectly competitive markets.

Outline

1. Introduction
2. Free Trade
3. Tariff
4. Quota
5. Conclusions

Non-Technical Summary

In this paper we analyse and compare the effects of tariff and quota restrictions on the incentives for mergers in segmented oligopolistic markets. The links between trade and competition policy have received increased attention from trade economists in recent years, as foreign trade and investment policies are liberalised. One interest is the effects of trade liberalisation on the incentives for existing firms to merge, and one important feature of the liberalisation process undertaken as an outcome of the Uruguay Round, is that it is not confined to tariffs, but also encompasses measures of a more quantitative character.

The mergers we consider may be national (involving firms with production facilities in a single country) or international (where the participants have production facilities in different countries). We are concerned with two issues. First, how do different forms of trade restriction imposed at an "equivalent" level affect the profitability of different types of mergers? This extends existing work on the (non)equivalence of tariffs and quotas in imperfectly competitive markets to look at the incentives for firms to merge. Second, how do changes in these trade policies affect the profitability of different types of merger? This considers the implications of tariff and quota liberalisation for the numbers of firms competing in particular markets.

Our analysis is of a merger between a large, low cost and a small, high cost firm, which sees the closure of production from the high cost partner. This process is set in an oligopolistic market, where Cournot-competing firms produce a homogeneous good and demand is linear. By simplifying the market structure and the outcomes of merger activity in this way, we are able to compare the results under equivalent tariff and quota policies, and to obtain explicit solutions for the (discrete) effects of changes in the numbers of firms (as a consequence of the merger) and for the (marginal) changes in trade policies.

Our three main results can be summarised as follows. First, a tariff increases the domestic sales of domestic firms and reduces the domestic sales of foreign firms. As a result it discourages marginal mergers that would see the closure of relatively inefficient domestic firms and encourages marginal mergers that would close relatively inefficient foreign firms. Second, if instead this country imposes a quota on imports, with quota rights allocated in proportion to free trade sales, then again the domestic sales of all foreign firms fall and those of all home producers rise. Marginal mergers which involve closure of the relatively inefficient home firm are again discouraged by this rise in its profitability. But unlike the tariff regime, marginal mergers involving the closure of the relatively inefficient foreign

firm are also discouraged by the quota, at least where the quota is binding on the merged firm.

Finally, a comparison of equivalent tariff and quota regimes leads to ambiguous outcomes in international mergers. But for national mergers we find that any profitable merger under the tariff regime is also likely to be profitable under quota regime.

I. Introduction

The links between trade, trade policy and competition policy have received increased attention from trade economists in recent years[1]. As foreign trade and investment policies are liberalised, other policies take on an even more significant role in regulating the international environment in which firms compete. One important influence will be the effects of trade liberalisation on the incentives for existing firms to merge, and a small literature has developed investigating the implications of tariff liberalisation for merger profitability. But one important feature of the recent liberalisation process undertaken as an outcome of the Uruguay Round, is that it is not confined to tariffs. It also encompasses Voluntary Export Restraints (VERs) and other "grey area" measures of a more quantitative character. The implications of liberalising quantitative restrictions for merger profitability remain to be investigated.

This paper therefore examines the effects of tariff and quota policies on the profitability of mergers. The mergers we consider may be national (involving firms with production facilities in a single country) or international (where the participants have production facilities in different countries). We are concerned with two issues. First, how do different forms of trade restriction imposed at an "equivalent" level (i.e. yielding the same domestic price and volume of imports) affect the profitability of different types of mergers? In examining this issue we are extending existing work on the (non)equivalence of tariffs and quotas in imperfectly competitive markets to the incentives for firms to merge. Second, how do changes in the restrictiveness of these trade policies affect the profitability of different types of merger? In examining this issue we hope to shed some light on the implications of tariff and quota liberalisation for the numbers of firms competing in particular markets.

A common approach to examining the interactions between competition policy and trade policy in the literature, has been to model the former as the direct choice of the number of identical domestic firms, and to see how the "optimal" number of these firms changes when constraints are imposed on trade policy choices[2]. More detailed analyses of firms' decisions to merge have employed a range of models reflecting those available in the general merger literature. Salant, Switzer and Reynolds (1983) have shown that identical Cournot-competing firms with constant marginal costs have no incentive to merge in a closed

[1] See Horn and Levinsohn (2001) and WTO Annual Report 1997 for reviews of the relevant literature.

market, unless the participants collectively have a large share of the market pre-merger, or the merger saves on fixed costs[3]. But small trade interventions will 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 firms that differ in their marginal costs. 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 than any of the individual participants and therefore lower costs[5].

A somewhat simpler way to introduce inter-firm size differences is to suppose that they indicate different firm technologies, reflected in different (constant) marginal costs. Open economy models of mergers using this assumption are found in Long and Vousden (1995) and Falvey (1998, 2001). Long and Vousden investigate the effects of unilateral and bilateral tariff liberalisation on the incentives for firms to merge 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. The merged firm is assumed to have the lower of these costs. For any given tariff only a range of cost differences generate profitable mergers, and this range shifts with changes in the tariff. They also consider two types of cross-border mergers, each involving a domestic firm and a lower cost foreign firm. In a type I merger, the foreign firm transfers its technology to its domestic partner, and each market is served by the relevant local plant. As might be expected, both bilateral and unilateral tariff cuts reduce the incentives for this "tariff-jumping" merger. In a type II merger, which is also the type considered in this paper, the higher cost (domestic) partner is simply shutdown. For this form of merger the results from both unilateral and bilateral tariff cuts are qualitatively the same as for a purely domestic merger.

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[2] See Collie (1997) and the references therein.

[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).

[4] Gaudet and Kanomi (2000) consider the incentive that different levels of a 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] This approach has also been extended to a multi-country context by Horn and Levinsohn (2001). 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.

The model employed below is that used in Falvey (1998). The details of the model are provided in the following section, but the analysis is of a merger between a large, low cost and a small, high cost firm, which sees the closure of production from the high cost partner. The firms can be from the same or different countries. This process is set in an oligopolistic market, where Cournot-competing firms produce a homogeneous good and demand is linear. By simplifying the market structure and the outcomes of merger activity in this way, we are able to compare the outcomes under equivalent tariff and quota policies, and to obtain explicit solutions for the (discrete) effects of changes in the numbers of firms (as a consequence of the merger) and for the (marginal) changes in these trade policies.

The question of whether price and quantitative trade restrictions yield equivalent outcomes in imperfectly competitive markets has been the subject of considerable investigation. The early work focussed on the case where domestic production was monopolised[6], and this was later extended to consider monopoly in importing or exporting. The general finding of this literature is that when markets are not perfectly competitive, price and quantitative restrictions are not fully equivalent, in the sense that two alternative restrictions that achieve the same outcome in one dimension (e. g. consumer prices) will lead to different outcomes in other dimensions (domestic output, imports, welfare etc.)[7]. Recent work has concentrated on oligopolistic markets, where some forms of restriction can affect the strategic interaction between import-competing and exporting firms under some market structures. This outcome arises if quantitative restrictions are imposed in a market where firms sell differentiated products and are Bertrand price competitors in particular[8].

The results from this literature would not lead us to expect tariffs and quotas to yield fully equivalent outcomes in the oligopolistic market considered below. Indeed it would be relatively easy for the complexities of the potential trade policy outcomes to obscure their implications for merger profitability that are the primary focus of this paper. But by assuming Cournot quantity competition among producers of a homogeneous product, we limit the impact that policy choice has on the strategic interactions between firms. Of course the quota constrains the ability of foreign firms to respond to changes in the restricted market (such as a merger between domestic firms), in ways that the tariff does

[6] See Bhagwati (1965) for example.
[7] Takacs (1978) provides a useful summary. The distribution of the "rents" can also differ across types or restrictions, even in competitive markets.
[8] Harris (1985) and Krishna (1989) investigate VERs, while Greaney (1996) considers "voluntary import expansions".

not. Yet under these assumptions a quota set at the free trade volume of imports will have no effect in this market and is thus equivalent to a zero tariff. Binding tariffs and quotas that lead to the same overall volume of imports (and therefore the same domestic price) generate different distributions of this volume across the individual exporting firms, and hence different distributions of exporting firm profits. Thus different forms of restriction will yield different incentives for mergers involving exporting firms. A firm's quota entitlement itself may provide an additional inducement to potential merger partners.

The structure of the remainder of the paper is as follows. Section II sets up the model and determines the factors influencing the profitability of mergers. The following section considers how the imposition of a specific tariff by one country will affect the incentives for different mergers. Section IV then looks at the equivalent quota, and contrasts the implications of the two regimes. The final section presents our conclusions. To simplify the presentation we examine the effects of tightening (equivalent) tariff or quota restrictions on imports. Trade liberalisation will have the opposite effects.

II. Free Trade

We consider a simple partial equilibrium model of international oligopoly with the following features[9]. The world is composed of two countries – home and foreign (whose variables are denoted with an asterisk). Each country has a small number ($n, n^* \geq 3$ so that a merger does not limit competition to a single firm in either market) of firms producing a homogeneous product and the entry of new firms is not possible. There are no transport costs and the two markets are segmented.[10] Each firm (j, j^*) faces constant unit cost (c_j, c_j^*) and no fixed costs. Unit costs differ across firms, with firms ordered in each country so that $c_k > c_j$ if $k > j$ and $c_k^* > c_j^*$ if $k^* > j^*$. Competition in both markets is assumed to be Cournot.

Demands in the two markets are given by

$$D = A - p\,; \qquad D^* = A^* - p^* \tag{1}$$

[9] This model is based on Falvey (1998).
[10] Thus each firm sells in both markets. This assumption also implies that the demands in the two markets are independent.

where A, A* are positive constants, and p and p* are domestic and foreign prices respectively[11]. Let h_j, f_j (h_j*, f_j*) denote the sales of home (foreign) firm j (j*) in the home and foreign markets respectively. Market clearing requires that

$$D = H + H^*; \quad D^* = F + F^* \tag{2}$$

where $H = \sum_{j=1}^{n} h_j$, $F = \sum_{j=1}^{n} f_j$, $H^* = \sum_{j^*=1}^{n^*} h_j^*$, $F^* = \sum_{j^*=1}^{n^*} f_j^*$.

The domestic and foreign firm profit maximization problems are

$$\underset{h_j, f_j}{\text{Max}} \; (p - c_j)h_j + (p^* - c_j)f_j \; ; \quad \underset{h_j^*, f_j^*}{\text{Max}} \; (p - c_j^*)h_j^* + (p^* - c_j^*)f_j^*$$

Which yield equilibrium firm outputs and profits:

$$h_j = p - c_j; \; f_j = p^* - c_j; \; h_j^* = p - c_j^*; \; f_j^* = p^* - c_j^* \tag{3}$$

$$\pi_j = h_j^2 + f_j^2; \; \pi_j^* = [h_j^*]^2 + [f_j^*]^2 \tag{4}$$

Substituting the outputs in (2) and then in (1) gives the free trade equilibrium prices

$$p = \frac{A + C + C^*}{N + 1} \; ; \qquad p^* = \frac{A^* + C + C^*}{N + 1} \tag{5}$$

where $C = \sum_{j=1}^{n} c_j$ and $C^* = \sum_{j^*=1}^{n^*} c_j^*$, and $N = n+n^*$. If we let $\alpha \equiv p^* - p = \frac{A^* - A}{N + 1}$, then $f_j = h_j + \alpha$, and $f_j^* = h_j^* + \alpha$, and each firm's sales are larger in the larger market by the same absolute amount.

Now suppose that two of these firms merge – i.e. they become a single decision making unit. To avoid considering too many special cases, we assume that any merger applies to both markets. Given that the merger itself has no effect on the technology of the participants, cost minimisation by the new merged firm implies the abandonment of the relatively inefficient participant's technology and the closure of its plant[12]. The new market equilibrium is simply that which would obtain in the absence of this firm[13]. Total output

[11] Note that while this assumption of a common unitary slope simplifies the algebra, it also implies that the larger market will have the less elastic demand at any price. This is a further reason why we assume markets of identical size when conducting the trade policy comparisons below.

[12] This removes the tariff- or quota-jumping motive for mergers. Levinsohn (1989) establishes the equivalence of tariffs and quotas when foreign direct investment is an alternative to exporting. Ryan (2001) explores mergers as a form of tariff and quota jumping.

[13] In common with much of the literature in this area, we take the initial number of firms and their technologies as given. By assuming a fixed number of firms we 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).

falls, the market price rises, the profits of the remaining firms rise and consumer surplus falls in each market. 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, because production is rationalised so that mergers may also be socially beneficial[14].

To illustrate, consider the effects of a merger between home firm 1 (that with the most efficient technology) and home firm n (that with the least efficient technology). As will be shown below, this is likely to be the most profitable of the potential mergers between home firms. The effects on equilibrium outputs and prices are:

$$\Delta h_j = \Delta h_j^* = \Delta p, j \neq n; \Delta p = \frac{h_n}{N}; \quad \Delta f_j = \Delta f_j^* = \Delta p^*, j \neq n; \Delta p^* = \frac{f_n}{N} \qquad (6)$$

where Δx indicates the (discrete) change in the equilibrium value of variable x as a result of the merger. 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 assumption of constant marginal costs, 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 and price rises. The price increase is greater in the larger market (e.g. if $f_n > h_n$ then $\Delta p^* > \Delta p$). The change in profits of home firm j (j≠n) and foreign firm j^* are given by:

$$\Delta\pi_j = \Delta p.[2h_j + \Delta p] + \Delta p^*.[2f_j + \Delta p^*]$$

$$\Delta\pi_j^* = \Delta p.[2h_j^* + \Delta p] + \Delta p^*.[2f_j^* + \Delta p^*]$$

Given Δp and Δp^*, which depend only on the initial output of the departing firm, the largest (most efficient) firm has the greatest increase in profits and hence the greatest incentive to initiate this merger.

A merger will be profitable for the participants only if their post-merger profits exceed their combined initial profits. The larger the departing firm, the larger the merger-induced price increase, but also the larger its foregone profits. The *Gain* (G) for a merger between home firms 1 and n, is then

[14] As Lahiri and Ono (1988) show, in an oligopoly with different technologies, the elimination of a minor firm has two opposing effects on welfare - it improves average efficiency but 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. The welfare effects of mergers in this model are discussed in Falvey (1998).

$$G(1,n) = \Delta\pi_1 - \pi_n = \Delta p.[2h_1 + \Delta p] + \Delta p^*.[2f_1 + \Delta p^*] - [h_n^2 + f_n^2]$$

Substituting from (6)

$$G(1,n) = 2\Delta p.R(1,n) + 2\Delta p^*.R^*(1,n) \qquad (7)$$

where $R(1,n) = h_1 - h_n g(N); R^*(1,n) = f_1 - f_n g(N); g(N) = \frac{N}{2} - \frac{1}{2N} > 1; g'(N) > 0.$

Similar conditions can be derived for foreign and international combinations of merging firms as illustrated below.

We can also compare the "gains" in the two markets. Since each firm's sales differ by the same absolute amount (α) in these markets, we have

$$R(1,n) - R^*(1,n) = \alpha.[g(N) - 1]$$

The right side of this equation has the same sign as α, implying that a gain from the merger is "more likely" in the smaller market, in the sense that if the merger would make neither a profit nor a loss in the larger market it will generate a profit in the smaller market [15]. Since determining the influence of differences in market size is not our objective here, we will assume for the remainder of the paper that the two markets are approximately equal in size (i.e. $A \approx A^*$).

Equation (7) provides a condition on relative firm sizes (or relative shares of output) for a profitable merger. Given h_n and f_n, the larger the number of firms the smaller the price increase and, from (6), the smaller the increase in output for the continuing partner (and every other) firm. Hence the larger the required initial output of the continuing 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[16]. In the

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[15] But, as noted above, the merger induces a greater price increase in the larger market, so that the magnitude of any gain could be larger there. One can show that

$$\text{sign}\ \{\frac{2h_n}{N}R(1,n) - \frac{2f_n}{N}R^*(1,n)\} = \text{sign}\ \{\alpha.[g(N).[h_n + f_n] - [h_1 + f_n]]\}$$

[16] As the two countries are symmetric it suffices to consider the effects of the merger in the home market. Given h_n, $dG/dh_1 = 2.h_n/N > 0,$ so that the optimal merger partner for the least efficient firm is the largest firm. But given h_1, $dG/dh_n = 2.[h_1 - 2h_n.g(N)]/N$, and $d^2G/dh_n^2 = -4.g(N)/N < 0$, implying that the optimal merger partner for the largest firm has an output of $h_1/2.g(N)$. Thus a sufficient condition for a merger to involve the largest and smallest firms is that $h_n \geq h_1/2g(N)$, or $h_1/h_n \leq [N^2 - 1]/N$.

analysis below we often focus on a *marginal merger* (i.e. that for which $R(1,n) = 0$, and hence $G(1,n) = 0$ initially), since this is where tariffs and quotas will influence the number of mergers that take place. For these mergers it is the sign of the effect of the policy change on R(1,n) that is important. For the tariff we sometimes also consider a *best merger* (i.e. that which achieves the maximum gain, which is when $h_1 = 2.g(N).h_n$ and $R(1,n) = h_n.g(N)$ above), to illustrate what happens away from the margin.

III. Tariff

Suppose that the home country were to impose a small specific tariff of t per unit on imports of this product. With segmented markets and constant marginal costs there are no production spillovers between markets. The home tariff therefore affects output and prices in the home market only. We begin this section by examining the effects of the tariff on the market equilibrium in the home country, and then consider how the existence of a tariff affects the profitability of national and international mergers. We can be relatively brief since many of the tariff results have been derived elsewhere[17].

The tariff acts as a unit cost increase for foreign firms supplying the home market and the new equilibrium price in the home market ($\bar{p}$) is

$$\bar{p} = p + \frac{n^* t}{N+1} \tag{8}$$

The effects of a tariff increase on the price and firm outputs and profits in the home market can then be derived – i.e.

$$\frac{d\bar{p}}{dt} = \frac{n^*}{N+1} > 0; \quad \frac{d\bar{h}_j}{dt} = \frac{d\bar{p}}{dt} > 0; \quad \frac{d\bar{h}^*_j}{dt} = \frac{d\bar{p}}{dt} - 1 < 0;$$

$$\frac{d\bar{\pi}_j}{dt} = 2\bar{h}_j.\frac{d\bar{p}}{dt} > 0 \text{ and } \frac{d\bar{\pi}^*_j}{dt} = 2\bar{h}^*_j.[\frac{d\bar{p}}{dt} - 1] < 0. \tag{9}$$

The home price increases, and each home firm has the same increase in domestic sales, while each foreign firm has the same decrease in domestic sales[18]. The domestic profits of

[17] See for example Long and Vousden (1995). The welfare effects of a tariff in this market structure are discussed in Falvey (1998). The implications of tariff liberalisation for the profitability and welfare consequences of mergers in an integrated world market are discussed in Falvey (2001).

[18] Changes in sales will vary with firm size if demand is non-linear. For example, the domestic sales of a particular foreign firm will fall by more than that of the average foreign firm if demand is concave (convex) and this firm is larger (smaller) than average. An ad valorem tariff will have a further rationalisation effect since it will make the foreign firms' perceived demand curves flatter. This latter effect on foreign firm sales is positive (negative) if the foreign firm is larger (smaller) than the average. See Collie (1998) on both of these points.

home firms rise, while the domestic profits of foreign firms fall. We are now in a position to investigate the effects of the tariff on the profitability of various potential mergers between 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. There are four potential mergers to consider:

[TA] A National Merger in the Restricting Country

As noted above, potentially the most profitable merger of this type involves the most efficient (1) and the least efficient (n) home firms. By raising the domestic price the tariff has increased the outputs and profits of both potential partners in the pre-merger equilibrium in the home country. The (potential) gains from the merger arise from sales in both markets, and the relevant expressions are, from (6) and (7):

$$\overline{G}(1,n) = \Delta\overline{\pi}_1 - \overline{\pi}_n = \frac{2\overline{h}_n}{N}\overline{R}(1,n) + \frac{2f_n}{N}R^*(1,n) \qquad (10A)$$

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

$$\frac{d\overline{G}(1,n)}{dt} = \frac{2}{N}\overline{R}(1,n)\frac{d\overline{p}}{dt} + \frac{2}{N}\overline{h}_n[1-g(N)]\frac{d\overline{p}}{dt} \qquad (11A)$$

Since g(N) > 1, a higher tariff reduces the profitability of any merger for which $\overline{R}(1,n) \le 0$, which includes all *marginal* mergers (i.e. those for which $\overline{G}(1,n) \approx 0$ 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 participating firms, what would have been a marginally profitable merger prior to the tariff becomes unprofitable. We conclude that, at the margin, a tariff discourages national mergers between firms in the restricting country. But mergers which were more than marginally profitable (i.e. for which $\overline{R}(1,n) > 0$), may find their profitability increased with a higher tariff. At the best merger for example, $\overline{R}(1,n) = h_n.g(N)$ and $d\overline{G}(1,n)/dt = [2.\overline{h}_n/N].[dp/dt] > 0.$

[TB] An International Merger that closes a firm in the Restricting Country

In looking at the profitability of this merger, we note that the tariff has increased the home sales of the least efficient home firm (n) and decreased the home sales of the most efficient foreign firm (1*). Clearly this makes the merger less profitable at the margin, as confirmed by

$$\overline{G}(1^*,n) = \Delta\overline{\pi}_1^* - \overline{\pi}_n = \frac{2\overline{h}_n}{N}\overline{R}(1^*,n) + \frac{2f_n}{N}R^*(1^*,n) \qquad (10B)$$

where $\overline{R}(1^*,n) = \overline{h}_1^* - \overline{h}_n g(N)$, hence

$$\frac{d\overline{G}(1^*,n)}{dt} = \frac{2}{N}\overline{R}(1^*,n)\frac{d\overline{p}}{dt} + \frac{2\overline{h}_n}{N}\{[1-g(N)].\frac{d\overline{p}}{dt} - 1\} \qquad (11B)$$

which is again negative for mergers that were initially unprofitable in the home market ($\overline{R}(1^*,n) \le 0$). Thus a tariff also discourages marginal international mergers involving inefficient home firms. Again it is possible that the profitability of some already profitable mergers involving this firm could increase, though this is less likely than in the case above since here the profitability of the best merger falls with a tariff increase[19].

[TC] <u>An International Merger that closes a firm in the Non-restricting Country</u>

While a tariff seems to discourage marginal 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 the tariff increases the home sales and profits of the relatively efficient partner, and reduces the home sales and profits of the relatively inefficient partner. The gain from the merger is

$$\overline{G}(1,n^*) = \frac{2\overline{h}_n^*}{N}\overline{R}(1,n^*) + \frac{2f_n^*}{N}R^*(1,n^*) \qquad (10C)$$

where $\overline{R}(1,n^*) = \overline{h}_1 - \overline{h}_n^* g(N)$. Then

$$\frac{d\overline{G}(1,n^*)}{dt} = \frac{2}{N}\overline{R}(1,n^*)[\frac{d\overline{p}}{dt} - 1] + \frac{2\overline{h}_n^*}{N}\{\frac{d\overline{p}}{dt} - g(N).[\frac{d\overline{p}}{dt} - 1]\} \qquad (11C)$$

which is positive for mergers initially unprofitable in the home market (i.e. $\overline{R}(1,n^*) \le 0$), since the domestic price increases by less than the tariff. A marginally unprofitable merger of this type becomes profitable under a tariff. Some already profitable mergers will also be encouraged; the best merger, for example[20].

[TD] <u>A National Merger in the Non-restricting Country</u>

A marginal merger between two foreign firms would also be encouraged by the tariff, since the domestic sales of both fall by the same amount. Now

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[19] That is $\frac{d\overline{G}(1^*,n)}{dt} = \frac{2}{N}.\overline{h}_n.[\frac{d\overline{p}}{dt} - 1] < 0$, when $\overline{R}(1^*,n) = h_n.g(N)$ initially.

[20] If $\overline{R}(1,n^*) = \overline{h}_n^*.g(N)$ initially, then $\frac{d\overline{G}(1,n^*)}{dt} = \frac{2}{N}.\overline{h}_n^*.\frac{d\overline{p}}{dt} > 0$

$$\overline{G}(1^*, n^*) = \frac{2\overline{h}_n^*}{N}\overline{R}(1^*, n^*) + \frac{2f_n^*}{N}R^*(1^*, n^*) \qquad (10D)$$

where $\overline{R}(1^*, n^*) = \overline{h}_1^* - \overline{h}_n^* g(N)$, and

$$\frac{d\overline{G}(1^*, n^*)}{dt} = \frac{2}{N}\overline{R}(1^*, n^*)[\frac{d\overline{p}}{dt} - 1] + \frac{2\overline{h}_n^*}{N}[1 - g(N)].[\frac{d\overline{p}}{dt} - 1] \qquad (11D)$$

A tariff increase will raise the profitability of any merger that was not initially profitable (i.e. $\overline{R}(1^*, n^*) \leq 0$). But the profitability of some already profitable mergers will fall; the best merger for example[21].

In summary, 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. Thus marginal mergers closing down a home firm become less profitable, while marginal mergers closing down a foreign firm become more profitable with a higher tariff. Away from the margin, profitability could rise or fall. "Best" mergers, which would go ahead regardless of the small tariff change, become more profitable where the continuing partner is a home firm, and less profitable where the continuing partner is a foreign firm.

IV. Quota

Suppose that, instead of the tariff, the home country imposes import quotas on foreign produced goods. Excluding the rare cases where quota rights are auctioned, the "revenue" from the restriction will be captured by those fortunate enough to be allocated the rights to import. In the context of this oligopolistic market structure, it seems sensible to assume that any entity through which imports are undertaken in free trade is fully integrated with the foreign producer[22]. The foreign producers then capture the rents, no matter whether the quota licences are allocated to "domestic" importers or to "foreign" exporters (as under a VER, for example).

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[21] If $\overline{R}(1^*, n^*) = \overline{h}_n^*.g(N)$ initially, then $\frac{d\overline{G}(1^*, n^*)}{dt} = \frac{2}{N}.\overline{h}_n^*.[\frac{d\overline{p}}{dt} - 1] < 0$

[22] This avoids the inefficiencies that would arise if a second independent profit maximising entity intervened between home consumers/retailers and the foreign producer.

An immediate problem in dealing with quantitative restrictions in oligopolistic markets is to determine how the import rights are to be allocated among the exporting firms. The GATT obligations with respect to the administration of quotas are provided in Article XIII. While these obligations refer to allocations to countries (since the "contracting parties" to the GATT are countries), they provide a strong indication of what would constitute an acceptable allocation to any group[23]. Briefly, Article XIII requires that all exporters be covered by the restriction (paragraph 1), and that the distribution of trade aim at approaching as closely as possible the shares that might be expected to obtain in the absence of the restriction (paragraph 2). The actual allocation of trade shares can be by agreement with all parties having a "substantial interest" in supplying the product concerned or, "where this method is not reasonably practicable", in proportion to the shares during a "previous representative period" (paragraph 2 (d)). While the ambiguity of many of these terms has proved fertile ground for disputes, in practice a three year period, during which trade was unrestricted, has generally been taken to be "representative".

Given the wide application of the "previous representative period" formula, here we assume that the quota allocation across foreign firms is in proportion to their exports in free trade. The domestic and foreign firm profit maximisation problems become

$$\underset{\tilde{h}_j, f_j}{\text{Max}} \; (\tilde{p} - c_j)\tilde{h}_j + (p^* - c_j)f_j$$

and (12)

$$\underset{\tilde{h}_j^*, f_j^*}{\text{Max}} \; (\tilde{p} - c_j^*)\tilde{h}_j^* + (p^* - c_j^*)f_j^* \quad \text{s.t.} \quad \tilde{h}_j^* \le q h_j^*$$

respectively, where *q* is the quota rate, $0 \le q \le 1$, and $\tilde{p}$, $\tilde{h}_j$ ($\tilde{h}_j^*$) denote the domestic price and domestic sales of firm j (j*) under the quota regime. Again, with segmented markets and constant unit costs, the equilibrium in the foreign market is unaffected by the home quota regime. Because the optimal response of an unconstrained firm is to increase its own output in the face of a reduction in its competitors' outputs, and the permitted sales by foreign firms in the home market are proportional to their optimal free trade sales, the quota constraint is binding for all foreign firms. Equilibrium sales under the quota regime are then:

$$\tilde{h}_j = \tilde{p} - c_j; \; f_j = p^* - c_j; \; \tilde{h}_j^* = q h_j^*; \; f_j^* = p^* - c_j^*$$

[23] Alternatively we could assume that our foreign firms are each based in a different country.

Which gives an equilibrium home market quota-induced price of

$$\tilde{p} = \frac{A + C - qH^*}{n+1} = p + \frac{[1-q].H^*}{n+1} \qquad (13)$$

The effects of a change in the quota regime can then be derived:

$$\frac{d\tilde{p}}{dq} = -\frac{H^*}{n+1} < 0; \frac{d\tilde{h}_j}{dq} = \frac{d\tilde{p}}{dq} < 0; \frac{d\tilde{h}_j^*}{dq} = h_j^* > 0; \frac{d\tilde{\pi}_j}{dq} = 2\tilde{h}_j \frac{d\tilde{p}}{dq} < 0;$$

$$\frac{d\tilde{\pi}_j^*}{dq} = [\tilde{p} - c_j^*]h_j^* + qh_j^* \frac{d\tilde{p}}{dq} \qquad (14)$$

It is worth noting at this point that the profits of some foreign firms may increase as a result of the quota, which can shift output towards the collusive optimum. This depends on the relative numbers of domestic and foreign firms, however, since only the latter are subject to the quota, and the former will in fact increase their outputs. For each foreign firm j, one can determine a profit-maximising quota (q_j^o), with

$$q_j^o = \frac{1}{2} + \frac{n+1}{2}.\frac{h_j^*}{H^*} \qquad (15)^{24}$$

Equation (15) also indicates that the larger foreign firm prefers a less restrictive quota.

Both the tariff and the quota lead to a fall in the volume of imports and a consequent increase in the domestic price. A tariff and quota that lead to the same volume of imports and consequently the same increase in the domestic price, can be found from (8) and (13) to be related as:

$$t = [1-q].\frac{N+1}{n+1}.\frac{H^*}{n^*} \qquad (16)$$

Henceforth, tariffs and quotas that satisfy (16) will be referred to as *equivalent regimes.* Of course individual foreign firms are constrained to different degrees by the two policies. The quota reduces all exports to the domestic market in the same proportion. The specific tariff,

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[24] Note that if there are no domestic firms, and all foreign firms are identical, then $q^o = \frac{1}{2} + \frac{1}{2n^*}$, which is the collusive outcome. The existence of unconstrained domestic firms tends to raise this profit maximising quota. Again, if all foreign firms are identical, $q^o = \frac{1}{2} + \frac{n+1}{2n^*}$, with no restriction being profit maximising once $n \geq n^* - 1$.

under our assumptions, reduces all exports by the same amount[25]. Where the regimes are equivalent, the larger, more efficient foreign firms export relatively more under the tariff regime, and the smaller, less efficient foreign firms relatively less – i.e.

$$\bar{h}_j^* = q.h_j^* + [1-q].[h_j^* - \frac{H^*}{n^*}] \qquad (17)$$

Foreign firms are not indifferent to the regime imposed on them for two reasons, therefore. First, all foreign firms will tend to prefer the quota regime, because while the tariff generates revenue for the importing country government, the quota generates rents for the exporters. Second, individual foreign firms have different sales under the two regimes. Comparing firm profits in the two cases, we have $\bar{\pi}_j^* = [\bar{p} - c_j^* - t].\bar{h}_j^*$, and $\tilde{\pi}_j^* = [\tilde{p} - c_j^*].qh_j^*$, so that

$$\tilde{\pi}_j^* - \bar{\pi}_j^* = [\bar{p} - c_j^*][1-q][\frac{H^*}{n^*} - h_j^*] + t\bar{h}_j^*$$

All but a relatively large foreign firm would clearly prefer the quota regime[26].

In comparing the potential profitability of different mergers under equivalent regimes, we have two elements to consider: (1) the increased profits of the continuing firm, which are increasing in both (a) the initial output of the continuing firm and (b) the merger-induced price increase, which is itself increasing in the initial sales of the closing firm; and (2) the pre-merger profits of the closing firm, which are increasing in its initial output. As we shall see, the merger-induced price increase is always greater under the quota regime. The initial output of any specific home firm (continuing or closing) does not differ by regime, while if a foreign firm is the continuing partner, its initial output is smaller under the quota regime, and if it is the closing partner its initial output is higher under the quota regime. These facts inform the comparison of mergers that follows.

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[25] So the quota outcome corresponds to that which would follow from a set of firm specific tariffs $\{t_j\}$, with the average tariff (t) as given by (16), and $t_j - t = [1-q][h_j^* - \frac{H^*}{n^*}]$, so that larger foreign firms are subject to higher tariffs. Rodrik (1989) considers optimal firm-specific export taxes under more general demand and cost functions. Note that while a sufficiently high (restrictive) tariff will force small foreign firms out of the home market, the quota never will.

[26] The average firm ($h^* = H^* / n^*$) has identical sales in each case, but captures rents ($t\bar{h}^*$) under the quota regime. It is possible that a very large foreign firm could be relatively worse off under the quota regime. As noted above, imposing an ad valorem tariff would exacerbate this difference between the tariff and quota outcomes. Since the larger (smaller) firm's sales tend to fall less (more) than the average under the ad valorem tariff. Again see Collie (1998).

[QA] A National Merger in the Restricting Country

The changes in domestic and foreign price as a result of a merger between the most efficient and the least efficient domestic firms are given by

$$\Delta\tilde{p} = \frac{\tilde{h}_n}{n} \text{ and } \Delta p^* = \frac{f_n}{N} \qquad (18)$$

The price change in the home market is larger than the corresponding tariff outcome (equation (6)) because foreign firms are unable to expand their sales in response to the domestic price increase. This difference is also reflected in the expression for the potential gain from this merger – i.e.

$$\tilde{G}(1,n) = 2\frac{\tilde{h}_n}{n}\tilde{R}(1,n) + 2\frac{f_n}{N}R^*(1,n) \qquad (19A)$$

where $\tilde{R}(1,n) = \tilde{h}_1 - \tilde{h}_n g(n)$. Since the home sales of both participating home firms are the same under equivalent tariff and quota regimes, the potential profitability of the merger is higher under the quota regime because the merger-induced price increase is higher, as shown by

$$\tilde{R}(1,n) - \bar{R}(1,n) = \bar{h}_n.[g(N) - g(n)] > 0$$ [27]

Changing the quota will affect only the merger gain in the domestic market

$$\frac{d\tilde{G}(1,n)}{dq} = \frac{2}{n}\tilde{R}(1,n)\frac{d\tilde{p}}{dq} + \frac{2\tilde{h}_n}{n}[1 - g(n)]\frac{d\tilde{p}}{dq} \qquad (20A)$$

While the sign of this term is ambiguous in general, it is positive (since $d\tilde{p}/dq < 0$) for any mergers that were not initially profitable in the home market (i.e. for which $\tilde{R}(1,n) \le 0$). Thus a tightening of the quota would reduce the profitability of a marginal merger of this type. As with the tariff regime, this is because the tighter quota generates the same increase in outputs of both merger participants.

[QB] An International Merger that closes a firm in the Restricting Country

A merger between the most efficient foreign firm and the least efficient home firm, again sees firm *n* exit both markets, with changes in domestic and foreign prices as given in (17) above. The change in profits of foreign firm 1 is

$$\Delta\pi_1^* = \Delta\tilde{p}.qh_1^* + \Delta p^*(2f_1^* + \Delta p^*)$$

which reflects the inability of this firm to increase its sales in the home market. Thus the gain from this merger is

$$\tilde{G}(1^*, n) = \frac{\tilde{h}_n}{n}\tilde{R}(1^*, n) + 2\frac{f_n}{N}R^*(1^*, n) \qquad (19B)$$

where $\tilde{R}(1^*, n) = qh_1^* - n\tilde{h}_n$.

In comparing the potential profitability of this merger under the two regimes, we note that the output of the closing firm is the same in each case, which means that its lost profits are the same. The merger-induced price increase is greater under the quota, but the home sales of the most efficient foreign firm are higher under the tariff regime. The overall comparison of profitability is therefore ambiguous[28].

Changing the quota will only affect the profitability in the home market – i.e.

$$\frac{d\tilde{G}(1^*, n)}{dq} = \frac{\tilde{R}(1^*, n)}{n}\frac{d\tilde{p}}{dq} + \frac{\tilde{h}_n}{n}[h_1^* - n\frac{d\tilde{p}}{dq}] \qquad (20B)$$

For mergers initially unprofitable in the home market (where $\tilde{R}(1^*, n) \le 0$), the right side of (20B) is positive. That is, a tightening of the quota reduces the profitability of this merger, because it increases the domestic sales of the less efficient home partner and reduces the domestic sales of the more efficient foreign partner. However, for mergers that were originally more than marginally profitable, a more restrictive quota may lead to a rise in this merger's profitability.

Given that the merged firm is prevented by the quota from expanding its domestic sales from the lower cost foreign source, it might contemplate production for domestic sale using firm n's inefficient technology. This would not be undertaken however, since the profit margin on a unit of domestic production ($\tilde{p} - c_n(=\tilde{h}_n)$) is less than the reduction in revenue on firm imports ($qh_1^*.[d\tilde{p}/d\tilde{h}_n] = -qh_1^*$), if the merger was profitable in the first place (which requires $qh_1^* > \tilde{h}_n$).

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[27] $\tilde{G}(1, n) - \bar{G}(1, n) = \frac{2n^*\bar{h}_n}{nN}\{\bar{h}_1 + \bar{h}_n\frac{n+N}{2nN}\} > 0$

[QC] An International Merger that closes a firm in the Non-restricting Country

We would expect a merger between the most efficient domestic firm and the least efficient foreign firm, to see the departure of the latter from both markets, and we assume that the merged firm retains the quota rights (but does not use them as we shall see). In this case the changes in the home and foreign prices are given by:

$$\Delta\tilde{p} = \frac{qh_n^*}{n+1} \text{ and } \Delta p^* = \frac{f_n^*}{N}. \qquad (21)$$

The merger-induced price change under the quota regime is higher than that under the equivalent tariff regime because the output of the departing firm is higher and because fewer firms are permitted to respond to that increase. This implies that the gain in profits to the continuing firm is higher under the quota, since its initial output is the same in each case. But the lost profits of the closing firm

$$\tilde{\pi}_n^* = (\tilde{p} - c_n^*)qh_n^* + (f_n^*)^2$$

are also higher under the quota regime. One cannot then determine the relative profitability of this merger under the two regimes, in general.

The gain from this merger is

$$\tilde{G}(1, n^*) = \frac{qh_n^*}{n+1}\tilde{R}(1, n^*) + \frac{f_n^*}{N}R^*(1, n^*) \qquad (19C)$$

where $\tilde{R}(1, n^*) = 2\tilde{h}_1 + \Delta\tilde{p} - [n+1].[\tilde{p} - c_n^*]$. The effects of a small change in the quota on its profitability is given by

$$\frac{d\tilde{G}(1, n^*)}{dq} = \frac{h_n^*}{n+1}\tilde{R}(1, n^*) + \frac{qh_n^*}{[n+1]^2}\{h_n^* + [n-1].H^*\} \qquad (20C)$$

This derivative is positive for any merger that was originally profitable in the home market (i.e. $\tilde{R}(1, n^*) \geq 0$). In other words, a tightening of the quota leads to a decrease in the profitability of any merger between firm 1 and firm n* that was not initially unprofitable. The primary reason that the outcome in this case is opposite to that under the equivalent tariff, is that a tightening of the quota does not necessarily reduce the profits that firm n* obtains on its domestic sales. This depends on whether the initial quota happens to be set at the profit maximising value for this firm as given in (15). So while tightening the quota

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[28] $\tilde{G}(1^*, n) - \bar{G}(1^*, n) = \bar{h}_n\{\frac{qh_1^*}{n} - \frac{2\bar{h}_1^*}{N} - \frac{\bar{h}_n}{N^2}\}$. Given $\bar{h}_1^* > qh_1^*$, $n > n^*$ is sufficient for the merger to be

raises the output and profit of the continuing home partner, it reduces the price increase following the merger and may or may not reduce the profits of the departing partner. For a merger that was originally profitable, the outcome is a reduction in its profitability.

The merged firm would not wish to continue importing output from firm n*, because the profit from selling an additional unit from this source ($\tilde{p} - c_n^*$) is less than the loss on home produced sales ($h_1 . d\tilde{p}/dh_n^* = -[\tilde{p} - c_1]$). It may be constrained by "use-it-or-lose-it" provisions of the quota regime, however[29]. If these provisions apply, then failure by the merged firm to employ its quota entitlement will see those rights redistributed to other foreign firms, who can be expected to exercise them. In such a case the merged firm might as well continue to import from the foreign source and accept the profits that would otherwise go to its foreign competitors. Any potential gain from the merger would therefore arise only in the foreign market, and would be unaffected by changes in the restrictiveness of the home quota regime.

[QD] A National Merger in the Non-restricting Country

When this merger takes place, we expect firm n* to exit both markets and we suppose that the quota rights of both partners pass to the new merged firm. Thus after the merger, the merged firm is allowed to serve the home market up to $q(h_1^* + h_n^*)$. With this new quota constraint the profit maximisation problem of the merged firm for the home market is

$$\underset{\tilde{h}_m^*}{\text{Max}} (\tilde{p}_m - c_1^*)\tilde{h}_m^* \quad \text{s.t.} \quad \tilde{h}_m^* \le q(h_1^* + h_n^*)$$

where $d\tilde{p}_m / d\tilde{h}_m^* = -1$. The corresponding Lagrangian is

$$L = [\tilde{p}_m - c_1^*]\tilde{h}_m^* + \lambda[q(h_1^* + h_n^*) - \tilde{h}_m^*]$$

and, since $\tilde{h}_m^* > 0$, the first order conditions give:

$$\tilde{h}_m^* = \tilde{p}_m - c_1^* - \lambda \text{ and } \lambda \cdot \frac{\partial L}{\partial \lambda} = 0 \qquad (22)$$

If the quota constraint is binding on the merged firm, or the firm faces a use-it-or-lose-it constraint, then total sales in the home market are as before the merger, $\tilde{p}_m = \tilde{p}$ and $\lambda \ge 0$. Writing $\tilde{p} - c_1^* = \tilde{p} - p + p - c_1^*$, and using (3) and (13), we can substitute in (22) to obtain

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more profitable under the tariff.

[29] See Bergsten et al (1987) for a discussion of the administration of quota regimes.

$$\lambda = [1-q].[\frac{H^*}{n+1} + h_1^*] - qh_n^*$$

Thus the quota constraint is binding on the merged firm for quotas more restrictive than

$$\hat{q} = \frac{H^* + h_1^*.[n+1]}{H^* + [h_1^* + h_n^*].[n+1]}$$

In such cases the gain from this merger is

$$\widetilde{G}(1^*, n^*) = [c_n^* - c_1^*]qh_n^* + 2\frac{f_n^*}{N}R^*(1^*, n^*) \qquad (19D)$$

The gain in the home market results from the transfer of the less efficient foreign partner's quota allocation to the more efficient foreign partner.

Comparing the profitability of this merger under the two equivalent regimes, we can write:

$$\widetilde{G}(1^*, n^*) - \overline{G}(1^*, n^*) = [qh_n^* - \frac{2\overline{h}_n^*}{N}].[\overline{h}_1^* - \overline{h}_n^*] + \frac{2.[\overline{h}_n^*]^2}{N}[g(N)-1] \qquad (23)$$

Since $qh_n^* > \overline{h}_n^*$ and $g(N) > 1$, if this merger is profitable under a tariff regime, it will also be profitable under the equivalent quota regime.

The effects of a small change in the quota on the profitability of a merger of this type where the quota constraint continues to bind is given by

$$\frac{dG(1^*, n^*)}{dq} = (c_n^* - c_1^*)h_n^* \qquad (20D)$$

which is positive for all constrained mergers. A tightening of the overall quota reduces the quota transferred between the partners and hence the efficiency gain from the merger in the domestic market.

If the quota constraint is not binding on the merged firm, then imports to the home market fall as a result of this merger and the home price increases. The gain from the merger is then:

$$\widetilde{G}(1^*, n^*) = [\widetilde{p}_m - c_1^*]\widetilde{h}_m^* - [\widetilde{p} - c_1^*]qh_1^* + [\widetilde{p} - c_n^*]qh_n^* + \frac{2f_n^*}{N}R^*(1^*, n^*) \qquad (24)$$

Analysing this case is complicated because the home sales of the continuing partner are constrained by the quota pre-merger, but not post-merger[30], and hence the merger induced price increase is not simply proportional to the domestic sales of the closing partner – i.e

$$\Delta\tilde{p} = \frac{q[h_1^* + h_n^*] - \tilde{h}_m^*}{n+1} = \frac{[\frac{H^*}{n+1} + h_1^* + h_2^*][q - \hat{q}]}{n+2}$$

To consider the effects of changes in the quota on the profitability of this merger, it is useful to write the gain in the home market as a function of q – i.e.

$$\tilde{G}(1^*, n^*) = \gamma(q) = [1-\delta].\gamma(1) + \delta.\gamma(\hat{q}) - \delta.[1-\delta].B \qquad (19D')$$

where $\delta = \frac{1-q}{1-\hat{q}}$; $\gamma(1) = \frac{2h_n^*}{n+2}\{h_1^* - h_n^*.g(n+2)\}$; $\gamma(\hat{q}) = [h_1^* - h_n^*]\hat{q}h_n^* > 0$ and

$B = .\frac{h_n^*}{n+2}\{\frac{h_n^*}{n+2} + [1-\hat{q}].n.\frac{H^*}{n+1}\} > 0$. If the quota is set near to the free trade volume of imports $(q \approx 1, \delta \approx 0)$, then the gain in the home market, $\gamma(1)$, is what one would expect from (7) for the case where n+1 firms are free to respond to the price increase. This term can be positive or negative in general. If the quota is set close to the "binding" level $(q \approx \hat{q}, \delta \approx 1)$, then the gain in the home market $(\gamma(\hat{q}))$ is positive and arises largely from the transfer of quota to the more efficient partner as in (19D) above. For quotas in between, the home market gain is a weighted average of these two extremes, minus a positive term. But one can show that $\gamma(\hat{q}) - B > 0$ [31], so that if there is a gain from this merger at a just binding quota (i.e. $\gamma(1) \geq 0$), there is a gain from this merger at all tighter quotas. Otherwise (i.e. if $\gamma(1) < 0$), the merger may only become profitable once the quota is sufficiently restrictive.

Comparing the profitability of this merger under the two alternative trade regimes is difficult in general. For a very small tariff or just binding quota $(t \approx 0, q \approx 1)$, this merger is more profitable under the quota because, while the initial sales of the participants are the same, fewer firms can respond to the price increase under the quota. For more restrictive tariffs and quotas the initial home sales and profits of the departing partner are higher under

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[30] So that $\tilde{h}_m^* = \Delta\tilde{p} + qh_1^* + [1-q].[\frac{H^*}{n+1} + h_1^*] > \Delta\tilde{p} + qh_1^*$

[31] $\gamma(\hat{q}) - B = \frac{h_n^*}{n+2}\{[h_1^* - h_n^*][(n+1)\hat{q} + \frac{1}{n+2}] + h_1^*[n(1-\hat{q}) + \hat{q} - \frac{1}{n+2}]\} > 0$

the quota, while the corresponding comparison for the continuing partner is ambiguous. But (23) implies that the merger will be more profitable under the quota once the policies become sufficiently restrictive ($q \approx \hat{q}$). This yields a presumption that the merger will be more profitable under the quota.

The effects of a change in the quota on the profitability of this merger can be derived from (19D'). We have that $\partial\tilde{G}/\partial q = [\partial\tilde{G}/\partial\delta][\partial\delta/\partial q]$ and $\partial\delta/\partial q = -1/[1-\hat{q}] < 0$. Now

$$\frac{\partial\tilde{G}(1^*, n^*)}{\partial\delta} = \gamma(\hat{q}) - \gamma(1) + [2\delta - 1].B \qquad (20D')$$

Two observations can be made concerning (20D'). First, $\partial\tilde{G}/\partial\delta$ is increasing in δ, and, since $\gamma(\hat{q}) - \gamma(1) > 0$ [32], we know that $\partial\tilde{G}/\partial\delta$ is positive for high values of δ (i.e. $\delta \geq 1/2$) and hence low values of q in this range (i.e. $[1-\hat{q}]/2 > q$). Thus as q approaches $\hat{q}$, $\partial\tilde{G}/\partial q < 0$, and a tightening of the quota raises the profitability of the merger. Second, since $\gamma(\hat{q}) - B > 0$, $\partial\tilde{G}/\partial\delta$ is always positive if $\gamma(1) \leq 0$. Thus if the merger is not profitable at a just binding quota, its profitability will rise as the quota is tightened. These results indicate that a tightening of the quota will tend to raise the profitability of this merger, except where the merger was profitable at a just-binding quota, in which case there may be a range of quotas for which the profitability of the merger falls before it begins to rise again.

In summary, like the tariff, a tightening of the quota raises the domestic sales of the least efficient home firm and reduces its attractiveness as a merger partner at the margin. And, like the tariff, a tightening if the quota reduces the home sales of the least efficient foreign firm. But this does not mean that this firm is more attractive as a merger partner at the margin. Tightening the quota does not necessarily reduce the profits of this firm, and where the continuing partner is a home firm, the price increase following the merger is smaller at a tighter quota. Where both merger partners are foreign, the outcome depends on how restrictive the quota is. Once it becomes binding on the merged firm, the merger gain in the home market is proportional to the quota transferred between the partners, and hence falls

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[32] $\gamma(\hat{q}) - \gamma(1) = \frac{h_n^*}{n+2}\{h_1^*[n-2+2\hat{q}] + h_n^*[(n+2)(1-\hat{q}) - \frac{1}{n+2}]\} > 0$

as the quota is tightened. Prior to this, tightening the quota will raise the profitability of marginal mergers, as would raising the tariff.

V. Conclusions

In this paper we have analysed and compared the effects of tariff and quota restrictions on the incentives for national and international mergers in segmented oligopolistic markets. The results are presented in Table 1 and can be summarised as follows:

(1) If the home country imposes a tariff on imports, this increases the home sales of home producers and reduces the home sales of foreign producers. Since outputs within each group change by the same amount, the effects tend to be proportionately larger on the profits of the smaller firms. As a result the tariff discourages marginal mergers that would see the closure of relatively inefficient home firms and encourages marginal mergers that would close relatively inefficient foreign firms.

(2) Suppose instead that the home country were to impose a quota on imports from foreign firms, with quota rights allocated in proportion to free trade sales. Then again the home sales of all foreign firms fall (but now in the same proportion) and those of all home producers rise (by the same amount), relative to free trade. Like the tariff regime, marginal mergers which involve closure of the relatively inefficient home firm are discouraged by this rise in its profitability. But unlike the tariff regime, marginal mergers involving the closure of the relatively inefficient foreign firm are also discouraged by the quota, at least where the quota is binding on the merged firm. The quota may not reduce the profits of the relatively inefficient foreign firm, since it retains the quota rents. Where the merger involves two foreign firms, its profitability may be increased if the quota is not binding on the merged firm, but once the quota becomes binding the gain from the merger in the restricted market arises only from the production cost saving on the quota transferred to the more efficient partner, and the amount transferred falls as the quota is tightened.

(3) Our comparison of equivalent tariff and quota regimes led to ambiguous outcomes in international mergers (i.e. those involving producers located in different countries). The merger induced price increase is larger under the quota in both cases. But so are the initial profits of the relatively inefficient foreign firm, which tends to reduce the profitability of the merger that sees its closure. In the other case, the initial profits of the relatively efficient foreign firm may be higher under the tariff. For national mergers we found that any profitable merger under the tariff regime is also likely to be profitable under quota regime. For a merger involving home firms, this reflected the inability of the foreign

firms to respond to the price increase in the home market under the quota. The same argument applies to a merger involving foreign firms, when the tariff and quota are close to their free trade values. Once both policies have become sufficiently restrictive that the quota is binding on the merged firm, the merger is again more profitable under the quota. But the possibility that the merger is more profitable under the tariff at some intermediate values cannot be excluded.

Table 1: Comparison of Tariff and Quota Outcomes.

Type of Merger	Comparison of Equivalent Policies	Effects of Tariff Increase at the margin	Effects of Quota Tightening at the margin
National Merger in Restricting Country (1,n)	More Profitable Under Quota	Less Profitable	Less Profitable
International Merger Closing an Unrestricted Firm (1*,n)	Ambiguous	Less Profitable	Less Profitable
International Merger Closing a Restricted Firm (1,n*)	Ambiguous	More Profitable	Less Profitable
National Merger in Non-Restricting Country (1*,n*)	More Profitable Under the Quota (Presumption)	More Profitable	Less Profitable if Binding; More Profitable if Not Binding

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