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Anti-dumping jumping: Reciprocal anti-dumping and industrial location

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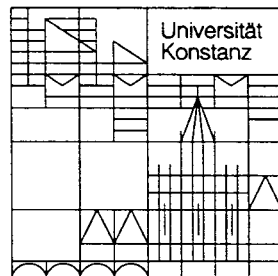
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and Industrial Location**

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ANTI-DUMPING JUMPING: Reciprocal Anti-dumping and Industrial Location

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Abstract

Anti-dumping policies are often justified as legitimate actions by governments in their efforts to protect domestic producers from unfair foreign competition. We investigate the impact of anti-dumping rules on firms' production decisions as to *how much* and *where* to produce. Anti-dumping measures may have unforeseen effects if they induce direct foreign investment and consequently increase domestic competition. We therefore focus on location choice and consider the strategies of national governments attempting to advance the interests of their citizens through anti-dumping legislation. Our analysis also has implications for the effects of market integration policies, such as Europe 1992.

Keywords

anti-dumping; market integration; location

JEL Classification Codes

F12, F13, L11

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1. Introduction

Anti-dumping policies are often justified as legitimate actions by governments in their efforts to protect domestic producers from, what they perceive to be, unfair competition from foreign firms. Irrespective of how convincing these arguments may be, anti-dumping legislation can be a formidable weapon in a country's arsenal of trade restrictions. As multilateral trade agreements have limited countries' ability to use more conventional trade policies, such as tariffs, alternatives such as anti-dumping legislation become relatively more important.¹ In this paper we examine the effects of anti-dumping rules on the strategic behaviour of firms and governments and the implications for profits and consumer welfare.

While the immediate impact of anti-dumping rules is similar to that of a tariff, that is, an increase in the price that consumers pay for imports of a product, the two instruments are only very imperfect substitutes. The incentive to dump in foreign markets does not exist for small, competitive firms. Dumping is an action taken by a firm with some degree of monopoly power, and the firm is most likely large and producing a product that is to some degree different from those of its competitors. This thrusts our analysis of anti-dumping into a world of economies of scale and imperfect competition. Such firms are often multinational enterprises, with production facilities in more than one country, and making decisions on more than mere output levels, but also on the locations of their economic activity. Anti-dumping rules may therefore influence all dimensions of a firm's production strategy.

In our investigation we consider firms' production decisions as to *how much* to produce and *where* it should be produced. This latter aspect provides some novel results, quite different from those that arise when production cannot be moved. For example, the anticipated protection of domestic firms resulting from anti-dumping actions may have the opposite effect if they induce inward foreign direct investment (FDI) and consequently

increase domestic competition. Thus location choice is the central element of our analysis of anti-dumping legislation and the resulting strategic play between national governments in introducing such measures in order to advance the interests of their firms or consumers.

The focus, in our partial equilibrium model, is on the effects of anti-dumping policies on profits and consumer surplus. However, if firms are induced to relocate their foreign production there will be higher employment in one country and lost jobs in the other country. We address this aspect of the issue in the final section of the paper.

2. Related literature

We give firms the possibility of either having a single production plant in their home countries, and servicing their global market from that one location, or establishing branch plants in each of their markets. Horstmann and Markusen (1992) examine a similar model in order to explain how the equilibrium market structure is determined by the particular parameterization of production and trade costs. They show that small changes in taxes could lead firms to shift locations and thereby result in discontinuous changes in welfare and profits. Tariffs make servicing a market from abroad more expensive, creating a *tariff-jumping* incentive for FDI. Norman and Motta (1993) discuss the impact of regional integration (in the form of preferential trade tax reductions) on the location of production. In this paper we have trade barriers that we model as real trade costs (for example, transport costs). Our policy experiments focus on government anti-dumping actions and the potential responses of firms in deciding to change the location of some of their production. Thus we may have an additional reason for FDI: *anti-dumping jumping*.

Dumping is a natural element of industrial competition whenever impediments to trade (such as transport costs or trade barriers) result in relatively weaker demand for a firm's

¹ The United States, in particular, has increasingly resorted to anti-dumping actions in pursuit of its commercial policy goals.

product in its export market than in its home market. Brander and Krugman (1983) demonstrate that oligopolistic rivalry between firms leads to “reciprocal dumping” in each other’s home market. In an earlier paper [Haaland and Wooton (1992)] we investigate the consequences of market integration and the elimination of reciprocal dumping. In this paper, we focus on the effects of anti-dumping measures, which might be introduced separately or as part of some comprehensive programme of market integration. We examine the implications, both for the equilibrium market structure and for profits and consumer welfare, of preventing firms from dumping in foreign markets.

Dixit (1988) considers the change in the optimal tariff in response to dumping by a foreign producer. In his conjectural variations model of international oligopoly he is unable to find a normative case for anti-dumping duties (that is, the optimal tariff *falls*, not rises, in response to dumping). In a multi-period setting, Staiger and Wolak (1992) look at anti-dumping measures against a foreign monopoly that dumps in a market with many competitive firms. Reitzes (1993) studies a similar situation with strategic interaction between the foreign firm and a domestic firm, while Webb (1992), in a one-period model, shows how the effects of anti-dumping measures may be ambiguous, depending (among other things) on the type of competition in the market. None of these studies look at bilateral policies or policy games between governments.

Anderson (1992) shows how even perfectly competitive firms may have incentives to dump in the first period, if there are chances that they can face VERs in the future. Gruenspecht (1988) looks at a two-period model with imperfect competition and learning effects, while Hartigan (1996) studies a similar setting where there are switching costs for the consumers. In these cases there are additional reasons to dump in the first period, compared to those in our one-period model, since the market situation in the future depends on the first-

period equilibrium. Dumping and antidumping measures today may thus influence the firms' competitive situation in the future.

Cuevas (1992) examines the effects of reciprocal anti-dumping in a model of potential entry of a foreign firm into the domestic market for a homogeneous good. Anti-dumping rules prevent these firms from price discriminating, deterring their entry, and permitting the domestic firms to charge higher prices. Anderson, Schmitt, and Thisse (1995) look at policy games between governments in a model of international duopoly fairly similar to ours, with some similar results. However, none of the above dumping papers allows for the firms to choose location of production, and hence circumvent the effects of the anti-dumping measures. In addition, as our results will show, adding such a location choice will alter many of the conclusions regarding the effects of anti-dumping measures for firms and consumers.

The FDI arising in our analysis comes about in response to government trade and industrial policy, contrasting with the work of Bhagwati and others on *quid pro quo* FDI, in which the foreign investment is used in an effort to influence future trade policy. [See Bhagwati *et al.* (1992) for a survey of this literature.] Brander and Spencer (1987) consider the strategic interactions between a monopolist and an importing country where the government wants to induce the firm to set up local production, in order to enjoy the benefits of increased domestic employment.

Flam (1994) examines the conflicting interests of car-producing and non-car-producing European countries in enticing FDI by Japanese car manufacturers when the EU has established quantity restrictions on car imports for the whole region. While our paper focuses on a different issue, both find that FDI makes domestic markets more competitive and has distributional effects between consumers and producers and between countries.

3. The Model

Let there be two countries A and B , each of which has a single firm producing a variety of a differentiated good for sale in both countries' markets. Denote the firm based in country A as firm a and let it produce variety a , with similar notation for country B . The model is symmetrical, in that demand for each variety and the costs of producing each are the same in both countries.

3.1. Demand

Utility is derived from the consumption of these two varieties of the good together with consumption of the numeraire, an homogeneous product z . We assume that tastes are identical in the two countries. Let utility be quadratic with respect to the varieties of the differentiated good. The utility of consumers in country J is then:

$$u_j = \alpha x_{aj} - \frac{1}{2} \beta x_{aj}^2 + \alpha x_{bj} - \frac{1}{2} \beta x_{bj}^2 - \gamma x_{aj} x_{bj} + z \quad (1)$$

where x_{ij} and p_{ij} are the quantity and price of variety i sold in country j , respectively. Let the budget constraint be:

$$I = p_{aj} x_{aj} + p_{bj} x_{bj} + z \quad (2)$$

Together these yield inverse demand functions:

$$\begin{aligned} p_{aj} &= \alpha - \beta x_{aj} - \gamma x_{bj} \\ p_{bj} &= \alpha - \beta x_{bj} - \gamma x_{aj} \end{aligned} \quad (3)$$

for countries $j \in \{A, B\}$. The two varieties are substitutes in consumption and so $\beta \geq \gamma \geq 0$.

3.2. Costs

Firms incur a constant marginal cost of production c . In addition they face a fixed cost h of operating the production facility in their home country. They are assumed always to have a production plant in their home country, but can choose whether or not to have an additional

branch plant in the other country, in which case they will face the additional fixed cost of f .

Profits from sales in a firm's home market are:

$$\pi_{jj} = x_{jj}(p_{jj} - c) - h \quad (4)$$

while the profits from foreign-market sales depend on the location of the factory supplying that market. If the firm chooses to establish a foreign plant, so as to provide *local* service to the foreign market, then it incurs f :

$$\pi_{ij} = x_{ij}(p_{ij} - c) - f, \quad i \neq j \quad (5)$$

while servicing from a *distance* will avoid this additional fixed cost, but will result in the producer price being lower than the consumer price as a result of the trade costs t . Thus:

$$\pi_{ij} = x_{ij}(p_{ij} - t - c) \quad i \neq j \quad (6)$$

For firms to be willing to sell their goods in both countries, the market price must exceed marginal cost, which implies that $\alpha > (c + t)$.

Firms are profit maximisers, choosing quantities to sell in each market. We initially assume that the firms are able to discriminate between their markets. We shall consider later the potential effects of restricting firms' ability to treat the markets as segmented. We additionally make the assumption that firms are Cournot competitors, that is, they set their output levels on the assumption that their competitor in the market will not change its output decision.

3.3. Stages of the Game

Firms have two sets of decisions to make. First they must decide upon production locations, specifically whether or not to manufacture goods in the foreign country. We shall use \mathbf{L}_i to indicate firm i 's decision to have *local* production in each country; while for \mathbf{D}_i a firm has production facilities only in its home country i and services the foreign market from a

distance.² It may be convenient to think of the latter as the *dumping* option because it has come to be accepted that, in such a model of segmented markets and trade costs, foreign producers might choose to sell at lower producer prices in their export markets than in their home markets. [See, for example, Brander and Krugman (1983).]

Having decided where to produce, firms must decide on how much to produce for each country's market. As has become familiar in solving such two-stage games, we solve the second (quantities) stage first and use the solution in determining the equilibrium of the first stage of the game. We assume that first-stage moves are simultaneous and that the second stage is a one-shot Cournot game.

Later, we shall introduce government policy controlling foreign firms' ability to dump in domestic markets. Firm i 's decision to service its foreign market from its home plant in such circumstances is indicated as \mathbf{XD}_i . Should the national governments attempt to use their anti-dumping policies strategically, we shall have to add an additional stage to the game in which governments choose their policies simultaneously and prior to the firms' choices of production locations and outputs.

3.4. *Dumping, injury, and anti-dumping policies*

We need to be able to determine whether or not a firm is dumping in its export market. The *dumping margin* for good i , DM_i , is the difference between firm i 's home-market price and the price it receives in its export market (net of trade costs), that is, $DM_i = p_{ii} - (p_{ij} - t)$.³ In the US anti-dumping duties will only be imposed if domestic firms have been injured by the

² What we term "local production" might otherwise be called FDI and a firm that adopts this option is what Markusen and Horstmann (1992) refer to as a "multinational enterprise".

³ The United States uses the dumping margin while the EU uses an alternative, the *injury margin*: which is the amount by which the producer price of the imported good undercuts the price of the competing domestically produced good. Thus for good i the comparison is between the prices of the two goods sold in country J , that is, $IM_i = p_{ij} - (p_{ij} - t)$ [see Vandenbussche (1994)]. In symmetric equilibria of our model the two anti-dumping measures yield the same result, that is, $DM_i = IM_i$.

foreign firm's dumping.⁴ Devault (1993) studies the basis for antidumping rulings by the ITC in the US, and in particular he focuses on the material injury part of a ruling: what are the criteria used in determining that the domestic industry is injured? The conclusion is that a number of economic and non-economic criteria are used, but the most important are profits and market shares for home firms, or the change in these over time.

In our one-period model, injury for domestic firms is related to the level of profits (or market shares) in a situation with dumping compared to what the profits would have been if the foreign firm did not dump. As will be clear from the results below, dumping will always cause injury to the other firm in the sense that both profits and market shares for the home firm in its domestic market are lower with foreign dumping than they would have been without such dumping.

Our anti-dumping rule prevents a foreign firm i from selling its goods in market j for less than the price it charges in its home market *plus* the trade cost t . That is: $p_{ij} \geq p_{ii} + t$.⁵ Being unable to price discriminate will not force a firm out of its foreign market completely, but it may lower its exports or it might choose to produce the good in that country. In doing so it circumvents the restrictions on its pricing policies (as it cannot be perceived to be dumping a good in a foreign country when it is actually manufacturing it there) and also avoids trade costs, though per-unit production costs will be higher as a result of having two production facilities instead of one.

⁴ Anti-dumping duties are permitted under Article VI of the GATT where paragraph 6(a) provides that: "No Contracting Party shall levy any antidumping or countervailing duty on the importation of any product of the territory of another Contracting Party unless it determined that the effect of the dumping or subsidization, as the case may be, is such as to cause or threaten material injury to an established domestic industry, or is such as to retard materially the establishment of domestic industry."

⁵ An anti-dumping policy might be initiated through a duty on imports equal to the difference between the producer price in the home market and the foreign market. Firms will respond to this by eliminating this differential and so the anti-dumping duty is never actually collected. We are therefore assuming that anti-dumping policies are fully effective and are not used as a means of generating government revenues. See Prusa (1992) for empirical evidence showing that only a minor share of antidumping petitions result in antidumping duties being levied.

The notion of injury we have discussed is limited to the effects on the profitability of existing domestically owned firms. It does not take into account the potential benefits to consumers of dumping. In our analysis, we shall look at the consequences of anti-dumping policies for all of the agents in an economy. We now compare the outcomes resulting from the firms' choices of production locations.

4. Firms' Output Decisions

4.1 Segmented markets

Consider initially the case of segmented markets, where the firms consider each market individually. Firm a 's Cournot assumption is that firm b will not adjust its output in response to a change in firm a 's output (and *vice versa*). Thus in country J 's market firm a assumes:

$$\frac{\partial x_{bj}}{\partial x_{aj}} = 0 \quad (7)$$

The perceived price response to changes in firm a 's output is then (from differentiation of the inverse demand function (3)):

$$\frac{\partial p_{aj}}{\partial x_{aj}} = -\beta \quad (8)$$

Suppose that both domestic and foreign firms have local production facilities in country B .

Then the first-order conditions for firm a , given the Cournot assumption are:

$$\begin{aligned} \frac{\partial \pi_{aa}}{\partial x_{aa}} &= p_{aa} - c - \beta x_{aa} = 0 \\ \frac{\partial \pi_{ab}}{\partial x_{ab}} &= p_{ab} - c - \beta x_{ab} = 0 \end{aligned} \quad (9)$$

Should firm a choose to supply country B 's market from abroad then these expressions are:

$$\frac{\partial \pi_{aa}}{\partial x_{aa}} = p_{aa} - c - \beta x_{aa} = 0$$

$$\frac{\partial \pi_{ab}}{\partial x_{ab}} = p_{ab} - c - t - \beta x_{ab} = 0$$
(10)

Similar expressions can be derived for firm b .

4.2. Integrated markets

Suppose that firm a cannot segment its market and has to consider its aggregate sales, not its sales in each separate, national market. This would be the case for both firms if the countries co-operated in maintaining a single regional market (as, for example, with the EU) and would impact on a single firm if the foreign country were to use anti-dumping legislation. Aggregate profits for firm a in this situation are:

$$\pi_a = x_a(q_a - c) - f$$
(11)

where $x_a \equiv x_{aa} + x_{ab}$ and $q_a \equiv p_{aa} = p_{ab} - t$.

The Cournot assumption will now involve the competitor's actions in both national markets. Therefore the perceived slope of firm a 's aggregate demand curve is:

$$\frac{\partial q_a}{\partial x_a} = -\frac{\beta}{2}$$
(12)

Firm a 's first-order condition is then:

$$\frac{\partial \pi_a}{\partial x_a} = q_a - c - \frac{\beta}{2} x_a = 0$$
(13)

Once again, similar expressions can be derived for firm b should country A impose an anti-dumping policy or if there were a single regional market.

Depending on where firms choose to locate their production activities, the constraints imposed on them by governments, and the decisions of their rival, firms' profits can take a wide range of values. Table 1 presents an exhaustive menu of the profit expressions. For example, cases (i) and (ii) are the profits in the home market and the foreign market,

respectively, if both firms are local. The succeeding sections will identify which cases arise in the various possible equilibria.

Table 1. MENU OF FIRMS' PROFITS	
(i) $\frac{\beta(\alpha - c)^2}{(2\beta + \gamma)^2} - h$	(ii) $\frac{\beta(\alpha - c)^2}{(2\beta + \gamma)^2} - f$
(iii) $\frac{\beta[(\alpha - c)(2\beta - \gamma) + \gamma]^2}{(2\beta - \gamma)^2(2\beta + \gamma)^2} - h$	(iv) $\frac{\beta[(\alpha - c)(2\beta - \gamma) - 2\beta t]^2}{(2\beta - \gamma)^2(2\beta + \gamma)^2}$
(v) $\frac{2\beta[(\alpha - c)(2\beta - \gamma) - t\beta]^2}{(2\beta - \gamma)^2(2\beta + \gamma)^2} - h$	
(vi) $\frac{\beta\{(\alpha - c)(2\beta - \gamma)(2\beta^2 - \gamma^2) + \gamma(3\beta^2 - \gamma^2)\}^2}{(4\beta^2 - \gamma^2)^2(2\beta^2 - \gamma^2)^2} - h$	
(vii) $\frac{\beta[(\alpha - c)(2\beta - \gamma)(2\beta^2 - \gamma^2) - \beta^2\gamma]^2}{(4\beta^2 - \gamma^2)^2(2\beta^2 - \gamma^2)^2} - f$	
(viii) $\frac{\beta[2(\alpha - c) - t]^2}{2(2\beta + \gamma)^2} - h$	
(ix) $\frac{\beta[2(\alpha - c)(2\beta^2 - \gamma^2) + \gamma(3\beta + 2\gamma)]^2}{4(2\beta + \gamma)^2(2\beta^2 - \gamma^2)^2} - h$	
(x) $\frac{\beta[2(\alpha - c)(2\beta^2 - \gamma^2) - \beta t(4\beta + 3\gamma)]^2}{4(2\beta + \gamma)^2(2\beta^2 - \gamma^2)^2}$	

5. The Location Decisions of Firms

5.1. Segmented markets

The profits payoff matrix for firms' locations when there is no government intervention in the form of anti-dumping rules is shown in Table 2, where the roman numerals refer to the entries in Table 1.

Table 2. SEGMENTED MARKETS			
Firms' Profits, $[\pi_{aa} + \pi_{ab}, \pi_{bb} + \pi_{ba}]$			
		Firm <i>b</i>	
		L_b	D_b
Firm <i>a</i>	L_a	$[(i) + (ii), (i) + (ii)]$	$[(iii) + (ii), (i) + (iv)]$
	D_a	$[(i) + (iv), (iii) + (ii)]$	$[(iii) + (iv), (iii) + (iv)]$

Consider either firm's decision as to the location of its production for foreign consumers when the firms are not subject to any anti-dumping rules. In comparing the profits in Table 2, we see that this decision is independent of the actions of the rival firm. In switching from distant to local production the firm's profits change by $[(ii) - (iv)]$, regardless of whether the other firm is local or distant. Thus the choice of production location will be a dominant strategy: if $[(ii) - (iv)] > 0$, the firm will choose local production; and it will be distant if $[(ii) - (iv)] < 0$. Subtracting (iv) from (ii) yields:

$$\frac{4\beta^2 t [(\alpha - c)(2\beta - \gamma) - \beta t]}{(2\beta - \gamma)^2 (2\beta + \gamma)^2} - f \quad (14)$$

Clearly, when there are no trade costs ($t = 0$) there is no need for two production facilities. If there are trade costs, the firm must compare these with the cost of setting up a foreign plant for local production. As the fixed cost of establishing a foreign plant increases, the profitability of shifting to local production declines. Differentiating the above expression with respect to t :

$$\frac{4\beta^2 [(\alpha - c)(2\beta - \gamma) - 2\beta t]}{(2\beta - \gamma)^2 (2\beta + \gamma)^2}$$

which is positive for free trade, but diminishes with increasingly large trade costs. Thus for t/f close to zero, a firm will choose distant production, while larger relative trade costs will encourage a firm to choose local production. Given the symmetry of the model and the independence of firms' actions, low trade costs will result in a Nash equilibrium of (D_a, D_b) ,

while a higher ratio of trade costs to fixed costs may induce a jump to local production with an equilibrium of $(\mathbf{L}_a, \mathbf{L}_b)$. This is illustrated in Figure 1.⁶ Line $x(t)$ plots [(ii) - (iv)] for a range of trade costs. When $x(t) > 0$, local production is the dominant strategy for both firms.

Now consider how a firm is affected by its rival's choice of location. When a firm changes from distant to local production, it changes the profits of its rival by [(i) - (iii)]. Subtracting (iii) from (i) yields:

$$\frac{-\beta\gamma[2(\alpha - c)(2\beta - \gamma) + \gamma]}{(2\beta - \gamma)^2(2\beta + \gamma)^2} \quad (15)$$

which is negative. Thus a firm's move to local production always lowers the profits of the other firm by increasing the level of competition in its home market.

If the loss arising from the rival firm's change in location is sufficiently great that it outweighs the direct benefits to a firm of its own change in location, there is a possibility that the Nash equilibrium of $(\mathbf{L}_a, \mathbf{L}_b)$ is less profitable for *both* firms than $(\mathbf{D}_a, \mathbf{D}_b)$; that is, there would be a Prisoner's Dilemma. This will occur if $\{[(i) + (ii)] - [(iii) + (iv)]\} < 0$. This expression may be decomposed into [(i) - (iii)], expression (15), which is the negative impact on a firm of its rival jumping to local production, plus [(ii) - (iv)], expression (14), which is the private benefit to a firm of jumping to local production. The latter term will be positive but very small for a firm that faces trade costs that are just high enough to make it marginally profitable to jump. Given that the other firm will also choose to jump and thereby lower its rival's profits, both firms will jump to their mutual detriment. However, as we have established that the higher the trade cost, the better is $(\mathbf{L}_a, \mathbf{L}_b)$ relative to $(\mathbf{D}_a, \mathbf{D}_b)$, then the Prisoner's Dilemma disappears for high trade costs.

⁶ Our figures have been drawn using the following parameters: $\alpha = 15$, $\beta = 6$, $\gamma = 4$, $c = 4$, $h = 1$, and $f = 1$.

5.2 Unilateral anti-dumping

Now consider the effects of country B unilaterally introducing anti-dumping rules. These will only be effective if, prior to the introduction of the anti-dumping legislation, firm a is servicing its foreign market from a distance. The profits associated with each pair of locations are listed in Table 3. We shall establish that firm a is harmed by the anti-dumping rules and this will create an incentive for it to jump to local production. If it does so, there will be implications for firm b .

Table 3. COUNTRY B UNILATERALLY IMPOSES ANTI-DUMPING RULES			
Firms' Profits, $[\pi_{aa} + \pi_{ab}, \pi_{bb} + \pi_{ba}]$			
		Firm b	
		L_b	D_b
Firm a	L_a	[(i) + (ii), (i) + (ii)]	[(iii) + (ii), (i) + (iv)]
	XD_a	[(v), (vi) + (vii)]	[(viii), (ix) + (x)]

The impact of anti-dumping legislation on firm a is found in a comparison of its profits under the rules and in their absence. This involves a comparison of corresponding cells in Tables 2 and 3. When both firms are initially distant and firm a is made subject to anti-dumping, its profits change by $\{(viii) - [(iii) + (iv)]\}$. Solving this yields:

$$\frac{-\beta t^2}{2(2\beta - \gamma)^2} \quad (16)$$

which is negative. Thus firm a suffers from the anti-dumping policy. As a consequence of anti-dumping lowering profits of distant production, it makes the local option relatively more attractive and may induce firm a to jump to local production, which it will do if $[(iii) + (ii)] - (viii) > 0$. The jump to local production cannot, however, fully restore firm a 's

profits, otherwise the firm would have been willing to go to local production in the absence of the anti-dumping policy.⁷

Now consider the benefits to firm b of its government's anti-dumping measures. Assume that the Nash equilibrium before country B 's introduction of anti-dumping rules is $(\mathbf{D}_a, \mathbf{D}_b)$ and that firm a does not change its location after the policy is implemented and so the new equilibrium is $(\mathbf{X}\mathbf{D}_a, \mathbf{D}_b)$. The change in firm b 's profits is $\{[(ix) + (x)] - [(iii) + (iv)]\}$, which can be reduced to:

$$\frac{\beta^2 \gamma^2 (4\beta^2 + \beta\gamma - 2\gamma^2)}{2(2\beta - \gamma)^2 (2\beta^2 - \gamma^2)^2}$$

which is positive. Thus firm b benefits from its rival being forced to charge the same producer price in both of its markets.⁸

However, should the equilibrium location of production change as a result of the anti-dumping rules, the situation is quite different. We have already shown that firm a has an increased incentive to switch to local production as a result of the anti-dumping rules. Should it do so, firm b 's profits will change by $[(i) - (iii)]$ which is expression (15) and is negative. Thus the anti-dumping rules have precisely the wrong effects in this case. Rather than protecting a country's domestic firm, the policy has induced a local rival to set up, increasing the level of competition in the domestic market, and driving down the home firm's profits. Consequently, a policy designed to protect domestic industry can end up harming it.

⁷ Given the symmetry of the model, firm b will have chosen distant production if firm a has chosen this option. However, should firm b be local when the anti-dumping measures are introduced, firm a will still lose from their introduction. It can easily be shown that the change in firm a 's profits of $\{(v) - [(i) + (iv)]\}$ is negative.

⁸ Had firm b been local, its profits would also have increased from the anti-dumping legislation (the change in profits, $\{[(vi) + (vii)] - [(iii) + (ii)]\}$, being positive).

5.3. Reciprocal anti-dumping or integrated markets

We now consider the case of bilateral anti-dumping actions, where both countries introduce anti-dumping legislation. This is equivalent to a policy of market integration in a region.⁹ The profits associated with the various location decisions are listed in Table 4.

Table 4. INTEGRATED MARKETS			
Firms' Profits, $[\pi_{aa} + \pi_{ab}, \pi_{bb} + \pi_{ba}]$			
		Firm <i>b</i>	
		L_b	XD_b
Firm <i>a</i>	L_a	[(i) + (ii), (i) + (ii)]	[(vi) + (vii), (v)]
	XD_a	[(v), (vi) + (vii)]	[(viii), (viii)]

We assume that in the initial equilibrium there are no anti-dumping rules and both firms are distant. If the anti-dumping does not induce a jump in location, then both firms' profits change from [(iii) + (iv)] to (viii), which we know from expression (16) to be a fall. Thus both firms are worse off and each faces an increased incentive to jump to local production. Suppose that one firm does so in anticipation of receiving higher profits and that, without loss of generality,⁹ it is firm *a* that jumps to local production. This action changes the potential for its rival to increase profits from a similar jump in location. First of all, firm *a*'s jump lowers the profits of firm *b* if it remains distant. Firm *b*'s profits change from (viii) to (v) as a result of firm *a*'s jump. The difference [(v) - (viii)] is equal to:

$$\frac{\beta\gamma[4(\alpha - c)(\gamma - 2\beta) - \gamma - 4\beta t]}{2(2\beta - \gamma)^2(2\beta + \gamma)^2}$$

which is negative. Thus the firm that jumps benefits itself at the cost of the other firm's profits. This may or may not be the Nash equilibrium. That depends on whether firm *b* still

⁹ This is the same experiment as was conducted in studies of the consequences of the EU's programme for completion of the single market by the end of 1992 [for example, Smith and Venables (1988), and Haaland and Wooton (1992)]. These looked at the implications of firms being unable to continue segmenting the markets within a region.

has an incentive to jump. The jump by firm a has, however, reduced the incentive for firm b to jump from $\{[(vi) + (vii)] - (viii)\}$ to $\{[(i) + (ii)] - (v)\}$, which is:

$$\frac{-\beta\gamma^2(\gamma^5 + 4\beta\gamma^4 - 8\beta^2\gamma^3 - 16\beta^3\gamma^2 + 16\beta^4\gamma + 16\beta^5)}{(2\beta - \gamma)^2(2\beta + \gamma)^2(2\beta^2 - \gamma^2)^2}$$

and is less than zero. Nonetheless, with sufficiently high trade costs, firm b will jump and the Nash will be $(\mathbf{L}_a, \mathbf{L}_b)$.

However, there exists a range of values of trade costs such that the change in location of one firm will result in the other firm choosing to stay distant; that is, $(\mathbf{L}_a, \mathbf{XD}_b)$ and $(\mathbf{XD}_a, \mathbf{L}_b)$ will be the Nash equilibria. This is shown in Figure 2. The line $x(t)$ plots the profit gain for the first firm to jump from distant to local, leaving its rival subject to anti-dumping rules. $y(t)$ plots the profit gain of the other firm should it also jump to local production. As $x(t) > y(t)$ the figure shows the three possible Nash equilibria. When trade costs are low, $x(t) < 0$ and $y(t) < 0$ and both firms will continue to produce at a distance despite the anti-dumping rules. If $x(t) > 0$ and $y(t) < 0$, one firm will jump to local but the other will stay distant. Should trade costs be sufficiently high, both firms will choose local production under bilateral anti-dumping legislation, that is $x(t) > 0$ and $y(t) > 0$.

It is, once again, possible to have a Prisoner's Dilemma, in that both firms can end up with lower profits from jumping than they would have had remaining at a distance. It can be shown that the profits a firm gets in the Nash equilibrium $(\mathbf{L}_a, \mathbf{L}_b)$ are less than those it would receive from $(\mathbf{XD}_a, \mathbf{XD}_b)$ for levels of trade costs close to the jump level where $y(t) = 0$.

Now consider whether a firm that is itself facing anti-dumping rules would like its government to retaliate with its own anti-dumping legislation. That is, is there an incentive for *reciprocal* anti-dumping to take place? This will depend upon the initial Nash equilibrium and whether the reciprocal action induces the other firm to change location.

First take the case where anti-dumping legislation does not result in any change in location. We have shown that unilateral anti-dumping measures benefit the firm whose home market is being protected. An artefact of our symmetric, linear model is that once a firm faces anti-dumping rules its profits are independent of whether or not its competitor is subject to similar restrictions; in either case its profits are (viii). Thus there is no incentive for retaliation in this case.¹⁰

Now consider the case where the initial, unilateral anti-dumping action caused the affected firm to jump to local production. Reciprocation may result in one of two equilibria: the other firm may stay distant or may also jump to local production. In the former case, the profits of the firm whose government is retaliating change by $\{[(vi) + (vii)] - [(iii) + (ii)]\}$. This is equal to:

$$\frac{2\beta^3\gamma^2t^2(3\beta^2 - \gamma^2)}{(2\beta - \gamma)^2(2\beta + \gamma)^2(2\beta^2 - \gamma^2)^2}$$

which is positive. If the rival firm does jump, the impact on the profits of the firm whose government is retaliating is $[(i) - (iii)]$, which we know from expression (15) to be negative.

Thus, as long as the rival firm does not jump to local production, the impact on profits from reciprocation is non-negative. Should the retaliatory action induce the rival firm to set up a competing local plant, though, then reciprocation clearly is harmful to profits. We next consider the governments' choices of policies.

6. Government Policy Choices

As mentioned earlier, we can introduce the two governments as additional players in the game, making an initial, simultaneous, announcement of whether or not they will enforce anti-dumping measures, following which the firms will make their location and output decisions.

¹⁰ The only consequence for a country that retaliates would be that its consumers would no longer benefit from the lower prices resulting from the foreign firm's dumping in their market.

We have already assembled in Tables 2, 3, and 4 the implications of the governments' anti-dumping policies for firms' profits. In Table 5 we compile the possible Nash equilibria of these, in order to determine the outcome of the various policy combinations that may be adopted by the two governments. We use the terms "active" and "passive" to indicate the use of anti-dumping regulations and a non-interventionist policy, respectively, and list the location choices made by the firms and the associated profits that they receive in the face of these policy combinations. The Nash equilibrium for the non-cooperative game between governments is indicated by a "*".

Table 5. PAYOFF MATRIX FOR GOVERNMENT ANTI-DUMPING POLICIES			
* NASH EQUILIBRIUM		Country B	
1. No location jumps		Passive	Active
Country A	Passive	(D_a, D_b) [(iii) + (iv), (iii) + (iv)]	(XD_a, D_b) [(viii), (ix) + (x)]
	Active	(D_a, XD_b) [(ix) + (x), (viii)]	$(XD_a, XD_b)^*$ [(viii), (viii)]
2. Jumps in location		Passive	Active
Country A	Passive	$(D_a, D_b)^*$ [(iii) + (iv), (iii) + (iv)]	(L_a, D_b) [(iii) + (ii), (i) + (iv)]
	Active	(D_a, L_b) [(i) + (iv), (iii) + (ii)]	(L_a, L_b) [(i) + (ii), (i) + (ii)]

As anti-dumping policies have no effect on an initial equilibrium of (L_a, L_b) , we can safely ignore that case and consider the two interesting outcomes starting from an initial (D_a, D_b) equilibrium: one in which the firms stay distant in response to anti-dumping regulations; and that in which the firms jump to local production.

In case 1 of Table 5, an affected firm will remain distant and therefore a country's unilateral use of anti-dumping regulations benefits its firm. In addition, we have established that a firm is not harmed by retaliatory action on the part of its government. Therefore, both governments will pursue active anti-dumping policies. This has an unfortunate consequence

for both firms which end up with profits lower than if the governments had chosen passive policies. The decline in profits is $\{(viii)-[(iii) + (iv)]\}$ and equal to expression (16).

In case 2, trade costs are sufficiently high that anti-dumping policies induce firms to jump to local production. A government would lower the profitability of its firms by encouraging the rival enterprise to set up local production facilities. Therefore the Nash equilibrium will have both governments passive.

While the games between governments have different Nash equilibria in the two cases that we have considered, it is clear that from the point of view of all of the firms it would be best if governments could be constrained from using anti-dumping policies. Thus an interdict against anti-dumping legislation at the supranational level (for example, the GATT or the EU) would be in the best interests of industry.

Presumably governments do not have only the interests of their firms at heart in making policy choices. Therefore we should consider the effects arising from the governments' policy choices. Consumers lose from unilateral anti-dumping actions of their own government *unless* the anti-dumping rules induce the foreign firm to jump to local production, in which case the market power of the domestic firm is diminished even farther than it was by the dumping.

Thus in case 1 of Table 5, each government acting on behalf of its own consumers will choose to be passive in the Nash equilibrium. Consumers *can* gain from anti-dumping legislation, but that of the other government not their own. This is because foreign anti-dumping laws will force the home country's firm to set a single producer price for the home and foreign market, resulting in a lower price at home. Thus while both governments pursuing active anti-dumping policies might benefit all consumers, this will not arise in this non-cooperative setting (that is, there is a Prisoner's Dilemma). In case 2, unilateral anti-dumping

policies benefit consumers, due to increased local competition, and the Nash equilibrium will have both governments choosing to be active.

In summary, governments concerned exclusively with corporate profits would be best to adopt a mutual *laissez faire* approach, whereas those that act purely on behalf of their consumers will enact anti-dumping legislation as a means of inducing firms to create a more competitive domestic environment through FDI. The actual outcome must be sensitive to the weights in the political process.¹¹

6. Summary and Conclusions

We have considered the use of anti-dumping rules as a strategic trade instrument in an oligopolistic model in which each firm chooses either to produce all of its output in a single plant in its home country or to establish a factory in each country.

When a firm is prevented from dumping it has two options. First, it may choose to adopt a single producer price for all of its output, that is, it can give up dumping. This has the expected results of lowering the profitability of the affected firm and of reducing the welfare of consumers who previously were in that firm's foreign market. The other firm realises an increase in its domestic profits, because its monopoly power has been enhanced in its home market, and increases its dumping (in the sense that the differential between its prices in its home and foreign markets increases).

Secondly, the firm could establish a foreign production facility and thereby have no trade subject to anti-dumping measures. While its profits are also reduced by this option, the consequences for the other agents in the economy are reversed as a result of the change in location. Having another domestic producer in its home market lowers the other firm's profits, while consumers benefit from this increased domestic competition.

We also considered the non-cooperative policy game between governments and established that those governments that are most concerned with industrial profits should not introduce anti-dumping policies, though it may take a binding agreement between governments to ensure that neither government is tempted to introduce such legislation. Consumer interests would however be best served by all firms being subject to anti-dumping rules in order to make domestic markets more competitive than they would otherwise be.

There may be some important general equilibrium consequences that are not captured in our model. Specifically, the improved domestic employment resulting from foreign firms setting up local production might be very significant. This is a crucial element in Brander and Spencer (1987) in which a foreign firm is induced through the tax system to shift to local production so that the country might benefit from the increased domestic employment opportunities. Cordella and Grilo (1995) have the opposite concern, where “social dumping” might lead to firms shifting employment overseas. Were we to take employment effects into account, they would reinforce the incentives for governments to introduce unilateral anti-dumping measures. However, using anti-dumping rules for employment purposes is a beggar-thy-neighbour policy. If both countries pursue such policies the net employment effects will be minimal.

This paper has considered the interplay between two governments where one of the possible equilibria is equivalent to market integration. We might also investigate governments’ responses to a regional policy of market integration. That is, given a regional ban on dumping, should national governments respond by attempting to influence the production locations of firms?¹² We leave this possibility to be explored in future research.

¹¹ Flam (1994) remarks that it has been common in political economy models to focus on the impact on producers of changes in government policies, but argues that governments might also take into account the effects on consumers.

¹² Flam (1994) looks at a similar situation but considers different issues and policy instruments.

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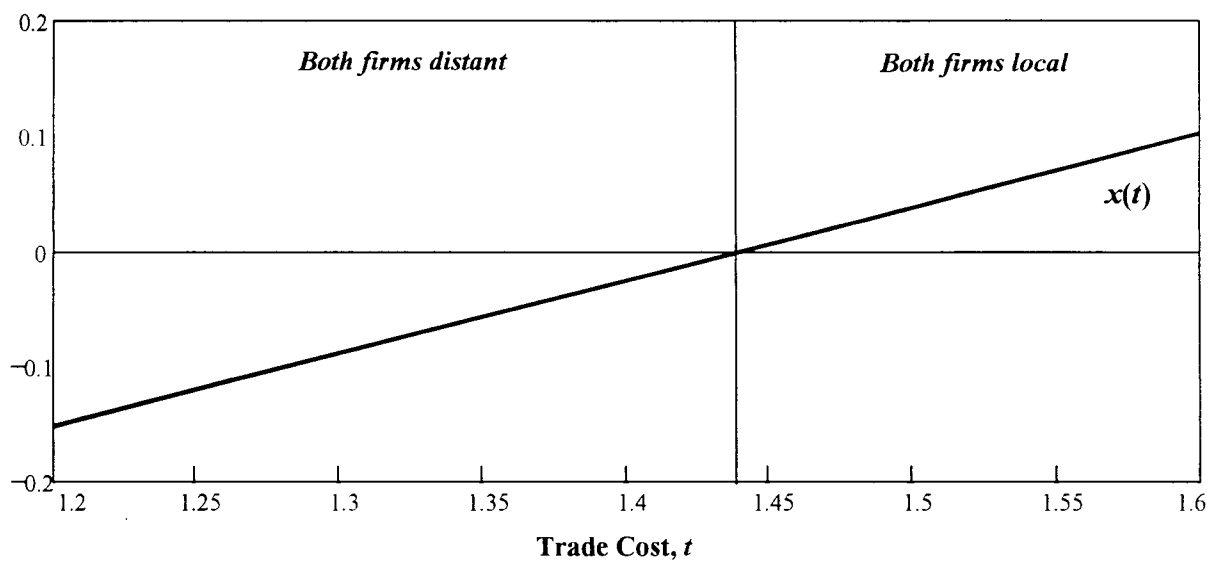


Figure 1

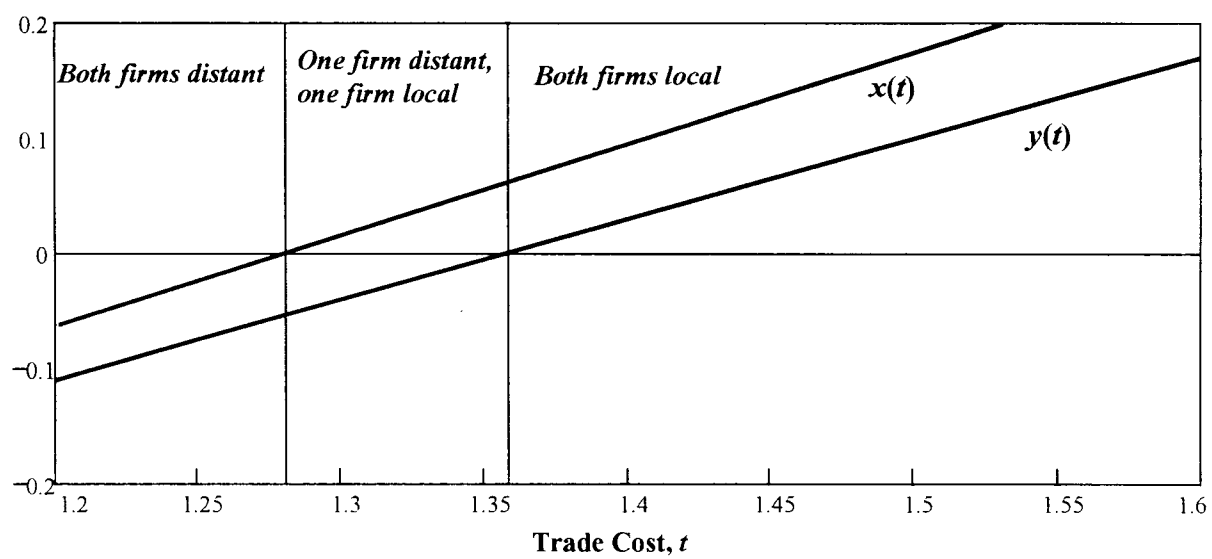


Figure 2