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Merger Policies and Trade Liberalization

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1. Introduction

This paper is about the interactions between what is traditionally considered trade policy and a narrow but important aspect of competition policy, namely merger policy. The notion that trade policy and competition policy might be linked in important ways is not new. From a purely intuitive viewpoint, it is natural to suspect that the two types of policies might interact. After all, the by now large literature on trade policy in imperfectly competitive markets relies on the same sorts of market structures that have induced industrial organization economists to consider possible roles for competition policy. The market imperfections that give rise to pure profits motivate the potentially welfare-enhancing role for government intervention in both the domestic (competition policy) and international (trade policy) contexts.

Recent developments in the policy arena have elevated concern about possible links between trade and competition policy. In particular, as international economic integration has progressed, policy makers have started to ponder the possible conflicts arising from nationally pursued competition policies in a more unified goods market. An idea that is underlying much of this discussion is that international trade liberalization, by limiting countries' abilities to promote their self-interest with beggar-thy-neighbor trade policies, will induce countries to instead use competition policies to pursue the same goals (with similar beggar-thy-neighbor consequences.)

International organizations traditionally concerned with trade policies have also turned their attention to competition policies. For example, the members of the World Trade Organization (WTO) noted the importance of giving more attention to competition policies in their first ministerial-level meeting in December 1996. Also, for more than a decade, the OECD has focussed attention on the

The views expressed in this paper are not intended to necessarily reflect those of the World Trade Organization. Horn thanks Jan Wallander's and Tom Hedelius' Research Foundations and Levinsohn thanks the Ford Foundation and Jan Wallander Research Foundation for research support. We are also grateful for helpful comments from participants in a seminar at Erasmus University.

interaction between trade and competition policies. The European Union has gone even further, suggesting an international agreement in competition policies. The E.U. has also in practice sought to solve the problem of often conflicting competition policies in the context of a unified European market through supra-national competition policies.

The appropriate design of competition policies has been discussed in a voluminous literature that almost exclusively disregards open-economy aspects of the issues. The role of any one of these policies, though, may change when one analyzes an open, as opposed to closed, economy. In this paper, we choose to focus on links between merger policies and trade liberalization. We put special emphasis on the topical issue of the role that international agreements such as the GATT play when merger policies are nationally chosen. As noted above, of particular concern is the possibility that liberalization of international trade will induce countries to increasingly use competition policies to promote national interests at the expense of others. We examine the incentives for a welfare maximizing government to make such a substitution. Interpreting merger policy as a choice of degree of industrial concentration, we investigate how the merger policy that is optimal from the point of view of an individual country is affected by restrictions on the use of tariffs and export subsidies.

That is what this paper is about. Here is what the paper does not consider. This paper does not consider the details of specific merger cases. Rather, it focuses on structural aspects of merger (and industrial) policy. Thus, it can perhaps be viewed as being concerned with the formulation of the framework in which the day-to-day decisions are made; that is, the writing of the Merger Guidelines, rather than the implementation of them. This paper does not consider the possibility of multinational firms, in that only purely domestic mergers are analyzed. Finally, this paper does not consider the issue of harmonization of competition policies, although our analytic framework could provide the modeling structure for such an analysis. (The problems we address are in a sense more fundamental in that they may arise even between symmetric countries.) Each of these omissions is potentially important and represents an area of future research.

Two general points emerge from our analysis. First, merger policies are indeed associated with international externalities in open economies. This suggests that there are potential gains from international policy coordination, even though the magnitude of these gains in practice is unclear. The second point is perhaps more surprising. We argue that one should not expect to find any particular relationship between trade policy and merger policy. We do indeed find an unambiguous such relationship in all the parametric models we analyze. However, considering this relationship in a slightly more general framework strongly suggests that this relationship could be of any nature.

Thus, there seems to be no presumption that international trade liberalization induces countries to pursue merger policies that have more of a beggar-thy-neighbor flavor.

The remainder of the paper is organized as follows. In section 2, we very briefly review what is becoming a rapidly growing literature on trade and competition policy. Section 3 then presents our general framework. In section 4, we ask how the presence of trade impacts a country's incentives to concentrate production. In this section and those that follow, we begin our analysis using a more general representation of demand, which frequently enables us to decompose the influences that policy makers face. We are seldom able to derive specific results, however, since too much simply depends on the shape of demand functions. We therefore turn to a more specific framework — with linear demand — and analyze the issue at hand in this special but familiar context.

In section 5, we introduce trade policy in the form of export subsidies. Here, we analyze incentives the home country faces with regard to its merger policy with the imposition of, first, its own export subsidy, and, second, an export subsidy imposed by its trading partner. Section 6 introduces a "thinking" foreign country into the analysis. Recognizing that the foreign country will behave strategically rather than passively, this section analyses how trade liberalization impacts the *equilibrium* degree of industry concentration. This is done in the context of four different model specifications. Section 7 returns to the question of whether trade liberalization increases the desirability of supra-national merger policies. Section 8 concludes, while the analytics of the linear model are gathered in the Appendix.

2. The literature

The possible links between trade and competition policy have been noted in the literature. An early paper on this topic is Acquier and Caves (1979) in which the authors examine tradeoffs between domestic consumer welfare and monopoly profits from abroad. One of the first reviews of the strategic trade policy literature, Dixit (1984), investigates how domestic welfare, in an oligopolistic model of international trade, depends on the number of home firms, the number of foreign firms, and export subsidies. Dixit raises "the commonly expressed view that the existence of foreign competition makes domestic anti-trust policy unnecessary, and may even make it desirable to encourage mergers of domestic firms, or prevention of excessive entry, so as to keep the home industry strong enough to withstand the competition," although he does not explicitly analyze how optimal trade and merger policies interact.[1] At about the same time, industrial organization economists who

[1] Another early example is Brander and Spencer (1984.) In that paper, they consider an oligopoly model in which the importing country sets a tariff and the exporting country responds by setting the number of firms in the exporting industry.

traditionally thought about mergers in a strictly domestic context gave consideration to the role of international markets in analyzing mergers. (See, for example, Ordover and Willig (1986).) From the outset of the literature on trade and imperfect competition then, there has been a realization that trade and merger policy may interact. The literatures on strategic trade policy and domestic merger policy seem to have then treated each other like relatives that, once introduced, were best ignored. Very few, if any, of the strategic trade policy papers that followed gave much consideration to the existence of domestic competition policy, and similarly most of the developments in the merger policy literature ignored the role of international competition or trade policy.

In the last few years, attention has again focussed on links between trade and competition policy. This rapidly expanding literature typically focuses on merger policy in the presence of international competition. These papers, which might be thought of as "open-economy industrial organization," typically analyze how implications of domestic merger policy change when the domestic country trades with other countries. In these papers, while trade matters, *trade policy* is usually either very much in the background or simply absent. A much smaller set of papers explicitly considers the impact of trade policy.

Examples of economics-oriented papers analyzing merger policy in the presence of international trade (but not trade policy) are Barros and Cabral (1994), Head and Ries (1995), and Levinsohn (1996), while more law-oriented papers appear in Hawk (1994), and in the proceedings from the ABA's Antitrust Law Journal's symposium on "The Role of Foreign Competition in the U.S. Merger Enforcement" (1996). These papers recognize that the optimal design of merger policy may change drastically as one moves to an open-economy context. Another economics-oriented paper is Bliss (1996). In that paper, the author argues generally against international harmonization of competition policies and analyzes the possible role of competition policies to promote exports in a Krugman cross-hauling model.

There is also a related literature in international regulation which investigates the issue of the delegation of regulatory powers from national authorities to an international body. This question has been addressed by Bhagwati (1991) in connection with the broadening of the international policy agenda as well as by Gatsios and Seabright (1990) and Neven (1992), in relation to regulatory reforms in the European community. These authors have attempted to identify the policies which should be subject to international negotiations or assigned to higher levels of government. Policy spillovers are identified as the key issue in this discussion because they are at the source of prisoners' dilemma outcomes.

Another branch of the literature consists of papers which more explicitly examine links between trade policy and competition policy. Indeed, titles such as "Competition and Trade Policy: Identifying the Issues After the Uruguay Round," (Lloyd and Sampson, (1995)) "Competition Policy and Trade Policy: Mediating the Interface," (Trebilcock, (1996)) Competition, Competition Policy and the GATT (Hoekman and Mavriodis, (1994)) and "Trade Policy and Competition Policy" (Motta and Onida, (1996)) suggest that we are not the first to think about these links. Here, papers are aptly divided into more applied policy papers and more analytically formal papers. The papers listed immediately above fall into the former category. We now discuss in more detail examples of the latter which are most closely related to this paper.

Neven and Seabright (1997) formally show that trade liberalization and competition policy might be substitutes in terms of their effects. For instance, in one of the several models in their paper, they show how liberalizing trade might increase competition in the home market and hence might perform the same task as competition policy, with the latter interpreted as promoting competition.[2] Their focus is not on optimal policy responses by the government, but rather on the changes in firms' incentives to engage in anti-competitive practices. They write that "static models .... confirm the widely held presumption that trade liberalization has pro-competitive effects." Neven and Seabright are careful, though, to point out that in more complicated, often repeated game frameworks, the insights from the static framework may not be robust. They conclude that "Overall, our analysis suggests that unalloyed confidence that trade liberalization will address problems of uncompetitive market structure ... would be inappropriate. Nevertheless, it supports the *general presumption* that trade and domestic competition policies are substitutes, albeit imperfect ones." (Our italics.)

Bond (1997) develops a political economy model of merger policy in which the government maximizes a social welfare function to decide whether or not to allow various mergers. Bond argues that the sorts of mergers that would be allowed when competing states make the decision differ from those that would be allowed when a federal government makes the decision. The model is then used to analyze how merger policy differed in the era during which U.S. states set competition policy and more recently when the federal government set the policy. Bond draws analogies between setting policy at the federal level and setting competition policy in the context of a customs union.

Rysman (1997) is more closely related to ours. Rysman uses a linear Cournot model in which a country first selects the number of firms in the industry, then sets the optimal trade policy, and

[2] With "competition policy" we refer in this paper to the usage of anti-trust instruments, rather than policies that promote competition as such. Hence, the last qualification in the statement in the text.

firms then compete in a Nash fashion. Rysman's model only considers a scenario in which firms from the home and foreign countries compete in a third market. Rysman finds that the strategic benefits from choosing a large number of firms due to the commitment this confers are negated by the foreign subsidy in the second period. Since, by assumption, there is no consumer surplus to consider, Rysman finds that countries choose a monopoly and subsidize that monopoly. When subsidies are restricted, such as under the GATT, countries move toward greater competition.

Our paper is most closely related to work done concurrently and independently by Richardson (1996). The approaches and issues addressed are quite similar. Like us, Richardson works with a model in which countries strategically set both merger policy and trade policy. We differ by placing the issues in a more general context, addressing the role of a broader range of trade policies (i.e. subsidies as well as tariffs), and considering merger technologies that give rise to both fixed cost savings and lower marginal costs. Richardson, though, examines issues relating to customs unions which we do not.

3. The model

The model is a two country partial equilibrium set-up. Merger policy takes the particular form of choosing the optimal level of industry concentration. The number of identical firms in the home (foreign) country is given by m (n). We assume that markets are segmented and that firms produce with constant marginal costs c and fixed costs f. In a later formulation, we will allow the constant marginal cost to depend on the degree of concentration, in order to capture the notion of "marginal cost synergies." Firms compete in Cournot fashion. The markets are thus strategically separated in the sense that firms' decisions concerning one market don't affect their incentives in the other market. On the demand side of the model, we consider the homogeneous products case. Introducing the next-simplest case of symmetrically differentiated products as in the CES utility representation significantly complicates the welfare analysis, both since entry will introduce variety effects, and since firms' first order conditions become much more involved.

As noted above, the intention is to focus on structural aspects of merger policy. The paper will not explicitly take into consideration firms' incentives to merge. To do this would require a theory of endogenous merger formation, something that would substantially complicate the analysis.[3] One cannot generally assume that governments can achieve any level of concentration it desires simply

[3] Note that the traditional criterion for merger incentives — that the merging group's profit after merger is larger than in the initial situation — in itself does not provide a theory of merger formation, since it is constrained to a comparison of two out of many possible configurations of merging firms. (See Horn and Persson (1996).)

by deciding on an upper degree of concentration, since firms may not want to merge to this extent. Nevertheless, we assume that our governments, in the long run, can set the desired degree of industrial concentration, and our merger policy hence also borrows features of industrial policy.[4] To our defense, note that our disregard of the short-run merger incentives has a direct counterpart in much of the industrial organization and strategic trade policy literature: if firms don't have incentives to merge in these models (whatever the appropriate theory of merger formation is), they are likely to want to divest. However, for unexplained reasons this is typically not permitted in these models.

Trade policy for the home (foreign) country is represented by the choice of a variable r (s). We will for the time being concentrate on the case of export subsidies (or export taxes if negative), but we will later consider specific tariffs. Let $\Pi^h(m,n,s)$ be the variable profits per firm in the home market, and let $\Pi^f(m,n,r)$ be the corresponding profits in the foreign markets net of the subsidy. The reduced form welfare level for the home country is given by $V(m,n,r,s)$, and consists of consumer surplus, $CS(m,n,s)$; industry variable profits from sales to the home market, $H(m,n,s) \equiv m\Pi^h(m,n,s)$; industry variable profits from export sales to the other country net the export subsidy, $E(m,n,r) \equiv m\Pi^f(m,n,r)$; and industry fixed costs, mf. In general, then,

$$V(m,n,r,s) = CS(m,n,s) + H(m,n,s) + E(m,n,r) - mf.$$

The model above is very, very simple. Somewhat surprisingly, even this model typically yields ambiguous answers to key questions. We believe this, in and of itself, is actually informative in that it warns us not to expect any simple relationships between trade and competition policies. Nonetheless, in an effort to derive more definitive results, we will sometimes impose more structure on the model. In these instances, we will assume that there is a linear industry demand, $p = a - bQ$, in each national market.

Before employing this model in any detail, it is useful to first reiterate why we are doing the analysis in the first place. As noted in the introduction, the policy concern that motivates this analysis is that as trade policy is liberalized, governments will have an increased incentive to act in a beggar-thy-neighbor fashion in setting their competition policy. If this is true, the role of internationally coordinated competition policy policy may be enhanced. The implicit assumption in this argument is that governments are acting rationally in their own (as opposed to global) self-interest and they do so before, as well as after, any trade liberalization. For example, in

[4] As long as profits are positive, as they are in our parametric models below, the government can also influence entry.

our equilibrium framework, governments have an incentive to engage in trade policy. The same market structures that underlie this incentive also provide an incentive for the government to engage in competition policy. At the heart of the analysis is the *interaction* of these two sets of incentives. The question then becomes one of how this rational behavior is impacted by trade liberalization. Formally, this involves analyzing how first-order conditions with respect to merger policy are affected by the trade policy regime. Note that this approach differs fundamentally from that of asking how the "need" to pursue vigorous competition policies is affected by trade liberalization. Our approach is, in this respect, the same as that of Richardson, Bond, and Rysman.

We will consider cases where the trade policy is discretionarily determined by each country, and where it is constrained by an international trade agreement (the "GATT"). Similarly, we will consider cases where merger policies are set at a national as well as an international level. To better understand this interaction between policies and between countries, it is useful to initially highlight the channels through which trade by itself affects an individual country's incentives with regard to merger policy (which is modeled here as the country's optimal degree of concentration.) This is only an intermediate step, since the full analysis will have to take into consideration the interplay between the setting of trade trade and merger policies in the two economies.

4. Trade and the incentives to concentrate production

In this section, we use the framework developed above to begin to investigate links between international trade and a country's optimal degree of concentration while assuming there is no trade policy intervention.

Absent trade, the utility of the home country is determined by the number of domestic firms m and is given by $CS(m,0,\cdot)+H(m,0,\cdot)-mf$. Hence, with consumer surplus increasing in the number of firms ($CS_m > 0$) and industry variable profits declining in the number of firms ($H_m < 0$), the optimal industrial concentration is in standard fashion such that the gain in consumer surplus from one more firm equals the sum of the resulting loss in industry profits and the additional fixed cost. Let m^a be the optimal degree of concentration in autarky.

There are two basic reasons why the optimal degree of concentration may differ in closed and open economies — trade enables home country firms to sell in foreign markets and it enables foreign firms to sell in the home country market. The home country's optimal degree of concentration is affected by trade through both these channels.

4.1 Foreign consumers

Consider first how the presence of foreign consumers affects the optimal degree of concentration, assuming that there are no foreign firms, and that the home country does not use its trade policy. Home country welfare is now given by:

$$V(m,0,0,\cdot) = CS(m,0,0,\cdot) + H(m,0,0,\cdot) + E(m,0,0,\cdot) - mf.$$

Differentiating this expression w.r.t. m, and evaluating V_m at the autarky optimal level of industrial concentration yields:

$$V_m(m^a,0,0,\cdot) = E_m(m^a,0,0)$$

Since $E(m,0,0) \equiv m\Pi^f(m,0,0)$, and industry profits typically decrease in the number of firms, $E_m(m,0,0)$ is in general negative. This is because there are no foreign firms and hence no foreign profits to shift. Domestic profits from the foreign market, then, are going to be maximized with collusion as any competition in the foreign market is destructive. With $V_m(m^a,0,0,\cdot) < 0$, adding a firm, relative to the autarky number of firms, reduces welfare, hence the optimal number of firms in the exporting free trade equilibrium will be smaller than the optimal number of firms in the autarkic equilibrium. Thus, *the presence of foreign consumers yields an incentive for the domestic country to increase the degree of concentration.*

4.2 Foreign producers

International trade also implies competition from foreign firms, and the degree of this competition is influenced by the degree of foreign concentration. We begin by examining how foreign concentration affects the optimal degree of concentration among home firms, i.e., whether the two policies are strategic substitutes or complements. For the sake of clarity we continue to assume that neither country uses trade policies. The impact on the home country's incentives is now captured by the relevant mixed derivative

$$V_{mn}(m,n,0) = CS_{mn}(m,n,0) + H_{mn}(m,n,0) + E_{mn}(m,n,0)$$

Given our assumption of a symmetric demand structure, the lack of trade barriers means that we can write welfare as

$$V(m,n,0,0) = CS(N) + m\Pi(N) - mf$$

where $N = m + n$, and $\Pi(N)$ is total variable profits per firm resulting from home and foreign markets. The mixed derivative can hence be expressed as

$$V_{mn} = CS_{NN} + \Pi_N + m\Pi_{NN}. \tag{1}$$

This expression shows how the incentives for domestic concentration change with the introduction of another foreign firm.

To interpret (1), note that since output is homogeneous, we can rewrite the consumer surplus as

$$\begin{aligned} CS(m,n,s) &\equiv \widetilde{CS}(Q) \\ &\equiv \int_0^Q P(\xi)d\xi - P(Q)Q \end{aligned}$$

where $Q \equiv Q(m,n,s)$ is the total output volume sold in the home country market, and $P(Q)$ is the inverse demand function. We then have

$$\widetilde{CS}_{QQ}(Q) = -P' - QP''$$

Hence, a sufficient condition for $\widetilde{CS}$ to be convex in total output is that $P'' \leq 0$.

Now return to (1). The first term gives how the benefit to consumers of another domestic firm changes with the introduction of another foreign firm. Expressing the consumer surplus as $\widetilde{CS}(Q(N))$, we have:

$$CS_{NN} = \widetilde{CS}_{QQ}Q_N^2 + \widetilde{CS}_Q Q_{NN}$$

With general demands, the term Q_{NN} will depend on the third order derivatives of demand, and will thus be ambiguously signed. But, with linear demands, CS_{NN} is unambiguously negative: consumer surplus is convex in total output ($\widetilde{CS}_{QQ} > 0$), but the latter is concave in the number of firms ($Q_{NN} < 0$), and the latter effect dominates the former.

The second term in (1) represents the fall in profit per domestic firm with the introduction of another foreign firm to the market, and hence is negative. This effect tends to make foreign and domestic concentration strategic substitutes.

To interpret the third term in (1), think of $m\Pi_N$ as the industry-level profit destruction effect of entry of another domestic firm. The third term then gives how this industry profit destruction changes when a foreign firm enters. Absent more structure, this term is also ambiguously signed. This is even true in the linear model where

$$H_{mn} = E_{mn} = \frac{2(a-c)^2(2m-n-1)}{b(m+n+1)^4}$$

(still assuming the export subsidies are nil.) This term can take on either sign, and will tend to be negative the lower is the degree of foreign concentration.

The sign of V_{mn} is important in that it yields information about the strategic relationship between merger policies in the two countries, similar to the issue of whether outputs or prices of

competing firms are strategic substitutes or complements. If $V_{mn} < 0$ (> 0), the optimal response on part of the home country to increased foreign concentration, is less (more) concentration. We cannot sign this derivative in general. However, it is noteworthy that it is not sign-able even in the linear case:

$$V_{mn} = \frac{3(a-c)^2(2m-2n-1)}{b(m+n+1)^4}$$

We conclude that the fundamental issue of whether more foreign competition yields incentives for more or less domestic competition cannot be determined unambiguously, and that restricting the analysis to the linear model does not change this ambiguity. This may appear somewhat surprising, considering the intuitively appealing notion that increased international competition should lessen the need for domestic competition, and thus for a restrictive merger policy. It is indeed correct in that international competition is a *substitute* for domestic competition, in the sense that it can perform the same role of disciplining firms serving the domestic market. However, the incentives with regard to merger policy are determined by how increased foreign competition affects the *marginal* benefits and costs of domestic concentration. Hence whether foreign and domestic competition are *strategic* substitutes or complements is a much more subtle issue. From an analytic point of view, this is a simple point. But it is a crucial point if one is to understand why our results differ from those of the earlier literature.

5. Export subsidies and the incentives to concentrate production

The previous section looked at how international trade affects competition policy incentives. International trade was, by assumption, free trade, so trade policy played no role. The main goal of this paper, though, is to consider the impact of trade liberalization on the equilibrium degree of concentration. In this section, we take a step towards that goal by introducing export subsidies. We first investigate how a country's merger policy interacts with its choice of export subsidy. We then investigate how the home country's merger policy interacts with the export subsidy of its trading partner.

5.1 Domestic export subsidies

Because of the strategic separability between the two markets, the optimal export subsidy depends only on conditions in the foreign market. The optimal subsidy is implied by the first order condition:

$$V_r(m,n,r,s) = 0 = m\Pi_r^f(m,n,r),$$

hence its sign depends on whether home profits in the foreign market increase or decrease with the subsidy. In the special case where there are no foreign firms, the optimal subsidy would be negative. In this case, the negative subsidy (tax) works to deter destructive competition. More generally, the optimal subsidy would be positive with foreign firms in the foreign market in the Cournot case, as shown by Brander and Spencer (1985) and negative in the Bertrand case, as demonstrated by Eaton and Grossman (1986).

The direct impact of an exogenous change in the domestic export subsidy on the incentives with regard to the domestic degree of concentration, is given by

$$\begin{aligned} V_{mr} &= \frac{\partial^2}{\partial m \partial r}[m\Pi^f(m,n,r,s)] \\ &= \Pi^f_r(m,n,r) + m\Pi^f_{mr}(m,n,r), \end{aligned}$$

since a change in the subsidy has no impact on domestic consumer surplus or profits from the domestic market. In order to disentangle the various forces determining the sign of this expression, we will first assume the absence of foreign competition in the export market, so that the role of the export subsidy is to facilitate the extraction of foreign consumer surplus. We will then consider the case when it is used as a "strategic trade policy" instrument, i.e., to shift foreign producer surplus.

Absent foreign competition, there are two basic forces at work in determining the sign of V_{mr}. To see this, let $X(m,r)$ be the industry output sold in the foreign market: $X(m,r) \equiv mx(m,r)$ where $x(m,r)$ is the reduced form output per firm in the foreign market. Due to the linear cost structure, variable profits in the foreign market can then be written as:

$$\begin{aligned} m\Pi^f(m,0,r) &= P(X(m,r))X(m,r) - cX(m,r) \\ &\equiv \Pi^M(X(m,r)) \end{aligned}$$

Note that $\Pi^M(X)$ is simply the profit function that a monopolist would face if selling in the foreign market at constant marginal cost c. We assume that this profit is concave in the output volume. Also, let $r^*(m)$ be the optimal trade policy, given some arbitrary degree of domestic concentration m:

$$V_r(m,0,r^*(m),\cdot) \equiv 0.$$

Hence,

$$\Pi^M_X(X(m,r^*(m))) = 0.$$

Absent foreign competition, the optimal export subsidy induces the firms in the industry to jointly act as a monopolist in the foreign market. Since the oligopoly is over-producing compared to

the optimal behavior of the monopolist, the optimal trade policy is to tax the foreign sales of the oligopolists. This is welfare maximizing since subsidy revenue is a pure transfer and any competition in the foreign market would just destroy profits.

Now return to the mixed derivative linking trade and merger policy in the case of no foreign firms:

$$V_{mr} = \Pi^M_{XX} X_m X_r + \Pi^m_X X_{rm}$$

At the optimal trade policy, r^*, this derivative is given by:

$$V_{mr}(m, 0, r^*(m)) = \Pi^M_{XX} X_m X_r,$$

since $\Pi^m_X = 0$. The first element of the product on the right-hand side is negative by the concavity of the profit function. The second element, X_m, gives the effect on industry output of the entry of an additional firm, and this will be positive. (Were this not the case, consumers would lose from the entry of an additional firm.) The third element, which equals mx_r, is again positive and gives the impact on industry output of an increase in the subsidy. Hence, $V_{mr} < 0$.

It is reasonable to think of trade liberalization as r moving toward zero. The above finding then implies that *absent foreign competition, the optimal degree of domestic concentration increases with a small move toward home country trade liberalization.* Intuitively, the negative mixed derivative V_{mr} directly reflects on the link between a country's optimal merger policy and its trade policy. Starting at the optimal export tax, a small reduction in this tax (an increase in r) will induce the home country to reduce the number of firms. This is simply a reflection of the fact noted above: Absent export subsidies and foreign competition, it is optimal for the domestic economy to be a monopolist in the foreign market. Adding domestic consumers into the picture introduces a trade-off and calls for a larger number of firms. The domestic export subsidy tends to ease this conflict between what is the optimal degree of concentration in the domestic and in the foreign markets. In fact, with two markets, the two policy tools m and r allow the home country to reach a first best with regard to capturing surplus in the foreign market.

Finally, in the case of the linear Cournot model we can also show that $V_{mr}(m, 0, r) < 0$ even if the export subsidy is not optimally set, as long as $r \geq r^*(m)$ (recall that $r^*(m) < 0$ in this case). This can be seen from the fact that for $n = 0$,

$$V_{mr} = -\frac{(a-c)(3m-1) + mr}{b(m+1)^3}$$

Since this expression is negative at $r = r^*(m)$, it must be so *a fortiori* for larger values of r.

Next, we add foreign producers back into the calculus. Export subsidies (or taxes) now play a role in addition to just restricting destructive competition in the foreign market. Now, export subsidies may serve to shift profits from the foreign to the domestic firms, as demonstrated by Brander and Spencer (1985). These subsidies, though, may also interact with the optimal degree of concentration — this is indeed the expressed fear behind some of the calls for international agreements on competition policies. It is difficult in general to draw any affirmative conclusions regarding the link between the two types of policies. Formally, the question boils down to whether V_{mr} is positive or negative for $n > 0$. The reasoning in the previous subsection is not directly applicable, since it relied on the absence of foreign firms. However, in the linear model, we have that $V_{mr} < 0$ also in the presence of foreign firms, as long as the export subsidy is at the optimal level

$$r^* = -\frac{(a-c)(m-n-1)}{2m(n+1)},$$

since in this case

$$V_{mr} = -\frac{(a-c)(n+1)}{b(m+n+1)^2} < 0.$$

But, when r is not optimal, the presence of foreign firms make the sign of the mixed derivative unclear. For instance, at $r = 0$,

$$V_{mr} = -\frac{(a-c)(n+1)(3m-n-1)}{b(m+n+1)^3}$$

This expression is positive for $n > 3m - 1$. In such a case the introduction of a small positive export subsidy, which in itself would increase welfare since

$$V_r = -\frac{(a-c)m(m-n-1)}{b(m+n+1)^2} > 0$$

at $r = 0$, would give an incentive to the home country to reduce the degree of domestic concentration.

In sum, *there is no unambiguous relationship between the level of the domestic export subsidy and the optimal degree of concentration, and this is true even in the linear case.*

5.2 Foreign export subsidies

We next consider export subsidies levied by the foreign government. The direct impact of the foreign subsidy on domestic welfare is

$$V_s = CS_s(m,n,s) + H_s(m,n,s)$$

In a standard model, the first term is positive, reflecting the gain to consumers from increased total supply to the market, and the second term is negative, since the subsidy yields a smaller market share for the domestic producers. The balance of these terms cannot be determined *a priori:* the negative profit shifting effect may outweigh the gain to consumers. For instance, in the linear model[5]

$$V_s = \frac{n}{b(m+n+1)^2}[(a-c)(n-m) + ns(2m+1)],$$

a foreign export subsidy definitely benefits the domestic economy if $n \geq m$, while it will be detrimental if

$$n < \frac{(a-c)m}{a-c+2sm+s}.$$

Now turn to the implication of the foreign subsidy for the incentives with regard to the optimal degree of concentration:

$$V_{ms} = CS_{ms}(m,n,s) + H_{ms}(m,n,s)$$

Not surprisingly, this is also of ambiguous sign. The basic impact of the foreign subsidy is to increase the output of foreign firms, to reduce that of domestic firms, while in the aggregate yielding an output expansion. The term CS_{ms} measures the change in the sensitivity of consumer surplus to the number of domestic firms. With homogeneous outputs, it can be rewritten as

$$CS_{ms} = \widetilde{CS}_{QQ} Q_s Q_m + \widetilde{CS}_Q Q_{sm}$$

Again, both $\widetilde{CS}_{QQ}$ and Q_{sm} are of ambiguous sign, with the latter involving third-order derivatives of the demand function. A similar ambiguity applies to the sign of H_{ms}. This basic lack of a clear impact of s on the incentives w.r.t. m is also evidenced by the fact that in the linear Cournot model,

$$Sgn[V_{ms}] = Sgn[(a-c)(m-3n-1) - 2ns(m-n)]$$

which clearly can take on either sign. We conclude that *the impact of the foreign export subsidy on the optimal degree of domestic concentration simply depends on the details of the situation.*

[5] These equations are very similar to those derived in Dixit (1984). The key difference between Dixit's work and ours is that Dixit was concerned with the first derivatives (i.e. V_s) whereas we focus on the second mixed derivatives. Dixit's work, then, is an essential building block to ours.

6. Export subsidies and the equilibrium degree of concentration

Thus far we have examined the incentives the home country faces without considering the fact that the foreign country may also be strategically setting trade and merger policy. In order to consider the impact of multilateral trade liberalization, however, one must take into consideration the fact that the foreign country will also change its policies in response to the trade liberalization. To fix ideas, suppose one wishes to analyze the impact of the GATT, and that this is modeled as a move toward freer trade by both countries. In terms of the model, this amounts to reductions in both r and s, both of which will affect the home country's optimal degree of concentration. But this liberalization will also affect the foreign country's chosen degree of concentration, and this will in turn affect the home country's decision problem with regard to the degree of concentration. Thus, several of the affects we considered one-by-one in the pervious sections will now jointly impact the outcome.

We begin by assuming that countries simultaneously determine the degree of concentration and their export subsidies (if these are permitted by the trade regime). Depending on our interpretation of the two policies, it could be argued, though, that merger policies are of a more long run nature, and that it would be more natural to assume that the degree of concentration is determined prior to the decisions on trade policies, This case is considered later.

In order to facilitate the analysis, we concentrate throughout on cases where the countries are identical, so as to allow symmetric equilibria with $r = s$ and $m = n$. There are four types of equilibria (in addition to autarky) that are of interest. In the "discretionary" equilibrium, given by the pair (m^d, r^d), each country discretionarily chooses both its trade policy and the degree of concentration among domestic firms. This equilibrium is given by:

$$V_m(m, m, r, r) = 0$$

$$V_r(m, m, r, r) = 0.$$

In the "GATT" equilibrium $(m^g, 0)$, countries continue to discretionarily choose concentration, but have agreed not to utilize export subsidies:

$$V_m(m, m, 0, 0) = 0$$

There are then two cases where the degree of concentration is set by a supranational agency that maximizes world welfare. A first case, which is obviously of less practical relevance (but is still of interest in that it yields information about the externalities involved in the merger policies) is

where the countries retain the possibility to choose their export subsidies in a discretionary manner. The resulting degree of concentration and export subsidies are denoted (m^k, r^k), and are given by

$$V_m(m, m, 0, 0) + V_n(m, m, 0, 0) = 0$$

$$V_r(m, m, r, r) = 0$$

The other, and practically perhaps more interesting, case is where the "GATT" is augmented by a supranational merger policy. We denote the resulting concentration level as m^s. Because of the assumed symmetry between the markets, it is given by:

$$V_m(m, m, 0, 0) + V_n(m, m, 0, 0) = 0$$

Our interest is in comparing the degrees of concentration in the different policy regimes. An indication of the relative magnitude of m^d and m^g could be obtained by considering a marginal reduction in the subsidy from the discretionary level, assuming national merger policies:

$$\frac{dm}{dr} = -\frac{V_{mr} + V_{ms}}{V_{mm} + V_{mn}}$$

However, note that the mixed derivatives that appear in the above equation are exactly the same as those we have already investigated, with the exception of V_{mm}, which has implicitly been assumed to be negative to ensure that one of the second-order conditions for the government's optimization problem is fulfilled. As was seen above, most of these derivatives are of ambiguous sign. While in principle it is possible that the assumed symmetry between the countries might have helped to determine the direction in which concentration moves, we found that *even in the symmetric case one should not expect international trade liberalization to have any particular effect on the equilibrium degree of concentration.* Instead, in order to get clear-cut results we turn now to models with linear demands to investigate these issues.

6.1 Fixed Cost Savings

We begin with comparing the equilibria for the four cases considered above in the case in which fixed costs give rise to economies of scale, but where there are no marginal cost synergies. In the benchmark case of autarky, the equilibrium (and optimal) degree of concentration m^a is given by[6]

$$(m + 1)^3 = h \tag{2}$$

[6] The derivations for the parametric models in the paper are done with the aide of the computer programs Derive-XM Ver. 3.0, and Scientific Workplace 2.5. Further details about the calculations are provided in the Appendix.

where $h \equiv (a-c)^2/(bf)$.

Secondly, the "pre-GATT" equilibrium degree of concentration, m^d, is characterized by the equation

$$2(m+1)(2m+1) = h \tag{3}$$

Thirdly, in the "GATT" equilibrium, the degree of concentration, m^g, is given by

$$\frac{(2m+1)^3}{2(m+1)} = h \tag{4}$$

The fourth case is where there is a supra-national merger policy that maximizes world welfare, but where trade policies are decided upon unilaterally. The resulting degree of concentration, m^k, is characterized by

$$4m(m+1)^2 = h \tag{5}$$

Finally, the equilibrium degree of concentration, m^s, pertaining to the case where the present GATT is extended to include a supra-national merger policy that maximizes world welfare, is given by

$$\frac{1}{2}(2m+1)^3 = h \tag{6}$$

As can be seen, in all five cases the equilibrium degree of concentration is determined by the parameter h. Note also that in all cases under consideration, firms make non-negative profits.

There are at least two ways of characterizing merger policy in the different equilibria — by a measure of concentration and by a measure of monopoly power such as a Lerner index. Because of the symmetry, a Herfindahl concentration ratio simply corresponds to the number of firms. We can then characterize the degree of concentration in the different equilibria as follows:

Proposition 1: *For values of h such that the equilibrium number of firms in all cases exceeds 1, $m^k < m^s < \min(m^a, m^d) < \max(m^a, m^d) < m^g$.*

Several points are noteworthy. First, while $m^a < m^d$ for low values of h, and conversely for h sufficiently large, it is always the case that $m^g > m^a$. Hence, the equilibrium degree of concentration is unambiguously *lower with free trade than in autarky.* That is, there are more firms in *each* economy with free trade than in autarky.

This result contrasts to those usually found in models where the number of firms is determined through zero-profit ("free entry and exit") restrictions. In the latter models, trade typically implies a "rationalization" in that it reduces the number of firms in each economy, even though the combined number is larger than in either economy in autarky. The same effect as captured in these models

— the lowered profitability because of the intensified competition — is present also here. Here, however, firms don't make zero profit in autarky, since the government restricts socially inefficient entry in order to exploit economies of scale. Hence, the intensified competition need not lead to a reduction in the number of firms.

Secondly, assuming countries pursue national merger policies, *trade liberalization reduces the optimal degree of concentration compared to the situation where the countries discretionarily determine trade policies:* $m^g > m^d$. The "GATT" is thus in this sense pro-competitive. Note, however, that the difference $m^g - m^d$ is never larger than 1/2. Thus, if the integer constraint is taken seriously, the difference between the two concentration levels could not be more than one firm. In the context of the model, the GATT hence has insignificant consequences for the optimal degree of concentration. We are undecided about exactly how to interpret this fact, but at the very least the model does not suggest a strong impact of international trade liberalization on nationally pursued merger policies.

Thirdly, the two equilibria involving a supranational merger policy feature significantly *more* concentration than the other equilibria. That is, *the basic distortion caused by nationally pursued merger policies is insufficient exploitation of economies of scale.* With nationally pursued merger policies both countries strive to increase their market share by increasing the number of firms. The reason why a larger number of firms tends to increase the market share is exactly the same as the reason why the oligopoly as a whole produces more the larger the number of firms — it yields a commitment.

Characterizing merger policy by Lerner indices

Our second measure of the restrictiveness of the merger policy is the Lerner index. Denoting this index by L,

$$L = \frac{p - c}{p}$$

the value of the index is in the linear model in autarky

$$L^a = \frac{a - c}{a + m^a c}$$

In the case of trade it is generally given by

$$L(m, r) = \frac{a - c - mr}{a + m(2c - r)}$$

so that

$$L(m^d, r^d) = \frac{a - c}{a + (2m^d + 1)c}.$$

Hence,

Proposition 2: $L^d < L^g < L^s$.

Note, first, that for any particular m, $L(m, r^d) < L(m, 0)$, providing a tendency for GATT to be *anti*-competitive. But on the other hand, both indices are decreasing in the number of firms. Hence, to the extent that there are more firms with than without the GATT, it has a tendency to be *pro*-competitive. The latter of these two forces dominates the former when $2m^d + 1 > 2m^g$. This will indeed be the case since, as was noted above, $m^g - m^d < 1/2$. Hence, it follows that on balance trade liberalization is *anti-competitive*, in the sense of being associated with a higher mark-up over true marginal costs: $L(m^g, 0) > L(m^d, r^d)$.

The intuition behind this result is simple. The export subsidies tend to increase production where, due to imperfect competition, there was too little production. When countries are then constrained not to use subsidies, they find it optimal to enforce a market structure with more firms, and this partially, but not fully, off-sets the negative impact of the trade liberalization.

Secondly, we have seen that $m^s < m^g$. Hence, since the Lerner index falls in the number of firms in the absence of subsidies, we have that $L(m^s, 0) > L(m^g, 0)$. That is, absent export subsidies, with an supranational merger policy, the mark-ups are higher than with national policies. Again, the problem with nationally pursued competition policies is not that they are too lax, but rather that they are too restrictive.

Finally, observe that $L^s < L^a$ if and only if $2m^s > m^a$. This indeed holds, since

$$2m^s - m^a = \sqrt[3]{h}\left(\sqrt[3]{2} - 1\right) > 0$$

Hence, as expected, the autarky equilibrium features higher mark-ups than the free trade equilibrium with supranational merger policies, hence reflecting the size differences between the two economies. It can also be seen that the mark-ups are higher in the autarky than in the discretionary equilibrium: $L^a > L^d$ if and only if $m^a < 2m^d + 1$. It can be shown that

$$2m^d - m^a = -1/2 + 1/2\sqrt{(1 + 4h)} - \sqrt[3]{h}$$

This is positive for $h > 2 + \sqrt{5}$. Hence, in the range of h considered here, the discretionary equilibrium implies lower mark-ups than in autarky.

6.2 When merger policy more long-run than trade policy

In the previous section, trade and merger policy were set simultaneously. However, as mentioned above, it could be argued that one could view the merger policy to be of a more long-run nature (and hence changed less frequently) than the trade policy. In this subsection, we will briefly consider a variant of the model which seeks to capture this intuition.

Let the technology and demand be as in the previous section. However, assume now that in situations where countries unilaterally decide on export subsidies, this is done simultaneously in the two countries, but *after* they have simultaneously determined their respective degrees of industrial concentration.[7] The new element that appears now is thus that when determining their merger policies, countries have to take into account how the consequent decisions on subsidies will be affected. In the general case, this has the consequence of introducing derivatives of demand of an even higher order than above, and would clearly add to the ambiguity of the outcomes in the general case. However, with the linear parametrization we can still solve for the various equilibria.

It is straighforward to show that when countries set both the export subsidies and the merger policies discretionarily, the equilibrium degree of concentration m^d is characterized by the expression.

$$\frac{4(m+1)^3}{m+2} = h$$

In this case, the optimal concentration for one country is independent of that of the other country. Of course, both the "GATT" equilibrium (with subsidies constrained to be zero, but with discretionary setting of merger policies) as well as the equilibrium with supranational merger policies (and no export subsidies), m^s, are the same as in the previous model.

We can then establish the following result:[8]

Proposition 3: *For values of h such that the number of firms is at least one in each equilibrium, it holds that $m^s < m^d \leq m^g$.*

In other words, the basic finding in the previous subsection — that, relative to the discretionary equilibrium, the degree of concentration would fall (or at least not increase) with the agreement on the GATT, and would increase with a supranational merger policy — is at least partly robust to the specification of the sequence of decisions.

[7] This timing is similar to that in Rysman (1997) (see Section 2).

[8] Strictly speaking, $m^d < m^g$ when treating m as a continuous variable. However, we conjecture that the difference between the two values never exceeds one.

6.3 Marginal cost synergies

The model above highlighted one aspect of strategic merger policies — the incentive for individual governments to capture foreign firms' market shares by promoting domestic entry. In that model, entry also benefitted individual governments by increasing consumer welfare, but was restricted by its associated cost of less exploitation of economies of scale. However, mergers did not affect the competitive position of individual firms. That is, firms were no more efficient after merging. However, much of common thinking about mergers is that they do exactly this — indeed, this belief is what seems to motivate the promotion of "national champions". We will therefore in this subsection briefly consider a case where mergers lower marginal costs of the participating firms; that is, where mergers give rise to variable cost "synergies", but where there are no fixed cost savings from mergers. Governments will again face a trade-off with regard to the merger policy, but the incentive to hold back entry will now stem from the cost an unconcentrated market structure has in terms of unexploited synergies.

The model is identical to the one in the previous subsection except for two differences. First, as mentioned above, there are no fixed costs: $f = 0$. More importantly, in order to capture the marginal cost synergies, we will use a simple formulation that is similar to the one employed by Perry and Porter (1985). To this end, let the marginal cost in a firm i be k/k_i^2, where k is a constant and k_i is the amount of capital employed in this firm. Let the total fixed amount of capital be $K = 1$. Since all domestic firms are symmetric, $k_i = K/m$, so that the marginal cost in each domestic firm is km^2. Intuitively, the government will have incentives to pursue a lax merger policy in order to achieve low marginal costs for domestic firms, partly for the sake of consumers (even though from their point of view the cost in terms of increased monopolization matters) and partly in order to enhance the competitive position of domestic firms vis-a-vis their foreign counterparts.

How does the introduction of the marginal cost synergies affect countries' incentives? We will consider three of the equilibria with trade again. First, in the case where both subsidies and and the degree of concentration are chosen unilaterally by each country, the equilibrium degree of concentration m^d is given by

$$m(12m^2 + 13m + 2) = \frac{a}{k}$$

In the "GATT" equilibrium, with nationally determined industrial concentration, but with export subsidies set to zero, the corresponding value m^g solves

$$\frac{m^2}{m+1}(12m^2 + 15m + 5) = \frac{a}{k}$$

Finally, absent export subsidies, but with supranationally set industrial concentration, the equilibrium degree of concentration m^s is given by

$$m^2(8m^2 + 12m + 5) = \frac{a}{k}$$

A comparison of these three equations yields the following result:[9]

Proposition 4: *For values of $\frac{a}{k}$ such that the number of firms in each equilibrium is at least one, $m^s < m^d \leq m^g$.*

Hence, the ranking of m^s, m^d, and m^g is exactly the same as in the two previous cases.

6.4 Tariffs

It might be argued that the consistency of the results above is due to the fact that in all cases, the trade policy was an export subsidy. We therefore now turn to investigating the interaction between tariffs and merger policies, first briefly applying a more general approach, and then turning to a linear Cournot model. We assume throughout this section that tariffs are the only trade policy at the disposal of the home and foreign countries.

In the presence of tariffs, the welfare function has to be modified to take into account the allocational effect of tariffs and the tariff revenue. With tariffs, welfare is now given by:

$$V(m, n, t_h, t_f) \equiv CS(m, n, t_h) + H(m, n, t_h) + E(m, n, t_f) - mf + t_h n y(m, n, t_h)$$

where $H(m, n, t_h) \equiv m\Pi^h(m, n, t_h)$, $E(m, n, t_f) \equiv m\Pi^f(m, n, t_f)$, and $y(m, n, t_h)$ is the sales of the representative foreign firm in the domestic market .

Consider the welfare maximizing degree of concentration in the domestic economy for given concentration in the other country and for given tariffs. It is obtained by equating

$$V_m = CS_m + [\Pi^h + \Pi^f] - f + [m\Pi^h_m + m\Pi^f_m] + tny_m$$

with zero. The direct impact of trade liberalization (interpreted as a restriction on the use of tariffs) on merger policy incentives, is given by the mixed derivative V_{mt_h}:

$$V_{mt_h} = CS_{mt} + \Pi^h_t + m\Pi^h_{mt} + n[y_m + ty_{mt}]$$

[9] As above, $m^d < m^g$ when treating m as a continuous variable.

As was the case when we investigated the implications of an export subsidy for the optimal degree of concentration (V_{ms}), the sign of V_{mt} is ambiguous. A restriction on the use of tariffs might provide an incentive for governments to either relax or restrict industry concentration.

With a linear demand, and equal marginal costs c and fixed costs f,

$$Sign[V_{mt_h}] = -Sign[(a-c)(m-n) + t_h n(2m+1)].$$

This expression can clearly take on either sign. But, in the symmetric, a reduction in a country's tariff level provides an incentive for the country to reduce domestic concentration.

Characterizing merger policy by the degree of concentration

The autarky equilibrium number of firms m^a is, of course, the same as in the previous section, and is given by (2). Likewise, the equilibrium industrial concentration "with GATT", i.e., with tariffs constrained to zero, and with national control of merger policies, is the solution m^g given by (4), and the supranational competition authority would still choose m^s, as given by (6).

The difference between the case of tariffs and subsidies arises in the discretionary case. The equilibrium degree of industrial concentration with t_h and t_f unilaterally decided by the countries, is given by

$$\frac{(m+2)^2(2m+1)^3}{8m^2+12m+5} = h.$$

We can then show the following:

Proposition 5: $m^s < m^d < m^a < m^g$.

Note that the ranking of industrial concentration in this case of tariffs is identical to the ranking in the case of export subsidies!

Characterizing merger policy by Lerner indices

The Lerner index with GATT (i.e., $t_h = t_f = 0$), is the same as in the case of export subsidies in Section 6.1. The Lerner index without GATT is now

$$L(m, t_h) = \frac{a - c + t_h m}{a + m(2c + t_h)}$$

It can be shown, that for any particular value of m, the Lerner index is higher without GATT than with GATT. This only says that prices are higher with the tariffs. However, the number of firms will not be the same in the two equilibria. We have already seen that $m^g > m^d$. Therefore, since both the Lerner indices fall in the number of firms, we have the following:

Proposition 6: $L^g < L^d < L^s$.

To summarize, the general conclusions concerning the impact of international trade liberalization on industrial concentration are almost the same to those in the case of export subsidies: the removal of tariffs will induce countries to reduce industrial concentration, while it from a global point of view would be preferable that countries did just the opposite. The main difference between the two cases is that when tariffs are removed, the degree of monopoly power, as measured by a Lerner index, decreases whereas it increases in the case of export subsidies. The concern that GATT might induce countries to pursue less vigorous merger policies hence finds even less support in the case of tariffs than with export subsidies.

7. Trade liberalization and the desirability of supra-national merger policies

As noted at the beginning of the paper, some observers have suggested that trade liberalization increases the desirability of, or need for, supra-national merger policies. The implicit assumption is presumably that there are also gains to be had from supranational merger policies prior to trade liberalization, but that these gains have increased as a result of the trade liberalization. We will in this subsection briefly take a look at whether such a claim can be said to be warranted within the confines of the above model.

7.1 What constitutes a "beggar-thy-neighbor" merger policy?

A basic conceptual problem with the above-mentioned claim is the lack of a precise meaning of the terms "desirability" or "need". Implicit in the statement seems to be the presumption that trade liberalization induces a country to change its merger policies in a direction that is detrimental to other countries. This raises the basic question of what direction this would take? What constitutes a beggar-thy-neighbor merger policy? Concentration among foreign firms will be detrimental to the domestic economy if:

$$V_n = CS_n + H_n + E_n > 0,$$

while it would be beneficial in the opposite case. The entry of a foreign firm will increase the total output, and will thus bring gains to consumers, but will bring losses for producers. The balance of these two effects is ambiguous, and will partly hinge on the relative importance of consumer and producer surplus. For instance, if profits are small initially, the positive effect of entry on consumer surplus may dominate. In this case, increased concentration abroad would amount to more of a beggar-thy-neighbor policy. On the other hand, if e.g. the domestic market is small relative to the

foreign market, the opposite may prevail. We are thus led to the unsatisfactory conclusion that we cannot *a priori* determine whether concentration in one country is good or bad for other countries. Nor are we able to do so in the linear fixed cost model, even absent active trade policies. For instance, in the latter case

$$V_n = \frac{h^2}{(m+n+1)^3}(n-3m),$$

the sign of which is ambiguous in general.

7.2 The claim in four different versions

One possible interpretation of the above argument would then be to look at the situation from the point of view of an individual country, say the home country. Trade liberalization could then be said to lead to more of a beggar-thy-neighbor merger policy if it induces the foreign country to change its merger policy in a direction that is unfavorable to the home country, given that the home country does not change *any* of its policies. Interpreting the liberalization as a marginal reduction in the foreign trade policy instrument s, this situation would prevail if simultaneously

$$V_n^h < 0 \text{ and } V_{ns}^f < 0, \text{ or } V_n^h > 0 \text{ and } V_{ns}^f > 0, \quad \text{for } s > 0,$$

where s superscripts h and f denote home and foreign welfare, respectively.

A second interpretation would be that trade liberalization undertaken by *both* countries changed the foreign country's incentives with regard to merger policy in an unfavorable direction for the home country, for a given home country merger policy. Considering a symmetric situation with an equivalent small reduction in both r and s, this would correspond to the case where either

$$V_n^h < 0 \text{ and } V_{ns}^f + V_{nr}^f < 0, \text{ or } V_n^h > 0 \text{ and } V_{ns}^f + V_{nr}^f > 0 \text{ for} r, s > 0.$$

A third possible interpretation is that trade liberalization fosters a beggar-thy-neighbor merger policy in the foreign country if the combined effect of the reductions in export subsidies and the induced change in the merger policies of the two countries result in a foreign degree of concentration which is less preferable than the pre-liberalization concentration. Thus, comparing for instance the discretionary equilibrium and the "GATT" equilibrium, trade liberalization would be said to induce more of a beggar-thy-neighbor merger policy in the foreign country if

$$V^h(m^g, m^g, 0, 0) < V^h(m^g, m^d, 0, 0).$$

There are also other possible interpretations, but no single interpretation has a claim to general superiority. Instead, what constitutes the best measure depends on exactly what is being

asked. However, if one wants to argue that the gains from supranational merger policies are larger after liberalization than before, then a more suitable approach would be to compare changes in welfare levels from supranational merger policies with and without trade (before and after) trade liberalization. If

$$V(m^s, m^s, 0, 0) - V(m^g, m^g, 0, 0) > V(m^c, m^c, r^c, r^c) - V(m^d, m^d, r^d, r^d),$$

then the welfare gain from a supra-national merger policy is larger with than without trade liberalization. Of course, this would be equivalent to establishing the claim that the gains from trade liberalization are larger with supranational merger policies than nationally pursued policies:

$$V(m^s, m^s, 0, 0) - V(m^c, m^c, r^c, r^c) > V(m^g, m^g, 0, 0) - V(m^d, m^d, r^d, r^d).$$

It is simply not obvious under what intuitively interpretable conditions the above inequalities might hold, and this is even true for the linear model as well as the more general model. Hence in even the linear model, the notion that the gains from supranational merger policies are larger after trade liberalization than before are not verifiable or refutable unless one resorts to numerical examples.

8. Concluding discussion

The intuition with which many informed economists approach the links between trade and merger policy is the following: Trade liberalization increases competition in the domestic market so liberalization acts as a substitute for a stricter competition policy. Hence, as trade is liberalized, there is less of a need for competition policy, and rationally acting countries will therefore purse slacker policies than before liberalization. The main message of this paper is that while the first part of this logic – the pro-competitive effect of liberalization — often would be correct, this reasoning does not provide the basis for determining whether trade liberalization will lead to a more lax competition policy. Instead, what is at stake are the consequences of trade liberalization for the marginal incentives facing merger policy.

We have investigated the related notion that international trade liberalization has the undesirable consequence of inducing countries to adjust their merger policies in a beggar-thy-neighbor direction. The analysis above, simple as it is, points to some potentially serious weaknesses in this argument. First, it is not clear whether a beggar-thy-neighbor policy involves more or less concentration among domestic firms, and this is true even in the linear case. More generally, the very notion of a beggar-thy-neighbor competition policy is somewhat amorphous. We suggest several plausible interpretations and their implications vary depending on what definition is adopted.

As we examined the impact of trade liberalization on the equilibrium industry structure (i.e. competition policy) in a fairly general framework, we were not able to draw many unambiguous conclusions. Yet when we then moved to several specifications of the linear model, for example with and without synergies, and simultaneous and sequential setting of merger and trade policies, the results are remarkably similar across all the specifications. In particular, in all the parametric cases examined above, trade liberalization results, in equilibrium, in a *stricter* standard for competition policy. Thus, even in very simple models, replacing intuition with a more analytic approach may yield conclusions opposite to that suggested by the above-mentioned intuition.

When we considered supra-national merger policy, we found that the problem is not that there are too few firms with mark-ups that are too high, but rather the contrary: countries foster too little concentration, and they do so in order to increase the market share in export markets. This proves costly since it implies an under-exploitation of economies of scale.

Nonetheless, the paper finds little support for the idea that, because of a strong trade policy-merger policy linkage, merger policies should be internationally regulated. Of course, a lack of a clear link between trade and merger policies does not preclude the possibility that there are substantial gains to be had from international agreements on merger policies. Indeed, this paper has shown how nationally pursued merger policies may be associated with externalities between countries.[10] The rationale for such an agreement would not stem from the inter-linkage between trade policy and merger policy, but rather from the fact that there are negative international externalities from nationally pursued merger policies, just like in the case of trade policies.[11]

Finally, the list of restrictive assumptions underlying the models is painfully long. Some are special in the sense of relying of specific functional forms and symmetry. But these are pretty obvious. Let us instead point to four more general weaknesses that need to be modified in subsequent work.

First, the notion of capturing merger policy by the choice of the degree of concentration seems to be a natural starting point, but not more than that. Instead, one needs to take into consideration firms' incentives to merge, and the impact of the merger policy on mergers. This requires a theory of endogenous merger determination.

[10] For example, note that in the symmetric linear Cournot model, the quantitative impact of a supranational merger policy seems to depend very little on whether trade is or is not liberalized. Note also that it has a much larger impact than trade liberalization. These observations are consistent with the view that a supranational merger policy could be defended in its own right, regardless of whether or not there is an international trade agreement.

[11] However, as argued by Bacchetta et. al. (1997), such a theoretical argument is only a necessary, but not sufficient, reason for implementing such policies. It must also be shown that the externalities involved are empirically large enough to justify intervention and that there are no better legal alternatives than an international agreement.

Secondly, much of the policy debate has focused on the possibility that governments might treat firms differently depending on their nationality, whereas the analysis here has concerned the more general policy of choosing an industrial structure. It is not clear to us whether this focus in the debate reflects commentators beliefs that the discriminatory aspects are empirically more important than the general aspects, or if it stems from the fact that discrimination violates much of the spirit of the GATT. In any event, it is clear that we need to study the incentives of governments to employ merger and competition policies in a discriminatory fashion.

Thirdly, the assumption that governments maximize social welfare is much neater than reality. A first problem is the fact that many governments seem to have other objectives. Here, one could easily modify the objective by weighting the components in the welfare function differently as done by, for example, Richardson (1996). A more serious problem, which this paper shares with most other papers in economics, is the assumption concerning the information at the disposal of the government. In actuality, it is very hard to evaluate welfare consequences of most mergers with any degree of precision. This lack of information makes the conduct of competition policy much more of a "trial-and-error" process than is usually acknowledged. As a consequence, there are gains to be had from a world perspective of *not* harmonizing competition laws, in order to "learn" the most efficient form of legislation.

Fourthly, in the tradition of the two sets of theories on which the paper builds, those of Industrial Organization and Strategic Trade Policy, the analysis has been done in partial equilibrium. However, an international agreement on merger policy, and more generally competition policy, will most likely not be sector specific, but apply to the whole tradeables sector. There are therefore reasons to believe that a general equilibrium approach might be more suitable.

Appendix

The following expressions pertain to the models in Subsections 6.1-6.3. Let the output of a Home country firm in its home market be x, let a foreign firm's sales be y, and let c_h (c_f) be the home (foreign) country firm's marginal cost. In equilibrium:

$$x = \frac{a - (n+1)c_h - n(c_f - s)}{b(m+n+1)}$$

$$y = \frac{a - mc_h - (m+1)(c_f - s)}{b(m+n+1)}$$

Taking account of the symmetry between markets, the total profits of a home country firm, including subsidies, equal

$$\frac{(a - (n+1)c_h - n(c_f - s))^2}{b(m+n+1)^2} + \frac{(a - nc_f - (n+1)(c_h - r))^2}{b(m+n+1)^2} - f.$$

Consumer surplus is

$$\frac{((m+n)a - mc_h - n(c_f - s))^2}{2b(m+n+1)^2}$$

and the government outlays on export subsidies are

$$-m\frac{(a + nc_f - (n+1)(c_h - r))}{b(m+n+1)}r$$

Home country welfare is then the sum of these expressions.

A.1 The model in Subsection 6.1 In the model in subsection 6.1, $c_h = c_f \equiv c$.

A.1.1 *Equilibria in the different policy regimes*

Note that by Proposition 1 (which is established below), m^s is the lowest among equilibrium concentrations under consideration. In order to ensure that $m^g \geq 1$, we restrict attention to cases where $h \geq 13.5 \equiv h_{\min}$. With $c_h = c_f \equiv c$, the equilibria are the following.
(i) The equilibrium degree of concentration in autarky is:

$$f^a(m) \equiv (m+1)^3 = h$$

It is clear that there is a unique solution to this equation for any h.
(ii) With discretionarily setting of both trade and merger policies, the subsidies are given by

$$r^j = \frac{(a-c)}{2bm^j(m^j+1)};\ j = d, k \qquad (A1)$$

The equilibrium degree of concentration is given by:

$$f^d(m) \equiv 2(m+1)(2m+1) = h$$

$f^d(1) < h_{\min}$, f^d is continuous and monotonically increasing in m, and goes to infinity as m goes to infinity. Hence, a unique solution exists for any h.

(iii) With $r = s = 0$, and discretionarily determination of merger policies:

$$f^g(m) \equiv \frac{(2m+1)^3}{2(m+1)} = h$$

$f^g(1) < h_{\min}$, $f^g(m)$ increases monotonically in m

$$\frac{d}{dm} f^g(m) = \frac{1}{2}(2m+1)^2 \frac{4m+5}{(m+1)^2} > 0$$

and

$$\lim_{m \to \infty} f^g(m) = \infty$$

Hence, there exists a unique solution for any h.
(iv) With a supra-national merger policy, and discretionarily determined trade policies, the subsidies are again given by the expression above, and the equilibrium degree of concentration is given by:

$$f^k(m) \equiv 4m(m+1)^2 = h$$

$f^k(1) < h_{\min}$, f^k is monotonic in m, and approaches infinity as m becomes very large. Hence, there is a unique solution for any h.
(v) Finally, with a supra-national merger policy and $r = s = 0$:

$$f^s(m) \equiv \frac{1}{2}(2m+1)^3 = h$$

which also has a uniques solution for any h.

A.1.2 *Non-negativity constraints*

Consider first the constraint ensuring positive outputs: $a - c > \max(ns, mr)$. By the symmetry of the equilibrium, and using the expression for the optimal r above, this corresponds to the requirement that

$$a - c > \frac{(a-c)}{2b(m^j+1)};\ j = d, k$$

or $m^j > \frac{1}{2b} - 1$; this condition is definitely fulfilled for $b > 1/4$.

Now turn to profits. There are three types of situations. First, profits are non-negative in autarky iff

$$\alpha^a(m) \equiv (m+1)^2 \leq h$$

Secondly, with discretionary determination of export subsidies (includes the equilibria m^d and m^k) profits are non-negative iff

$$\alpha^d(m) \equiv \frac{4m^2(m+1)^2}{2m^2+2m+1} \leq h$$

Thirdly, with merger policy set discretionarily, and with $r = s = 0$, profits are non-negative iff

$$\alpha^g(m) \equiv \frac{1}{2}(2m+1)^2 \leq h$$

Clearly, since $m^g > m^s$, this also ensures that profits are positive in the case with supranational merger policies and the GATT.

Note that

$$\alpha^a(m) - \alpha^g(m) = -m^2 + \frac{1}{2} < 0$$

$$\alpha^d(m) - \alpha^g(m) = -\frac{1}{2}\frac{6m^2+6m+1}{2m^2+2m+1} < 0$$

Hence, if the constraint $\alpha^g(m) \leq h$ is fulfilled for all m, then the other constraints are also fulfilled. This is indeed the case, since

$$\begin{aligned} f^g(m) - \alpha^g(m) &= \frac{(2m+1)^3}{2(m+1)} - \frac{1}{2}(2m+1)^2 \\ &= \frac{1}{2}(2m+1)^2 \frac{m}{m+1} > 0 \end{aligned}$$

Hence, profits are positive in all equilibria.

A.1.3 *Proof of Proposition 1*

In order to establish Proposition 1, we make pairwise comparisons of the equilibrium expressions:

$$f^d(m) - f^g(m) = \frac{1}{2}(2m+1)\frac{4m+3}{m+1} > 0$$

$$f^a(m) - f^d(m) = (m+1)\left(m^2 - 2m - 1\right) >< 0$$

$$f^k(m) - f^a(m) = (3m-1)(m+1)^2 > 0$$

$$f^k(m) - f^s(m) = 2m^2 + m - \frac{1}{2} > 0$$

It follows from the facts that: i) $f^d(m) - f^g(m) > 0$; ii) both functions are monotonically increasing in m; and iii) there is a unique solution for any h, that for any h, $m^d < m^g$. The other claims in the Proposition follow analoguously.

A.2 The model in Subsection 6.2

We continue to have $c_h = c_f \equiv c$. The expressions for equilibrium quantities and the welfare function are thus the same as for the model in Subsection 6.1, and the equilibrium values m^g and m^s are also the same as in that model. The only new case to consider is the discretionary equilibrium. The optimal subsidies are still given by (A1). But, when optimizing over the number of firms, the countries take into consideration the fact that the subsidies are determined as in (A1). As it turns out, the optimal number of home country firms m^d is independent of the number of foreign firms, and is given by

$$f^d(m) \equiv 4\frac{(m+1)^3}{(m+2)} = h$$

This expression has a unique solution for any h, since $f^d(1) < h_{\min}$, f^d is continuous and monotonic in m, and $\lim_{m\to\infty} f^d(m) = \infty$. It is also straightfoward to show that the second order condition for the optimization w.r.t. m always is fulfilled.

A.2.3 *Proof of Proposition 3*

The Proposition follws from the above, and from the facts that

$$f^d(m) - f^g(m) = \frac{1}{2}\frac{4m^3 + 18m^2 + 19m + 6}{(m+2)(m+1)} > 0$$

$$f^s(m) - f^d(m) = \frac{1}{2}\frac{8m^4 + 20m^3 + 6m^2 - 11m - 6}{m+2} > 0 \quad \text{for m} > 1$$

A.3 The model in Subsection 6.3

We now assume that $c_h = mk^2$ and that $c_f = nk^2$, and furthermore that $f = 0$. We are only concerned with situations where $a/k \geq 25$, in order for $m \geq 1$ in all three equilibria. The expressions for equilibrium quantities and the welfare function, are the same as for the model in Subsection 6.1, with $c_h = mk^2$ and $c_f = nk^2$.
(i) With discretionary determination of both trade and merger policies:

$$f^d(m) \equiv m(12m^2 + 13m + 2) = \frac{a}{k}$$

which clearly has a uniques solution for any h. It can also be shown that the second order conditions are fulfilled locally in this equilibrium.
(ii) In the "GATT" equilibrium:

$$f^g(m) \equiv \frac{m^2}{m+1}(12m^2 + 15m + 5) = \frac{a}{k}$$

This has a unique solution for any a/k, since $f^g(1) < 25$,

$$\frac{d}{dm}f^g(m) = 2m\frac{18m^3 + 39m^2 + 25m + 5}{(m+1)^2} > 0$$

and

$$\lim_{m\to\infty} f^g(m) = \infty$$

Again, the second order conditions can be shown to be fulfilled locally in this equilibrium.
(iii) With supranational merger policy and no export subsidies:

$$f^s(m) \equiv m^2(8m^2 + 12m + 5) = \frac{a}{k}$$

which clearly has a uniques solution for any a/k. Again, the second order conditions are fulfilled locally in this equilibrium.

A.3.1 *Proof of Proposition 4*

The ranking of the merger policies from from the fact that:

$$f^d(m) - f^g(m) = 2m\frac{5m^2 + 5m + 1}{m+1} > 0$$

$$f^s(m) - f^g(m) = 2m^3\frac{4m^2 + 4m + 1}{m+1} > 0$$

A.4 The model in Subsection 6.4

We now turn to the case of specific tariffs t_h and t_f, and with identical marginal and fixed costs. In equilibrium home market quantities, consumer surplus, total profits of a home country firm, and government revenue, are:[12]

$$x = \frac{a - c + nt_h}{m + n + 1}$$

$$y = \frac{a - c - (m+1)t_h}{m + n + 1}$$

$$CS(m, n, t_h) = \frac{((m+n)(a-c) - nt_h)^2}{2(m+n+1)^2}$$

$$\tilde{\Pi}(m, n, t_h, t_f) = \frac{(a - c + nt_h)^2}{(m+n+1)^2} + \frac{(a - c - (n+1)t_f)^2}{(m+n+1)^2} - f$$

and

$$G(m, n, r) = n\frac{a - c - (m+1)t_h}{m + n + 1}t_h$$

The only equilibria here that differ from the corresponding ones in the case of export subsidies are those with discretionary setting of trade policies, and among those, we only consider that with both merger and trade policy discretionarily set:

$$f^d(m) \equiv \frac{(m+2)^2(2m+1)^3}{8m^2 + 12m + 5} = h.$$

The second order conditions supporting this equilibrium can be shown to be fulfilled. This equilibrium condition has a unique solution for any h, since $f^d(1) < h_{\min}$,

$$\frac{d}{dm}f^d(m) = 2\left(2m+1\right)^2\left(m+2\right)\left(m+1\right)\frac{24m^2 + 40m + 23}{\left(8m^2 + 12m + 5\right)^2} > 0$$

and

$$\lim_{m\to\infty} f^d(m) = \infty$$

1.4.1 *Proof of Proposition 5*

The Proposition follows from the findings above, combinded with the facts that:

$$f^d(m) - f^a(m) = \frac{8m^4 + 21m^3 + 14m^2 + m - 1}{8m^2 + 12m + 5} > 0$$

and

$$f^s(m) - f^d(m) = \frac{1}{2}\left(2m+1\right)^3\frac{6m^2 + 4m - 3}{8m^2 + 12m + 5} > 0$$

[12] The parameter b is unity in this subsection.

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