

Trade liberalisation and horizontal mergers

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Abstract

This paper analyses the effects of tariff reductions on cost-reducing horizontal mergers in a Cournot oligopoly in a two-country world. The Gain-from-Merger function for a merger between two domestic firms is shown to be strictly concave and non-monotone in the tariff level. For sufficiently large cost savings from merger, Long and Vousden (1995) show that marginal bilateral reductions in the tariff level lead to increases in the Gain-from-Merger function in the neighborhood of free trade, i.e. for tariff levels sufficiently close to zero. In this paper we generalize this result for the case of non-marginal tariff reductions and for high initial tariff levels. For sufficiently small cost savings from merger, Long and Vousden show that marginal tariff reductions lead to decreases in the gains from merger. We show that this is not true for all tariff levels. For any given cost savings a marginal decrease of a tariff increases the profitability of a merger when the tariff is above a certain threshold. We also determine when a marginal tariff reduction can be a reliable indicator of the impact of a non-marginal tariff reduction such as a switch to free trade. We show that the analyses of marginal tariff reductions around the area of free trade may not lead to accurate prescriptions for competition policy. We also conduct an analysis of the impact of trade liberalisation on the desirability of a merger (from a social welfare viewpoint). We show that trade liberalization can increase the desirability of a merger in Home and Foreign.

1 Introduction

During the period 1981-98 there were 70,000 mergers proposed across North America and Europe, each worth over \$1 million, of which approximately 45,000 were realised, the average value of firms being \$2 million. (Gugler, Mueller, Yurtoglu, Zulehner, 2003)). Given that globalisation affects merger activity across countries, often the merging firms being some of the largest multinational companies, policy measures taken by antitrust authorities based on the predictions of the existing models of merger analysis affect the welfare of billions of consumers across the world. As pointed out by Kofi Annan, Secretary General of the United Nations, "a freer market - and particularly the emerging global market for enterprises - calls for greater vigilance" (World Investment Report, UNCTAD).

Trade liberalisation in Europe, North America and Australia has been accompanied by the formation of a growing number of mergers, mainly domestic in Australia and the Canada-U.S. free trade area, including many cross-border cases in Europe (Long and Vousden, 1995). The effects of changes in trade policy on the industry structure and competition policy of the trading partners has been studied by many researchers from various perspectives.

Dixit (1984), one of the first studies in this area, shows that trade liberalisation, by increasing competition in the domestic market, reduces the need for active competition policy. Rysman (2000) sets up a Cournot model in which a country first selects the number of firms in the industry and then the optimal trade policy (in this case, an export subsidy). Since the model only considers the case where home and foreign firms compete in a third market, so that consumer surplus is not an issue for the two producing countries, each country can be shown to choose a monopoly and then to provide export subsidies. If agreements such as GATT limit the level of subsidies, it can be shown that competition rises in the producing countries, so that these results support those of Dixit. Neven and Seabright (1997) also obtain these results by examining the changes in firms' incentives to merge post-trade-liberalisation, instead of focusing on the choices made by the governments to maximise social welfare.

Horn and Levinson (2001) disagree. They investigate the effect of international agreements like GATT on merger policies (in this case represented by the level of industry concentration) that are chosen at a national level. Trade liberalisation results in stricter standards for competition policy in this model. Countries are shown to be substituting competition policy for trade policy in the use of promoting their own welfare at the ex-

pense of that of others. Richardson (1999) sets up a similar model in which countries strategically choose both the trade and merger policies and obtains similar results.

Although not the focus of our study in this paper, a particularly interesting area of study involves the examination of the benefits of setting up international antitrust authorities. Since 1996, the WTO has been paying close attention to competition policy, and the EU has set up a supra-national level antitrust authority. Head and Ries (1997) summarise the international welfare effects of cross-border mergers and point out that given the large volume of cross-border mergers today, world welfare could be significantly increased were there to exist international bodies for the implementation of global antitrust laws. The related literature include Bhagwati (1991), Gatsios and Seabright (1990) and Neven (1992). Bond (1997) sets up a political economy model to examine the differences in the decision to allow particular mergers between the federal government and the state governments.

Dixit (1984), Horn and Levinsohn (2001), Rysman (2000), Neven and Seabright (1997) and Richardson (1999), all study the effect of marginal changes in the tariff level on the gains from domestic mergers. The model presented in this paper is based on another paper in the same area, namely Long and Vousden (1995). Long and Vousden analyse the effects of marginal tariff reductions in the neighbourhood of free trade on horizontal mergers in a Cournot oligopoly in a two country world. For mergers between two domestic heterogeneous firms unilateral tariff reductions encourage mergers which concentrate market power at the expense of mergers which reduce cost, while bilateral tariff reductions have the opposite effect, encouraging mergers which significantly reduce cost. The merger induced cost savings in their model arise from differences in the marginal costs of production across firms, with a merged firm producing at the lowest marginal cost of its constituents. The analysis is carried out by focusing on the gains from trade as a function of the cost differential between the merging firms and then doing comparative statics to see the effect of marginal changes in the tariff level.

The only existing study of the effects of non-marginal changes in the tariff level, to our knowledge, is one conducted by Gaudet and Kanouni (2001). The equilibria that occur before and after the abolition of the tariff are compared, for different levels of the tariff. The merging firms are assumed to have no variable costs but do have identical fixed costs. This is similar to the assumptions made by Ross (1988), who examines the effect of marginal tariff reductions on gains from merger. The savings on fixed cost from the

merger makes mergers profitable. The threshold value of fixed costs that would make the merger just profitable is found. It is then examined how this threshold value changes with changes in the tariff level. The threshold values for different levels of tariff (relative to the prohibitive one) are compared to that under free trade. The larger the threshold value relative to the free trade threshold value, the larger the fixed cost savings from merger must be to make the merger profitable. In this setting, it is shown that when the tariff is not prohibitive, trade liberalisation increases the profitability of the merger. When the tariff is prohibitive, trade liberalisation always reduces the profitability of merger.

Our paper uses the same framework as Long and Vousden (1995) to set up its basic model but focuses on how the gains from merger between heterogeneous domestic firms change as the tariff level is increased progressively from zero to the prohibitive level (the prohibitive tariff being the minimum tariff level sufficiently high so as to reduce imports to zero). ‘Thus we are able to analyse the effects of non-marginal changes in the tariff level. In particular, the gains- from-merger function is shown to be non-monotone (and strictly concave) in the pre-liberalisation tariff level. For sufficiently small cost savings from merger, Long and Vousden show that marginal tariff reductions lead to decreases in the gains from merger. That this does not necessarily hold for non-marginal tariff reductions, and that for sufficiently high initial tariff levels even the marginal changes in the tariff level push the gains from merger in the opposite direction is shown in this paper. The effects of marginal and non-marginal changes in the tariff level on the gains from merger are studied in detail in this paper and it is shown that analyses of marginal tariff reductions around the area of free trade may not lead to accurate prescriptions for competition policy.

2 Domestic Mergers: The Model and Preliminaries

We consider two countries: Home and Foreign¹. Foreign has m identical firms and Home has $n+2$ firms. All firms produce a homogenous product. Each foreign firm has a constant marginal cost given by c_F . Each of the m foreign firms sells y in the home country and y^* in the foreign. In Home, we assume that n firms (firm 3 to firm $n + 2$) are identical with marginal cost c . The non-identical domestic firms, firm 1 and firm 2 have different

¹In order to make the comparison between our results and those of Long and Vousden easier we follow their setting and notation closely.

marginal costs (at least one different from c). Without loss of generality let us assume that $c_1 > c_2$. Firm 1 sells x_1 in the domestic market and x_1^* in the foreign market. Firm 2 sells x_2 in the domestic market and x_2^* in the foreign market. Each of the n identical domestic firms sells x in the domestic market and x^* in the foreign market.

In each market firms compete in quantities, i.e. *à la* Cournot. Both countries have identical linear demand curves given by:

$$p = a - bQ$$

where $a, b > 0$ and p and Q are the price and total quantity sold in the country.

Each country imposes an import tariff. Since the two countries are identical we study the case where the tariffs imposed by Foreign and Home are identical: a symmetric bilateral tariff denoted t . The model examines the case when both countries simultaneously reduce t by the same amount, i.e. bilateral tariff reductions.

2.1 The market equilibrium:

Let the total quantity sold in Home be $Q = x_1 + x_2 + nx + y$ and that in Foreign be $Q^* = x_1^* + x_2^* + nx^* + y^*$.

The profits of firm i in Home from its sales in Home are given by:

$$\pi_i = \begin{cases} x_i(a - bQ) - c_i x_i & \text{if } i = 1, 2 \\ x(a - bQ) - cx, & \text{if } i = 3, 4, \dots, n + 2 \end{cases} \quad (1)$$

The profits of firm i in Home from its sales in Foreign are given by:

$$\pi_i^* = \begin{cases} x_i^*(a - bQ^*) - (c_i + t)x_i^* & \text{if } i = 1, 2 \\ x^*(a - bQ^*) - (c + t)x^*, & \text{if } i = 3, 4, \dots, n + 2 \end{cases} \quad (2)$$

The profits of firm f in Foreign from its sales in Home are given by:

$$\pi_f = y(a - bQ) - (c_F + t)y, \text{ for } f = 1, 2, \dots, m \quad (3)$$

The profits of firm f in Foreign from its sales in Foreign are given by:

$$\pi_f^* = y^*(a - bQ^*) - c_F y^*, \text{ for } f = 1, 2, \dots, m \quad (4)$$

Each of Home's firms, i , takes the quantity chosen by the other $(n + m + 1)$ firms as given and chooses the quantities x_i and x_i^* that maximize **equations** (1) and (2) respectively, and similarly each of Foreign's firm f takes the quantity chosen by the other $(n + m + 1)$ firms as given and chooses the quantities y_i and y_i^* that maximize **equations** (3) and (4) respectively.

The Cournot equilibrium quantities for the two markets are computed. We have the interior equilibrium quantities sold in Home:

$$\begin{aligned} x_1 &= \frac{a + c_2 + nc + m(c_F + t) - (m + n + 2)c_1}{b(m + n + 3)} \\ x_2 &= \frac{a + c_1 + nc + m(c_F + t) - (m + n + 2)c_2}{b(m + n + 3)} \\ x &= \frac{a + c_1 + c_2 + m(c_F + t) - (m + 3)c}{b(m + n + 3)} \\ y &= \frac{a + c_1 + c_2 + nc - (n + 3)(c_F + t)}{b(m + n + 3)} \end{aligned}$$

Note that $x_1 > 0$ iff

$$z < \frac{a + nc + m(c_F + t) - (m + n + 1)c_2}{m + n + 2}$$

The total quantity sold in Home is

$$x_1 + x_2 + nx + my = -\frac{2c_2 + mc_F + nc + z - 2a + mt - na - ma}{b(m + n + 3)}$$

The equilibrium quantities sold in Foreign are given by:

$$\begin{aligned} x_1^* &= \frac{a + (c_2 + t) + n(c + t) + m(c_F) - (m + n + 2)(c_1 + t)}{b(m + n + 3)} \\ x_2^* &= \frac{a + (c_1 + t) + n(c + t) + m(c_F) - (m + n + 2)(c_2 + t)}{b(m + n + 3)} \\ x^* &= \frac{a + (c_1 + t) + (c_2 + t) + m(c_F) - (m + 3)(c + t)}{b(m + n + 3)} \\ y^* &= \frac{a + (c_1 + t) + (c_2 + t) + n(c + t) - (n + 3)c_F}{b(m + n + 3)} \end{aligned}$$

Note that $x_1^* > 0$ iff

$$z < z_{\max}(t) \equiv \frac{a + nc + mc_F - (m + n + 1)c_2}{(m + n + 2)} - \frac{(m + 1)}{(m + n + 2)}t$$

The total quantity sold in Foreign is

$$x_1^* + x_2^* + nx^* + my^* = -\frac{nt + 2c_2 + mc_F + nc + 2t + z - 2a - na - ma}{b(m + n + 3)}$$

It is straightforward to obtain the profits for each firm at the equilibrium by substituting the quantities above into equations (1), (2), (3) and (4).

The profits of Firms 1, 2 at the equilibrium can be written as

$$\pi_i = b \left((x_i)^2 + (x_i^*)^2 \right), i = 1, 2$$

We want to study the effect of trade policy on antitrust policy towards mergers. We first determine the impact of trade policy on firms' incentive to merge. In a closed economy, under Cournot oligopoly mergers are not always profitable. In fact, as shown by Salant, Switzer and Reynolds (SSR), 1983, a non-cost-reducing merger is only profitable if the merging firms constitute 80% of the post-merger market. The case studied in SSR can be retrieved from the model at hand by for example setting $t = 0$ and $c_1 = c_2 = c_F = c$, or alternatively setting t at a prohibitive level such that no exchange takes place.

2.2 A domestic merger:

In this paper we focus on the case of the merger of only two firms, firm 1 and firm 2 in Home. When **these** two firms merge, the new entity and the $n + m$ other firms compete *à la* Cournot. In the SSR framework, such a merger results in a Cournot equilibrium between $n + m + 1$ symmetric firms. Unless it's a merger to monopoly, the merger is always unprofitable for the merging firms: the profits of the new entity are smaller than the joint profits of the two firms in the premerger competition. Although in the SSR framework, firms are symmetric, the result can be generalized to the case of asymmetric firms. In our case firms are asymmetric with constant marginal costs, and the cost of the new entity is assumed to correspond to the lower of the two marginal costs of the merging firms i.e. There are cost savings from merger. The merging firms are firm 1 and firm 2 and the marginal cost of the new entity is c_2 (since we assumed $c_2 < c_1$). We compute the post-merger equilibrium quantities sold in Home and Foreign respectively. For interior solutions we find:

$$X = \frac{a + nc + m(c_F + t) - (m + n + 1)c_2}{b(m + n + 2)}$$

$$x = \frac{a + c_2 + m(c_F + t) - (m + 2)c}{b(m + n + 2)}$$

$$y = \frac{a + c_2 + nc - (n + 2)(c_F + t)}{b(m + n + 2)}$$

After a merger, the merged entity is producing a positive quantity, X , iff

$$c_2 < \frac{a + nc + m(c_F + t)}{(m + n + 1)}$$

The total quantity sold in Home after a merger

$$X + nx + my = -\frac{-a + nc + mc_F + mt + c_2 - na - ma}{b(m + n + 2)}$$

The equilibrium quantities sold in Foreign after a merger

$$X^* = \frac{a + n(c + t) + mc_F - (m + n + 1)(c_2 + t)}{b(m + n + 2)}$$

$$x^* = \frac{a + (c_2 + t) + m(c_F) - (m + 2)(c + t)}{b(m + n + 2)}$$

$$y^* = \frac{a + (c_2 + t) + n(c + t) - (n + 2)(c_F)}{b(m + n + 2)}$$

where X and X^* denote the quantities sold by the merged entity in Home and Foreign respectively.

Note that $X^* > 0$ iff

$$c_2 < \frac{a + nc + mc_F - (m + 1)t}{(m + n + 1)}$$

The total quantity sold in Foreign is

$$X^* + nx^* + my^* = -\frac{-a + nc + mc_F + c_2 + t - na + nt - ma}{b(m + n + 2)}$$

The change in production in Home after a merger is

$$X + nx + my - (x_1 + x_2 + nx + my) = \frac{c_2 - mc_F - nc + 2z - a + nz + nc_2 + mc_2 + mz - mt}{b(m + n + 3)(m + n + 2)}$$

which is negative for $z < z_{\max}(t)$. Consumer surplus, given by $\frac{b}{2}(Q)^2$, will always fall after a merger.

The profits of the merged firm, indexed by the subscript M , from sales in Home and Foreign respectively are given by:

$$\pi_M = b(X)^2 \text{ and } \pi_M^* = b(X_i^*)^2.$$

3 Profitability of domestic merger and Trade policy

We now turn to the case of interest of this paper: the impact of import tariffs on the profitability of mergers. In the setup described in Section 2 above, we consider the merger of firm 1 and firm 2 in Home.

The merger will thus be profitable if and only if:

$$G \equiv \pi_M + \pi_M^* - (\pi_1 + \pi_1^*) - (\pi_2 + \pi_2^*) \geq 0$$

where G represents the gains from the merger.

After substitution of the profits we have

$$G \equiv b(X)^2 + b(X^*)^2 - (b((x_1)^2 + (x_1^*)^2)) - (b((x_2)^2 + (x_2^*)^2)) \geq 0$$

In this context, trade liberalization takes the form of a decrease of the tariff t . We can first note that G is a quadratic function of t . Computing the second derivative of G with respect to t gives:

$$\frac{\partial^2 G}{\partial t^2} = -\frac{2(2m + 2n + 2mn + m^2 + n^2 - 1)(2m + 2m^2 + 1)}{b(m + n + 2)^2(m + n + 3)^2} < 0 \text{ for all } n, m > 0.$$

The gains from merger, G , is a function of t and the other parameters of the model $(a, b, c, c_F, c_1, c_2, m, n)$. Determining the sign of G in general (for all $(a, b, c, c_f, c_1, c_2, m, n)$) proves to be too difficult. A first attempt is to analyse the sign of G in the neighborhood of a given tariff level t_0 .

We say that trade liberalisation increases the profitability of merger if

$$\left. \frac{\partial G}{\partial t} \right|_{t=t_0} < 0$$

and decrease the profitability of a merger if $\left. \frac{\partial G}{\partial t} \right|_{t=t_0} > 0$.

Long and Vousden (1995) study the case $t_0 = 0$. This case constitutes a study of the profitability of a merger in the neighborhood of free trade.

$$G(t, z) = \frac{1}{b} \left(\frac{a + nc + m(c_F + t) - (m + n + 1)c_2}{m + n + 2} \right)^2 + \tag{5}$$

$$\frac{1}{b} \left(\frac{a + n(c + t) + m(c_F) - (m + n + 1)(c_2 + t)}{m + n + 2} \right)^2 - \tag{6}$$

$$\frac{1}{b} \left(\frac{a + c_2 + nc + m(c_F + t) - (m + n + 2)c_1}{m + n + 3} \right)^2 + \quad (7)$$

$$\frac{1}{b} \left(\frac{a + (c_2 + t) + n(c + t) + m(c_F) - (m + n + 2)(c_1 + t)}{b(m + n + 3)} \right)^2 - \quad (8)$$

$$\frac{1}{b} \left(\frac{a + c_1 + nc + m(c_F + t) - (m + n + 2)c_2}{m + n + 3} \right)^2 + \quad (9)$$

$$\frac{1}{b} \left(\frac{a + (c_1 + t) + n(c + t) + m(c_F) - (m + n + 2)(c_2 + t)}{m + n + 3} \right)^2 \quad (10)$$

Proposition 1:

Let $z \equiv c_1 - c_2$ be the cost differential between the merging firms, there exists a positive level of cost differential, denoted by z^* , above which marginal bilateral reductions in t , in the neighbourhood of free trade ($t_0 = 0$), lead to increases in the gains from merger and below which the same lead to decreases in the gains from merger.

Proof: see Long and Vousden (1995), Proposition 2 ■

In the neighbourhood of free trade, equal marginal bilateral tariff reductions encourage previously unprofitable mergers with high cost savings. Thus bilateral tariff reductions encourage mergers which primarily reduce cost rather than those which merely increase market concentration.

This has an important policy implication: while lowering barriers to trade such as a tariff, competition policy might not need to be made stricter since only mergers that create large cost savings will be encouraged. Before any policy prescriptions can be made, however, it must be investigated whether the cost savings from merger are sufficiently large to overcome the negative effect of the merger on consumers' surplus.

Another factor to consider is that this result is established only in the neighborhood of free trade ($t_0 = 0$). In many instances, the initial tariff is strictly positive. We first question the validity of the implications of Proposition 1 when we have a marginal tariff reduction around a strictly positive tariff level. Moreover, while short term changes in tariffs are gradual and their impact can be approximated by a local analysis (in the neighborhood of a given tariff), in the long-run, free trade agreements set non-marginal changes in the level of tariffs, and the results from a local analysis could be unreliable. Therefore we determine the impact of a non-marginal tariff reduction on firms' incentives to merge.

Proposition 2:

Given a tariff $t > 0$, a marginal trade liberalization increases (decreases) the prof-

itability of a merger iff $z > z^*(t)$ (iff $z < z^*(t)$) where

$$z^*(t) = \left(-1 + 2m + 2n + m^2 + 2nm + n^2\right) \frac{(a + nc + mc_F - (m + n + 1)c_2) - (2m^2 + 1 + 2m)t}{(m + n + 2)^2(m + n + 1)}$$

Proof:

Re-arranging 5 and taking the derivative with respect to t we get:

$$\begin{aligned} \frac{\partial G(t, z)}{\partial t} = & \frac{2}{b} \frac{-1 + 2m + n^2 + m^2 + 2mn + 2n}{(m + n + 3)^2(m + n + 2)^2} a + \\ & \frac{2}{b} \frac{-3nm^2 - 4 - m^3 - 5m^2 - 8m - n^3 - 5n^2 - 8n - 3mn^2 - 10mn}{(m + n + 3)^2(m + n + 2)^2} z + \\ & \frac{2}{b} \frac{mn^2 - m + 2mn + 2nm^2 + 2m^2 + m^3}{(m + n + 3)^2(m + n + 2)^2} c_F + \\ & \frac{2}{b} \frac{-6mn - 3nm^2 - 3mn^2 - n - m^3 + 1 - n^3 - m - 3n^2 - 3m^2}{(m + n + 3)^2(m + n + 2)^2} c_2 + \\ & \frac{2}{b} \frac{1 - 2m^4 - n^2 - 6m^3 - 3m^2 - 6mn - 4m^3n - 8nm^2 - 2mn^2 - 2n - 2m^2n^2}{(m + n + 3)^2(m + n + 2)^2} t + \\ & \frac{2}{b} \frac{nm^2 - n + 2mn + 2mn^2 + 2n^2 + n^3}{(m + n + 3)^2(m + n + 2)^2} c \end{aligned}$$

The term $\frac{\partial G(t, z)}{\partial t}$ is linear and strictly decreasing in z , and $z^*(t)$ corresponds to the cost savings such that $\frac{\partial G(t, z^*(t))}{\partial t} = 0$ ■

We note that the threshold of cost savings, $z^*(t)$, beyond which $\frac{\partial G(t, z)}{\partial t} < 0$, is an increasing function of a, c or c_F . The larger is a, c or c_F the more likely a marginal trade liberalization will decrease the profitability of merger. Moreover $z^*(t)$ is a decreasing function of the merged firm's production cost. The larger the cost of the merged firm the more likely a marginal trade liberalization is going to increase the profitability of merger.

For a given cost savings from merger, z , trade liberalization can decrease the profitability of merger for an efficient merged firm (low c_2) and increase the profitability of a less efficient merged firm (high c_2). The impact of the number of domestic competitors (n) depends on $c - c_2$, if $c - c_2 < 0$ the merged firm is less efficient than its competitors then $z^*(t)$ is a decreasing function of the domestic number of firms n . When n is high then trade liberalization increases the profitability of a merger and when n is low trade liberalization can decrease the profitability of merger.

The cost savings threshold $z^*(t)$ is a decreasing function of the tariff t and therefore for $t > 0$ we have $z^*(t) < z^*(0) = z_0^*$.

For a given tariff t_0 , if $z < z^*(t_0)$ for $t_0 > 0$ we have $z < z^*(t) < z_0^*$ for all $0 < t < t_0$ and therefore $\frac{\partial G}{\partial t} > 0$ for all $0 < t < t_0$. If trade liberalization decreases the profitability of a merger at t_0 then it will decrease the profitability of merger at any $0 < t < t_0$. We can therefore draw a conclusion regarding a non-marginal change in tariffs from $t = t_0$ to $t = 0$: for a given tariff t_0 , if $z < z^*(t_0)$ for $t_0 > 0$ then $G(t, z) > G(0, z)$.

Similarly if $z > z_0^*$ then we have $z > z_0^* > z^*(t)$ for all $0 < t < t_0$ and therefore $\frac{\partial G}{\partial t} < 0$ for all $0 < t < t_0$. If trade liberalization increases the profitability of a merger around free trade then it will increase the profitability of merger at any $0 < t < t_0$. We can draw a conclusion regarding a non-marginal change in tariffs from $t = t_0$ to $t = 0$: for a given tariff t_0 , if $z > z_0^*$ then $G(t, z) < G(0, z)$.

An interesting case arises. Given a tariff $t > 0$ we have for any $z^*(t) < z < z_0^*$: $\frac{\partial G}{\partial t} \Big|_t < 0$ and $\frac{\partial G}{\partial t} \Big|_{t=0} > 0$. The analysis of a marginal tariff reduction will cease to be a reliable predictor on the incentives to merge when moving from protection to free trade. The conclusions around $t > 0$ and $t = 0$ give conflicting recommendations on how to adjust competition policy following a move toward free trade.

Proposition 3:

For $z^*(t) < z < \tilde{z}(t) < z_0^*$, we have $\frac{\partial G}{\partial t} \Big|_t < 0$ and yet $G(0, z) < G(t, z)$ where

$$\tilde{z}(t) = -\frac{1}{2} \left(-1 + 2m + 2n + m^2 + 2nm + n^2 \right) \frac{2tm^2 + 2mt + t - 2mc_F - 2a - 2nc + 2c_2 + 2c_2m + 2c_2n}{(m+n+2)^2(m+n+1)} \quad (11)$$

Proof:

The function $G(t, z) - G(0, z)$ is a linear decreasing function of z with $G(t, \tilde{z}(t)) - G(0, \tilde{z}(t)) = 0$ where $\tilde{z}(t)$ is given by (11). Therefore for $z < \tilde{z}$ we have $G(t, z) - G(0, z) > 0$ and for $z > \tilde{z}$ we have $G(t, z) - G(0, z) < 0$. This, along with Proposition 2 completes the proof ■

It can be shown that the threshold cost savings $\tilde{z}(t)$ can be written as

$$\tilde{z}(t) = \frac{z^*(t) + z_0^*}{2}$$

Proposition 3 effectively shows that we can have the following situation: $\frac{\partial G}{\partial t} \Big|_t < 0$ and yet $G(0, z) < G(t, z)$. A marginal trade liberalization increases the profitability of a merger however a complete removal of a tariff reduces the profitability of a merger.

This situation arises when $z^*(t) < z < \tilde{z}(t) < z_0^*$ where $\tilde{z}(t)$ is such that $G(t, \tilde{z}) - G(0, \tilde{z}) = 0$. For this range of values of z our results support that of Gaudet and Kanouni

(2004) in the sense that marginal tariff reductions and non-marginal ones might lead to different changes in the profitability of mergers.

When $z_0^* > z > \tilde{z}(t)$ then $G(0, z) > G(t, z)$ and $\left. \frac{\partial G}{\partial t} \right|_t < 0$ a marginal trade liberalization would still be a good indicator of the impact of a non-marginal tariff change from t to 0 on the profitability of a merger.

We now turn to the study of the effects of trade liberalization on the change of welfare due to a merger. To this end, we introduce the main components of the social welfare function in the following section.

4 Welfare Effects of Domestic Mergers in an Open Economy

4.1 Welfare Effects on Home:

In this setting, it is straightforward to compute the pre-merger and post-merger social welfare, which is taken to be the sum of consumers' surplus, producers' surplus and government revenue.

Pre-merger consumers' surplus is given by

$$\begin{aligned} CS_B &= \int_0^{x_1+x_2+nx+my} P(Q)dQ - (P(x_1+x_2+nx+y))(x_1+x_2+nx+y) \\ &= \frac{(-a(m+n+2) + nc + c_1 + c_2 + m(c_F + t))^2}{2b(m+n+3)^2} \end{aligned} \quad (12)$$

Post-merger consumers' surplus is given by

$$\begin{aligned} CS_M &= \int_0^{X+nx+my} P(Q)dQ - (P(X+nx+my))(X+nx+my) \\ &= \frac{(-a(m+n+1) + nc + c_2 + m(c_F + t))^2}{2b(m+n+2)^2} \end{aligned} \quad (13)$$

The change in the quantity consumed as a result of the merger in the Home market is given by:

$$\frac{2z - a + c_2 + nc_2 + mc_2 - nc - mc_F + zm + zn - mt}{(m+n+2)(m+n+3)} < 0$$

Consumers' surplus will always fall since the quantity sold falls. This fall will be decreasing in absolute value following trade liberalization. This can be seen by examining the pre-merger consumers' surplus given by eq. 12.

Pre-merger tariff revenue:

$$TR_B = t(my) = t \left(\frac{m}{b(m+n+3)} \right) (a + c_1 + c_2 + nc - (n+3)(c_F + t))$$

Post-merger tariff revenue:

$$TR_M = t(my) = t \left(\frac{m}{b(m+n+2)} \right) (a + c_2 + nc - (n+2)(c_F + t)) \quad (14)$$

The change in tariff revenue

$$T(t) = -mt \frac{2z - a + c_2 + nc_2 + mc_2 - nc - mc_F + zm + zn - mt}{b(m+n+2)(m+n+3)} \quad (15)$$

The change in tariff revenue from merger is quadratic and convex in the tariff level. A merger induces an increase in imports and therefore an increase in tariff revenues. Lowering the tariff reduces the tariff revenues for a given level of the imports, however increases the amount imports the final impact of a marginal trade liberalisation on tariff revenues turns out to be negative. This is shown by writing $T(t)$ as

$$T(t) = m^2 \frac{t(t-t')}{b(m+n+2)(m+n+3)} > 0 \quad (16)$$

where $t' = -\frac{1}{m}(a - (m+n+2)(z+c_2) + c_2 + nc + mc_F) < 0$ from the non-negativity of the production of firm 1.

Pre-merger producers' surplus is given by:

$$\begin{aligned} PS_B &= \pi_1 + \pi_2 + n\pi + \pi_1^* + \pi_2^* + n\pi^* \\ &= \frac{(a + c_2 + nc + m(c_F + t) - (m+n+2)c_1)^2 + (a + c_1 + nc + m(c_F + t) - (m+n+2)c_2)^2}{b(m+n+3)^2} \\ &\quad + \frac{1}{b} \left(\frac{a + (c_2 + t) + n(c + t) + m(c_F) - (m+n+2)(c_1 + t)}{(m+n+3)} \right)^2 + \frac{1}{b} \left(\frac{a + (c_1 + t) + n(c + t) + m(c_F) - (m+n+2)(c_2 + t)}{(m+n+3)} \right)^2 \\ &\quad + \frac{n}{b} \left(\frac{a + (c_1 + t) + (c_2 + t) + m(c_F) - (m+3)(c + t)}{(m+n+3)} \right)^2 \end{aligned}$$

Post-merger producers' surplus is given by:

$$\begin{aligned}
PS_M &= \pi_M + n\pi + \pi_M^* + n\pi^* \\
&= \frac{(a + nc + m(c_F + t) - (m + n + 1)c_2)^2 + n(a + c_2 + m(c_F + t) - (m + 2)c)^2}{b(m + n + 2)^2} + \\
&\quad \frac{1}{b} \left(\frac{a + n(c + t) + mc_F - (m + n + 1)(c_2 + t)}{m + n + 2} \right)^2 + \frac{n}{b} \left(\frac{a + (c_2 + t) + m(c_F) - (m + 2)(c + t)}{m + n + 2} \right)^2
\end{aligned}$$

In the absence of fixed costs, producers' surplus equals the joint profits of all the existing domestic firms for any given market structure. For any given tariff level, the greater the cost-saving from merger, $(c_1 - c_2)$, the greater is post-merger producers' surplus as compared to the pre-merger level. This is because the greater the cost-saving from merger, the greater is post-merger merged firm's profit as compared to the pre-merger level. The nonparticipating firms also enjoy higher profits as a result of the merger, but these are decreasing in the cost-savings from merger.

The last terms of PS_B and PS_M give the non-participating firms joint profits under each market structure. The higher the cost-saving from merger, the lower is post-merger joint profits of the non-participating firms as compared to the pre-merger levels. For any given market structure, the lower the nonparticipating firms' own costs, c , the higher its profits.

The smaller denominator of PS_M as compared to that of PS_B shows that given any set of parameter values, profits of both the merged firm and non-participating firms are scaled upward as a result of merger.

Pre-merger social welfare is given by:

$$W_B = CS_B + PS_B + TR_B$$

Post-merger social welfare is given by:

$$W_M = CS_M + PS_M + TR_M$$

Let $F(t, z)$ denote the change in welfare due to a merger

$$F(t, z) \equiv W_M - W_B$$

We say that a marginal trade liberalization increases (decreases) the desirability of a merger when $\frac{\partial F(t,z)}{\partial t} < 0$ ($\frac{\partial F(t,z)}{\partial t} > 0$)

Proposition 4:

Given a tariff t , a marginal trade liberalization increases (decreases) the desirability of a merger when $z > z_w$ (when $z < z_w$) where

$$z_w(t) = \frac{2 + 6m^2n^2 + 4m^3n - 2m^4 + 11m^2 + 2n^2 + 6n + 24nm^2 + 4mn^2 + 12mn}{(m+n+2)^2(m^2+mn+6m+2)}t + \frac{-2m + 15m^2 + m^4 + 9m^3 - 6mn + m^2n^2 + 7nm^2 - 2mn^2 + 2m^3n}{(m+n+2)^2(m^2+mn+6m+2)}c_F + \frac{2 - 4n - m^4 - 9m^3 - 7m - 2n^2 - 19m^2 - 21mn - mn^3 - 3m^2n^2 - 18nm^2 - 9mn^2 - 3m^3n}{(m+n+2)^2(m^2+mn+6m+2)} - \frac{-2 + 4m^2 - 2n^2 - 6n + 9m + 2mn}{(m+n+2)^2(m^2+mn+6m+2)}a + \frac{2m^2n^2 + 10n + 4n^2 + 11nm^2 + 25mn + 11mn^2 + mn^3 + m^3n}{(m+n+2)^2(m^2+mn+6m+2)}c$$

Proof:

We determine the impact of a marginal change of tariff on the welfare change due to a merger $\frac{\partial F(t,z)}{\partial t}$

$$\frac{\partial F(t,z)}{\partial t} = -\frac{2n^2 - 2mn - 4m^2 + 2 + 6n - 9m}{b(m+n+3)^2(m+n+2)^2}a - \frac{m^2 + mn + 6m + 2}{b(m+n+3)^2}z - \frac{2mn^2 - m^2n^2 - 15m^2 - m^4 + 2m + 6mn - 7nm^2 - 2m^3n - 9m^3}{b(m+n+3)^2(m+n+2)^2}c_F - \frac{3m^3n + 3m^2n^2 + 21mn + 2n^2 + 9mn^2 + mn^3 + 9m^3 + 7m + 18nm^2 + 4n + m^4 + 19m}{b(m+n+3)^2(m+n+2)^2} - \frac{2m^4 - 6n - 2 - 12mn - 2n^2 - 4m^3n - 6m^2n^2 - 24nm^2 - 4mn^2 - 11m^2}{b(m+n+3)^2(m+n+2)^2}t - \frac{-11mn^2 - 11nm^2 - 25mn - 10n - mn^3 - m^3n - 4n^2 - 2m^2n^2}{b(m+n+3)^2(m+n+2)^2}c$$

The function $\frac{\partial F(t,z)}{\partial t}$ is a strictly decreasing linear function of z with $\frac{\partial F(t,z_w(t))}{\partial t} = 0$ where $z_w(t)$ is given by (19) ■

We note that $\frac{\partial z_w(t)}{\partial c} > 0$ and $\frac{\partial z_w(t)}{\partial c_2} < 0$. For a given cost savings z , if the cost of the merged firm is high we have $z < z_w(t)$ and ($\frac{\partial F(t,z)}{\partial t} > 0$) and the cost is low we can have $z > z_w(t)$ and ($\frac{\partial F(t,z)}{\partial t} < 0$). Trade liberalization increases the desirability of a merger

when the merged firm's cost is low and decreases the desirability when the merged firm's cost is high.

Remark: note that the sign of $\frac{\partial z_w}{\partial a}$ is ambiguous.

4.2 Profitability and Welfare Effects of Domestic Mergers

From the analysis of the profitability of a merger we have $\frac{\partial G}{\partial t} = 0$ at z_0^* and $\frac{\partial G}{\partial t} < 0$ for $z > z_0^*$. A decrease of the tariff encourages mergers. Combining the welfare analysis and the analysis of trade liberalization and the profitability of a merger we get the following:

When $z > z_w$ and $z > z_0^*$ we have $\frac{\partial F(0,z)}{\partial t} < 0$ and $\frac{\partial G(0,z)}{\partial t} < 0$: trade liberalization increases the profitability and the desirability of a merger

When $z < z_w$ and $z < z_0^*$ we have $\frac{\partial F(0,z)}{\partial t} > 0$ and $\frac{\partial G(0,z)}{\partial t} > 0$: trade liberalization decreases the profitability and the desirability of a merger.

The expressions $\frac{\partial F(0,z)}{\partial t}$ and $\frac{\partial G(0,z)}{\partial t}$ go in opposite directions (have the opposite sign) when z is between z_w and z_0^* .

We address the following questions: When trade liberalization increases the profitability of a merger does it necessarily increase the desirability of a merger? More specifically, does $\frac{\partial G(0,z)}{\partial t} < 0$ imply that $\frac{\partial F(0,z)}{\partial t} < 0$? If not, then is it true that when trade liberalization increases the desirability of a merger it necessarily increases the profitability of a merger?

The answer to these two last questions turns out to be negative. To answer these questions we need to compare z_w and z_0^* and show that the sign is $z_w - z_0^*$ is ambiguous. We illustrate our answers by giving special cases where each of these implications is proved wrong.

We consider the case where $t = 0$: the neighborhood of free trade. We have

$$z_0^* = - \left(-1 + 2m + 2n + m^2 + 2nm + n^2 \right) \frac{c_2 m - m c_F - n c + c_2 - a + c_2 n}{(m+n+2)^2 (m+n+1)}$$

and

$$\begin{aligned} z_w(0) - z_0^* &= - \frac{m(m+n+3)^2}{(m+n+2)^2 (m^2 + mn + 6m + 2)} c_2 + \\ &\quad \frac{m(m+n+3)(2m^2 + 5m - 4n - 2n^2)}{(m+n+2)^2 (m^2 + mn + 6m + 2)(m+n+1)} c_F + \\ &\quad (m+n+3) \frac{m^3 + m^2 + 2nm^2 + 3mn + mn^2 - 3m + 4n + 2n^2}{(m+n+2)^2 (m^2 + mn + 6m + 2)(m+n+1)} a + \end{aligned}$$

$$n(m+n+3) \frac{2n+4mn+11m+4+4m^2}{(m+n+2)^2(m^2+mn+6m+2)(m+n+1)} c$$

If c_2 is small enough and $(2m^2+5m-4n-2n^2) > 0$ then $z_w(0) - z_0^* > 0$ (as expected). If trade liberalization increases the desirability of a merger then it also increases its profitability. Moreover if trade liberalization decreases the profitability of a merger then it also decreases its desirability.

In this case we have

- when $z > z_w(0)$, trade liberalization increases the profitability and the desirability of a merger.

- when $z < z_0^*$, trade liberalization decreases the profitability and the desirability of a merger.

- when $z_0^* < z < z_w(0)$, trade liberalization decreases the desirability but increases the profitability of a merger.

We now show through an example that the sign of $z_w(0) - z_0^*$ can also be negative. We show through an example that this is possible

Case 1: Suppose $n = 0$, $m = 1$ and $c_2 = c_F = 0$. Then we have

$$z_w(0) - z_0^* = -\frac{2}{81}a < 0$$

In this case, when $z_w(0) < z < z_0^*$, a tariff reduction decreases the profitability of a merger while increasing the change in welfare resulting from a merger. Tariff reduction should result in a looser competition policy however, the incentive to merge is reduced by the tariff reduction.

Case 2: $n = 0$, $m = 1$ and $c_2 \neq 0$ and $c_F \neq 0$. Then we have

$$z_w(0) - z_0^* = \frac{14c_F - 2a - 16c_2}{81}$$

which is negative if c_F is not too large compared to c_2 .

Case 3: $m = 2$ and $c_2 \neq 0$ and $c_F \neq 0$ and $n = 0$. Then we have

$$z_w(0) - z_0^* = \frac{5c_F - 25c_2 + 5a}{144}$$

which requires a higher c_2 to obtain $z_w(0) - z_0^* < 0$.

If trade liberalization decreases the desirability of a merger then it also decreases its profitability. Moreover if trade liberalization increases the profitability of a merger then it also increases its desirability.

In this case we have

- when $z > z_0^*$, trade liberalization increases the profitability and the desirability of a merger.

- when $z < z_w$, trade liberalization decreases the profitability and the desirability of a merger.

- when $z_w < z < z_0^*$, trade liberalization decreases the profitability but increases the desirability of a merger.

There exists a body of literature (Horn and Levinsohn (2001), Richardson (1999), Rysman (2001)) which derives the welfare-maximising number of domestic firms in an open economy Cournot setting in order to determine whether trade and competition policies are strategic substitutes. These models do not take into account the changes in the profitability of mergers as a result of changes in the trade policy. The above examples illustrate that there do exist cases where a merger would improve welfare but firms have no incentive to merge. This highlights the weakness of such models in that they must rely on the assumption that the government can either force unprofitable mergers or drive out profitable firms from the industry at will in order to achieve the optimal industry structure.

4.3 Welfare Effects on Foreign:

Pre-Merger Consumers' Surplus:

$$\begin{aligned}
 CS_B^F &= \int_0^{x_1^* + x_2^* + nx^* + my^*} P(Q)dQ - (P(x_1^* + x_2^* + nx^* + my^*)) (x_1^* + x_2^* + nx^* + my^*) \\
 &= \frac{(2t - 2a + z - am - an + cn + nt + 2c_2 + mc_F)^2}{2b(m + n + 3)^2}
 \end{aligned} \tag{20}$$

Post-Merger Consumers' Surplus:

$$\begin{aligned}
 CS_M^F &= \int_0^{X^* + nx^* + my^*} P(Q)dQ - (P(X^* + nx^* + my^*)) (X^* + nx^* + my^*) \\
 &= \frac{1}{2b(m + n + 2)^2} (-a(m + n + 1) + t(n + 1) + nc + c_2 + mc_F)^2
 \end{aligned} \tag{22}$$

The change in total quantity consumed in the Foreign market as a result of the merger is given by:

$$X^* + nx^* + my^* - (x_1^* + x_2^* + nx^* + my^*) = -\frac{(a - t - 2z + cn - mt - mz - nz - c_2 - mc_2 - nc_2 + mc_F)}{(m + n + 3)(m + n + 2)b} \quad (24)$$

The change in the total quantity sold in the Foreign market is negative due to the merger as long as

$$(a - t - 2z + cn - mt - mz - nz - c_2 - mc_2 - nc_2 + mc_F) > 0 \quad (25)$$

Inequality 25 is identical to the necessary condition for $x_1^* > 0$. Thus assuming that firm 1 supplies a positive output to Foreign before the merger, we have an unambiguous fall in total quantity sold in Foreign due to the merger, which in turn implies an unambiguous fall in Foreign's consumers' surplus.

Pre-merger Producers' Surplus:

$$\begin{aligned} PS_B^F &= m(\pi_F + \pi_F^*) = mb(y^2 + y^{*2}) \\ &= mb\left(\frac{a + (c_1 + t) + (c_2 + t) + n(c + t) - (n + 3)c_F}{b(m + n + 3)}\right)^2 + \\ &\quad mb\left(\frac{a + c_1 + c_2 + nc - (n + 3)(c_F + t)}{b(m + n + 3)}\right)^2 \end{aligned} \quad (26)$$

Post-merger Producers' Surplus:

$$\begin{aligned} PS_M^F &= m(\pi_F + \pi_F^*) = mb(y^2 + y^{*2}) \\ &= mb\left(\frac{a + c_2 + nc - (n + 2)(c_F + t)}{b(m + n + 2)}\right)^2 + \\ &\quad \left(\frac{a + (c_2 + t) + n(c + t) - (n + 2)(c_F)}{b(m + n + 2)}\right)^2 \end{aligned} \quad (27)$$

Pre-merger Tariff Revenue:

$$\begin{aligned} TR_B^F &= t(x_1^* + x_2^* + nx^*) \\ &= \frac{t}{b(m + n + 3)}(a(n + 2) - t(m + 1)(n + 2)) + \\ &\quad \frac{t}{b(m + n + 3)}(-(1 + m)(nc + c_1 + c_2) + mc_F(n + 2)) \end{aligned} \quad (28)$$

Post-merger Tariff revenue:

$$TR_M^F = t(X^* + nx^*) = \frac{t}{b(m+n+2)} (a(n+1) - t(m+1)(n+1)) + \frac{t}{b(m+n+2)} (-(m+1)(nc+c_2) + mc_F(n+1)) \quad (29)$$

The change in tariff revenue due to merger is given by:

$$\Delta TR^F = -\frac{(m+1)t(a-t-2z+cn-mt-mz-nz-c_2-mc_2-nc_2+mc_F)}{(m+n+3)(m+n+2)b} < 0 \quad (30)$$

Assuming that firm 1 supplies a positive output to Foreign before the merger, we have an unambiguous fall in Foreign's tariff revenue due to the merger in Home. This merger increases the market power of the merging firms in the Foreign market. They thus reduce output supplied to Foreign, thereby reducing Foreign's imports, and thus tariff revenue.

Pre-merger Welfare:

$$W_B^F = CS_B^F + PS_B^F + TR_B^F$$

Post-merger welfare:

$$W_M^F = CS_M^F + PS_M^F + TR_M^F$$

The change in welfare in Foreign due to merger between firms 1 and 2 in Home is given by:

$$F_F(t, z) = W_M^F - W_B^F$$

For $t = z = c = 0$ we have:

$$F_F(0, 0) = \frac{1}{2}a^2 \frac{12m - 8n + 6m^2 - 2n^2 - 7 + 4mn}{b(m+n+3)^2(m+n+2)^2}$$

The sign of $F_F(0, 0)$ is ambiguous. If the number of firms n is large enough then it is negative and when it is small enough then it is positive.

For $n = c = 0$ we have:

$$F_F(0, 0) = \frac{1}{2}a^2 \frac{12m + 6m^2 - 7}{b(m+3)^2(m+2)^2} > 0$$

For $c = 0$ and $m = 1$ we have:

$$F_F(0, 0) = -\frac{1}{2}a^2 \frac{4n + 2n^2 - 11}{b(4+n)^2(n+3)^2} < 0$$

Proposition 5:

Given a tariff t , a marginal trade liberalization increases (decreases) the desirability of a merger when $z < z_F(t)$ (when $z > z_F(t)$) where

$$z_F(t) = \frac{m^2n^2 - 7m + 13m^2 + m^4 + 9m^3 - 8mn + 7nm^2 - 2mn^2 + 2m^3n}{(m+n+2)^2(m^2+mn+6m+1)}c_F + \frac{-5 - 10m - 2n + 13m^2 + 2m^3 - 2m^4 + 24nm^2 + 2mn + 2mn^2 + 4m^3n + 6m^2n^2}{(m+n+2)^2(m^2+mn+6m+1)}t + \frac{m^3n + 5n + 2n^2 + 11nm^2 + 23mn + 11mn^2 + 2m^2n^2 + mn^3}{(m+n+2)^2(m^2+mn+6m+1)}c + \frac{-1 + 5m^2 - n^2 - 3n + 12m + 4mn}{(m+n+2)^2(m^2+mn+6m+1)}a + \frac{-3m^3n - 18nm^2 + 1 - 2n - m^4 - 9m^3 - 5m - n^2 - 18m^2 - 19mn - mn^3 - 3m^2n^2 - 9mn^2}{(m+n+2)^2(m^2+mn+6m+1)}$$

Proof:

We determine the impact of a marginal change of tariff on the welfare change due to a merger $\frac{\partial F_F(t,z)}{\partial t}$

$$\frac{\partial F_F(t,z)}{\partial t} = \frac{8mn + 2mn^2 - 7nm^2 - 2m^3n - m^2n^2 - 13m^2 + 7m - 9m^3 - m^4}{b(m+n+3)^2(m+n+2)^2}c_F + \frac{4 + 30mn + 10mn^2 + 20nm^2 + mn^3 + 3m^3n + 3m^2n^2 + 29m^2 + 28m + 4n + 10m^3 + n^2}{b(m+n+3)^2(m+n+2)^2}t + \frac{5 + 10m + 2n - 13m^2 - 2m^3 + 2m^4 - 24nm^2 - 2mn - 2mn^2 - 4m^3n - 6m^2n^2}{b(m+n+3)^2(m+n+2)^2}t + \frac{-m^3n - 5n - 2n^2 - 11nm^2 - 23mn - 11mn^2 - 2m^2n^2 - mn^3}{b(m+n+3)^2(m+n+2)^2}c + \frac{1 - 5m^2 + n^2 + 3n - 12m - 4mn}{b(m+n+3)^2(m+n+2)^2}a + \frac{19mn + 9mn^2 + 18nm^2 + mn^3 + 3m^3n + 3m^2n^2 - 1 + 9m^3 + 5m + 2n + 18m^2 + n^2 + 9mn^2}{b(m+n+3)^2(m+n+2)^2}$$

We have $\frac{\partial F_F(t,z)}{\partial t}$ that is a linear strictly increasing function of z with $\frac{\partial F_F(t,z_F(t))}{\partial t} = 0$ where $z_F(t)$ is given by (31). This completes the proof ■

We now compare $z_F(t)$ to $z_w(t)$ to study the relationship between the impact of trade liberalization on the desirability of a merger in Home to its impact in Foreign. In

particular, when $z_F(t) > z_w(t)$ then for $z_F(t) > z > z_w(t)$ trade liberalization increases the desirability of the merger both in Home and in Foreign. We have :

$$\begin{aligned}
z_F(t) - z_w(t) = & -\frac{m^2n^2 + 12m + 19m^2 + m^4 + 8m^3 + 10mn + 10nm^2 + 2mn^2 + 2m^3n}{(m+n+2)^2(m^2+mn+6m+2)(m^2+mn+6m+1)}c_F \\
& -\frac{-2m^5 - 2m^4n + 2m^3n^2 + 2m^2n^3 + 2mn^3 + 12 + 62m + 10n + 52m^2 - 6m^3 - 12}{(m+n+2)^2(m^2+mn+6m+2)(m^2+mn+6m+1)}a \\
& -\frac{m^3n + 6nm^2 + 9mn + 6mn^2 + 2m^2n^2 + mn^3}{(m+n+2)^2(m^2+mn+6m+2)(m^2+mn+6m+1)}c \\
& -\frac{-3m^2n^2 - m^4 - 9m^3 - 3m^3n - mn^3 - 9mn^2 - 18nm^2 - 25m^2 - 21m - 25mn}{(m+n+2)^2(m^2+mn+6m+2)(m^2+mn+6m+1)}a \\
& -\frac{2nm^2 + m^3 + 9m + 6m^2 + 6mn + mn^2}{(m+n+2)^2(m^2+mn+6m+2)(m^2+mn+6m+1)}c_2
\end{aligned}$$

When $z < z_w(t)$ then trade liberalization increases the desirability of a merger in Home and decreases the desirability Foreign. When $z > z_F(t)$ then trade liberalization increases the desirability of a merger in Foreign but not in Home. When $z_w(t) < z < z_F(t)$ then trade liberalization decreases the desirability of a merger in Home and in Foreign.

We now show through an example that the sign of $z_F(t) - z_w(t)$ can also be negative. Suppose $c_F = c = c_2 = n = 0$ then we have

$$z_F(t) - z_w(t) = \frac{((2m^5 - 12 - 62m - 52m^2 + 6m^3 + 12m^4)t + (21m + 25m^2 + m^4 + 9m^3)(a - c))}{(m+2)^2(m^2+6m+2)(m^2+6m+1)} \quad (33)$$

This can be negative if $r(m) \equiv (2m^5 - 12 - 62m - 52m^2 + 6m^3 + 12m^4) < 0$. For example, for $m = 1$ we have $r(1) = -106z_F(t) - z_w(t) = -\frac{7}{81}c - \frac{53}{324}t + \frac{7}{81}a$. Thus for $t > \frac{28}{53}(a - c)$ we have $z_F(t) - z_w(t) < 0$. When $z_F(t) < z_w(t) < z$, trade liberalization decreases the desirability of a merger in Home but increases the desirability in Foreign. When $z_F(t) < z < z_w(t)$ trade liberalization increases the desirability of a merger in Home and in Foreign. When $z < z_F(t)$ trade liberalization increases the desirability of the merger in Home but decreases it in Foreign.

5 Conclusion

This paper is one of very few which analyse the effect of non-marginal reductions in the tariff level on the gains from horizontal mergers. For sufficiently large cost savings

from merger, Long and Vousden (1995) show that marginal bilateral reductions in the tariff level, in the neighbourhood of free trade, lead to increases in the Gain-from-Merger function, $\frac{\partial G}{\partial t}|_{t=0} < 0$. Using a two-country model in which domestic and foreign firms compete both in the Home and Foreign markets to reach Cournot equilibria we generalise this result for the case of non-marginal tariff reductions and for the case of marginal tariff reductions for any positive tariff level, not just in the neighbourhood of free trade. For sufficiently small cost savings from merger, Long and Vousden (1995) show that marginal bilateral reductions in the tariff level lead to increases in the Gain-from-Merger function, $\frac{\partial G}{\partial t}|_{t=0} > 0$ in the area of free trade, i.e. for t sufficiently close to zero. In this paper we show that for the case of non-marginal tariff reductions this result may be reversed in the sense that the (bilateral) abolition of a sufficiently large tariff may lead to a decrease in the gains from merger. We also conduct an analysis of the impact of trade liberalisation on the desirability of a merger (from a social welfare viewpoint). We show that trade liberalization can increase the desirability of a merger in Home and Foreign.

All of these results are obtained for the case where two heterogenous domestic firms merge, and given that all bilateral tariff reductions are equal for the two countries. It would be interesting to study cross-border mergers and unilateral tariff reductions in order to investigate the implications for competition policy.

6 References:

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