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Department of Economics
The University of Michigan
Ann Arbor, Michigan 48109-1220

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Competition, Unilateral Dumping, and Firm Profitability

David Weinstein

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Summary

This paper presents an analysis of the effects of market structure on the propensity of firms to dump goods. Contrary to the conventional wisdom, this paper finds that firms in more domestically competitive markets are more prone to dump unilaterally than firms in less competitive markets. This dumping is not predatory but may result in dumping at prices below average cost and higher profits for the firms that unilaterally dump.

The existence of dumping in international markets is ubiquitous. Between July 1985 and June of 1986, Australia, Canada, the European Community, and the US alone pursued a total of 568 outstanding antidumping actions involving 45 countries.[1] Economic treatments of dumping, however, have often treated the phenomenon as an aberration arising out of either sudden unexpected demand fluctuations or barriers to trade. In fact, despite mounting evidence to the contrary, the US continues to view dumping by other countries as evidence of firms in protected overseas markets attempting to eliminate competitive domestic enterprises. This paper will demonstrate, however, that contrary to the conventional wisdom, it is not true that more monopolistic firms are likely to dump into competitive markets. Rather, in the absence of protectionist barriers, firms in relatively competitive markets are far more prone to dump unilaterally than more monopolistic firms. The dumping described here involves no predatory behavior and arises simply from the profit maximizing interactions of firms in a Cournot equilibrium. Furthermore, it will be shown that if a domestic market is sufficiently competitive, domestic firms will dump at prices below average cost and may earn higher profits than firms in less competitive markets.

[1]These numbers are from Jackson, Table 1.

Before beginning the analysis, it is important to clearly define what types of actions will be categorized as dumping. Although there are many lay definitions of dumping, the standard definition used by economists and law makers will be the one adopted in this paper, i.e. price discrimination between international markets. Despite the general consensus that price discrimination in domestic markets should not be prosecuted, there are a variety of national laws and international treaties designed to facilitate the detection and prevention of international price discrimination. For example, the General Agreement on Trade and Tariffs (GATT) considers products dumped if they are offered for export at a price below the domestic price or below an estimate of what the price "should" be based on the production costs.[2] If dumping is detected and determined to cause "material injury" to the domestic firms, GATT permits countries to levy countervailing duties equal to the "margin of dumping" on the dumped goods.

One can broadly group the standard explanations of dumping into two categories: oligopolized (or monopolized) home market arguments (e.g. Viner, Yntema, and Eichengreen and van der Ven) and fluctuating demand arguments (e.g. Ethier and Davies and McGuinness). The oligopolized home market approach usually postulates firms in an oligopolistic home market who are protected from foreign competition by some sort of trade barrier and then sell into a relatively competitive foreign market. Because the home firms cannot raise prices in the competitive foreign market, they practice price discrimination and sell at a lower price abroad. The problem with this explanation is that it fails to deal with many of the stylized facts that surround dumping cases. For example, although many US antidumping actions are directed against Japan, Japanese trade barriers are probably as low or lower than US barriers.[3]

Furthermore, it is very hard to make a *prima facie* case that Japanese dumping is caused by firms in concentrated Japanese markets interacting with competitive US markets. Most research on international industrial concentration indicates that Japanese markets are less concentrated than US

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[2]According to Article 2 of the Anti-Dumping Code in the GATT treaty, a product is considered to be dumped "if the export price of the product exported from one country to another is less than the comparable price. . .for the like product when destined for consumption in the exporting country."

[3]See, for example, Saxonhouse p. 231 in *The Political Economy of Japan*.

markets. For example, in 1982 the 100 largest manufacturers in the United States accounted for 32% of all shipments (in value terms) whereas the same number for Japan in 1980 was 27%.[4] The lower Japanese firm concentration statistics are not only apparent in aggregate data but also in specific industries where dumping is alleged to have occurred. One such case is the recent preliminary finding by the Commerce Department that Japanese microdisks are being dumped despite relatively fierce competition between Japanese producers.[5] Since 3.5 inch disks have long been standardized and tend to be rather homogeneous in nature, it is difficult to believe that any particular firm could exercise its market power by significantly raising its price.[6] Furthermore, with at least ten indigenous Japanese floppy disk manufacturers, the low US price cannot easily be explained using arguments based on competitive US markets or predation against US firms.

Although demand fluctuation arguments do not have the same dependence on market structure considerations as oligopolized home market arguments, their failure to address the question of why dumping often continues unabated for many years raises some cause for concern about their overall applicability.[7] Demand fluctuation explanations generally postulate a firm facing a world demand curve that fluctuates according to some unpredictable process. Since firms do not know *ex ante* whether the world will be in a high or low demand situation, they must set expected marginal revenue equal to expected marginal cost. Unfortunately, this means that sometimes the realized world price will be below expected costs, and thus the firm will engage in dumping.

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[4]Census of Manufacturers, *Concentration Ratios in Manufacturing*, 1982, and Uekusa, Masu in *The Political Economy of Japan* p. 486. Using 1963 data, the last year in which the Japanese and US data are comparable, Caves and Uekusa (1976 p. 19) examined concentration ratios in the two countries at the 3-digit industry level. They constructed weighted concentration ratios covering the 512 sectors in Japan and 417 sectors in the US by multiplying the 4-firm concentration ratios in each sector by total sales in that sector and then dividing by total sales. Based on this calculation, they found that the weighted concentration ratio came to 35.4% for Japan and 40.9% for the US. I repeated this calculation for the US with 1977 Census of Manufacturers data and found that the weighted 4-firm concentration ratio had fallen slightly to 39.3% in the intervening fourteen years. Although changes in data definitions make it difficult to update Japanese data, the evidence presented in Uekusa (1982 pp. 29-31) suggests that over the same period the number for Japan increased by about 2 percentage points. Even given these changes, Japanese industries still appear either as concentrated or slightly less concentrated than US industries.

[5]See "Ruling Confirmed that Japan Dumps Microdisks in U.S.," *The Wall Street Journal*, Feb. 8, 1989, and *Electronic Business*, May 15, 1988.

[6]"Floppy Disk Makers Competing on Numerous Fronts: Denon, JVC, Konica, Sony, KAO, Maxel, Fuji Film, Toshiba, Mitsumi, Alps," Office Equipment and Products, vol. 17, Feb. 1988.

[7]Dam (1970 p. 171), for example, notes that "dumping, at least of the type against which antidumping duties are going to be imposed, is typically permanent."

These models suggest that dumping is a phenomenon that should appear primarily in economic downturns. However, demand fluctuation explanations cannot convincingly explain why dumping occurs in rapidly expanding industries as well as depressed ones. For example, considering the explosive growth in microdisk sales over the last nine years, it would be difficult to argue that dumping by Japanese firms has resulted from insufficient demand.

One model that does not quite fit into either category is the reciprocal dumping model developed by Brander and Krugman (1983). Their model postulates a monopolist in each of two countries that can export to the foreign market if it pays a certain per unit transportation cost. They then showed that since the marginal cost of exporting is higher than that of domestic sales, each monopolist will absorb some of the transportation costs in order to sell in the foreign market. Because even the partial absorption of international transportation costs is tantamount to dumping, reciprocal dumping arises in the Brander-Krugman model from the very natural desire of firms to exploit rents in foreign markets. Methodologically, this approach is very attractive because it generates dumping without relying on protectionism or other specific "institutional" explanations. However, since dumping tends to be more of a unilateral problem rather than a reciprocal problem, it is difficult to see how these results explain the unilateral dumping that has become so commonplace.

This paper extends the original analysis of Brander and Krugman by examining how unequal numbers of firms in different countries can affect the pattern of dumping. Not surprisingly, the reciprocal dumping result of the Brander-Krugman model is robust with regard to increases in the numbers of firms in the equilibrium. However, it can be shown that if one county's market has a critical number of firms in it, then the domestic price will be driven down sufficiently to prevent foreign entry, but domestic firms will continue to dump into the foreign market. Thus, sufficient competition in one country can cause that country to unilaterally dump into another country's market. The presence of this form of unilateral dumping in a wide class of Cournot models is demonstrated in the following section and forms the basis for much of the remainder of the analysis.

Dumping and Bilateral Intra-Industry Trade

Although most antidumping legislation is enacted with the intent of promoting trade, the close interconnection between dumping and intra-industry trade is not well understood. It is well known that the presence of transportation costs interferes with factor price equalization and the formation of an integrated world economy. Our intuition suggests that in the presence of transportation costs, competitive markets will set prices so that the price of a good in an exporting country exactly equals the price of the good in the importing country plus the per unit transportation cost. This leads us to believe that in the absence of barriers to trade other than transportation costs, the FOB price in any country should be the same as the domestic price. Yet, all of this intuition is contingent on the absence of two way or bilateral intra-industry trade. Specifically, as Proposition 1 demonstrates, in any situation in which there is bilateral intra-industry trade in the presence of positive transportation costs, then the firms in at least one of the two countries will engage in dumping. The connection between intra-industry trade, transportation costs, and dumping can best be understood by first noting that if the FOB price in one country is greater than or equal to the domestic price and transportation costs are positive, then the only way that firms in that country can export without dumping is if the domestic price is lower than the foreign market price. However, since it is not possible for the domestic price to be lower than the foreign price in every market, at least one of the countries must be dumping if all countries export the good. This statement is formalized and proved below.

Proposition 1 (Dumping is essential for bilateral intra-industry trade with transportation costs): If transportation costs are positive, then bilateral intra-industry trade of a homogeneous good is not possible without dumping.

Proof:

Let p and p* represent the prices in the domestic and foreign markets respectively, and let t represent the per unit transportation cost between the two markets. Dumping by home country firms occurs if the domestic price is greater than the FOB price or if

(1) $p > p^* - t$

and by the foreign firms if

(1') $p^* > p - t$

If firms do not dump then

$$p \leq p^* - t \text{ and } p^* \leq p - t$$

or

$$0 \leq -2t,$$

which is a contradiction.

This form of dumping does not appear in standard trade models because bilateral intra-industry trade is usually not compatible with positive transportation costs. For example, in the Heckscher-Ohlin model, bilateral intra-industry trade can occur but does not constitute dumping because of the absence of transportation costs. If this model is then modified to allow for positive transportation costs, dumping again will not appear because the presence of the transportation costs eliminates bilateral intra-industry trade. Thus, although bilateral intra-industry trade occurs in actuality and Proposition 1 suggests that this implies that dumping must be widespread, without a suitable trade model it is difficult to know what conditions make a country prone to dump and whether that dumping will be reciprocal or unilateral. Since relaxing assumptions about perfectly competitive markets within industries seems the easiest way to generate bilateral intra-industry trade in the presence of transportation costs, most of the remaining analysis will be based on a partial equilibrium analysis of a given industry that extends and builds on the model of "reciprocal dumping" developed by Brander and Krugman.[8]

Consider two countries that trade with each other. Let the total quantity of a good sold in the domestic country be denoted by Z, and by Z* in the foreign country, and assume that the price in either country is determined solely by the total amount of the good available in that country's

[8]Wherever possible, the original Brander-Krugman notation has been used.

market. This implies that the price in the domestic market, p(Z), is solely a function of the goods available in that market, and the price in the foreign market, p*(Z*), does not have any relation to conditions in the domestic market. Furthermore, assume that

$$\lim_{Z\to\infty} p(Z) = \lim_{Z^*\to\infty} p^*(Z^*) = 0$$

Since Brander and Krugman dealt primarily with a symmetric case with only one firm in each country, there was no need to specify individual firm output in the original model.[9] However, in order to add the asymmetry of different numbers of firms in each country, one must modify the original Brander-Krugman notation somewhat. Let n represent the number of firms in the home country and n* the number of firms in the foreign country. Domestic firm, i, produces x_i units of the good for the domestic market and x_i^* units of the good for the foreign market, while foreign firm, j, produces y_j units of the good for export and y_j^* units for its domestic market. Furthermore, let

$$x = \frac{1}{n}\sum_{i=1}^{n} x_i,\ y = \frac{1}{n^*}\sum_{j=1}^{n^*} y_j,\ x^* = \frac{1}{n}\sum_{i=1}^{n} x_i^*, \text{ and } y^* = \frac{1}{n^*}\sum_{j=1}^{n^*} y_j^*.$$

All of the firms will have identical cost functions with constant marginal cost:[10]

$$\text{For domestic firms: } C(x_i, x_i^*) = c(x_i + x_i^*) + F \text{ for all } i=1\ldots n$$

$$\text{For foreign firms: } C(y_j, y_j^*) = c(y_j + y_j^*) + F \text{ for all } j=1\ldots n^*$$

Transportation costs are assumed to be of the Samuelson "iceberg" form, i.e. the marginal cost of producing and exporting a good is assumed to be c/g where g is any number on the interval (0,1] and represents the fraction of the good that arrives at the final destination. Therefore, the cost of exporting a good is:

$$t = \frac{c(1-g)}{g} \text{ (note: } c + t = c/g)$$

Firms export by selling goods to perfectly competitive exporters who sell the goods in turn to the overseas market. Thus, if the price in the foreign market is p*, then a domestic firm selling abroad

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[9]While Brander and Krugman do mention that it would be possible to perform a similar analysis with a multifirm model, they do not discuss any of the asymmetrical results that will occur with different numbers of firms in each country.

[10]As the form of the cost function suggests, firms must pay the fixed cost, F, regardless of whether they produce any output.

would only receive $p^* - t$ dollars for each unit sold. The FOB price, then, is simply the price of the good in the overseas market minus the transport cost, t.[11]

Each firm will play a Cournot quantity game by trying to select an output that maximizes the firm's profits, subject to the production decision of the other firms. Thus, domestic and foreign firm profits can be written as follows:

$$\pi_i \equiv x_i p(Z) + x_i^* p^*(Z^*) - c(x_i + x_i^*/g) - F \text{ for all } i = 1 \ldots n \tag{2}$$

$$\pi_j^* \equiv y_j p(Z) + y_j^* p^*(Z^*) - c(y_j/g + y_j^*) - F \text{ for all } j = 1 \ldots n^* \tag{3}$$

Since the firms have constant marginal costs, the profit equations are additively separable in domestic and foreign production. This means that sales in one country will not affect the sales or price in the other country, and therefore, since there are no secondary effects from one market to another, the comparative statics will be relatively simple. For the remainder of the analysis the Novshek condition will be assumed to be binding in each market. Novshek (1985) has demonstrated that in addition to the assumptions already made in the paper, if one restricts the convexity of the inverse demand functions somewhat by specifying that

$$\frac{d[Zp'(Z)]}{dZ} = p'(Z) + Zp''(Z) \leq 0,$$

then a Cournot equilibrium will exist. This condition basically specifies that the best response curves are downward sloping in each firm's output, and thus if any one firm increases output, the marginal revenue of the other firms will decrease. The reason for requiring that the Novshek condition holds, as opposed to some other existence criterion, is that this condition also turns out to be a sufficient condition to generate many of the results of this paper. Based on the Novshek criterion, it will be possible to show that if the inverse demand functions are the same in two countries, then the firms in a market with many home country firms (the flooded market) may unilaterally dump into the market with fewer home country firms (the non-flooded market).

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[11] t could also be thought of as including tariffs. However, since the point of this paper is to demonstrate how unilateral dumping can arise without government intervention, t has been assumed to be equal for both domestic and foreign firms.

First, consider a situation in which all firms sell positive quantities in all markets. Differentiating 2 and 3 with respect to production sold in the home country (x_i and y_j) and setting these derivatives equal to zero yields:

(4) $\pi_{x_i} = x_i p'(Z) + p(Z) - c = 0$ for all $i = 1...n$

(5) $\pi^*_{y_j} = y_j p'(Z) + p(Z) - c/g = 0$ for all $j = 1...n^*$

(6) $Z = nx + n^*y$

and

(4') $\pi_{x^*_i} = x^*_i p'(Z^*) + p(Z^*) - c/g = 0$ for all $i = 1...n$

(5') $\pi^*_{y^*_j} = y^*_j p'(Z^*) + p(Z^*) - c = 0$ for all $j = 1...n^*$

(6') $Z^* = nx^* + n^*y^*$

It can be shown that because the Novshek condition holds, equations 4,5, and 6 generate a unique equilibrium in the domestic market, and equations 4',5', and 6' are sufficient for uniqueness in the foreign market.[12] Furthermore, the symmetry of the equations guarantees that all firms from a given country will produce the same amount of output in equilibrium, and therefore the notation can be simplified by letting $x_i = x$, $x_i^* = x^*$, $y_j = y$, and $y_j^* = y^*$.

Brander and Krugman demonstrated that for the case in which $n = n^* = 1$, each country's firm will dump into the other country's market. Proposition 2, below, demonstrates that this result continues to be valid for all values of n and n* that are compatible with an interior solution. In other words, provided that prices in each market are higher than the production and shipping costs to that market, then bilateral intra-industry trade will occur and firms in each country will dump into the other's market. The dumping in this case is reciprocal because firms in both countries recognize that their profits will be higher by exporting and absorbing some of the transportation costs than by not exporting at all.

[12]See Shapiro (1987 p. 7) for a more detailed discussion of the relationship between the Novshek condition and uniqueness of equilibria.

Proposition 2 (Reciprocal Dumping): If the inverse demand functions are equal in the two markets ($p(u) = p^*(u)$ for all $u \geq 0$) and all firms sell in both markets, then firms will carry out "reciprocal dumping".

Proof:

Dumping by home country firms occurs if equation 1 is satisfied and by the foreign firms if equation 1' is satisfied

Summing up equations 4 and 5 over all firms and setting them equal to the sum of equations 4' and 5' yields[13]

(7) $(n+n^*)p(Z) + (nx+n^*y)p'(Z) - nc - n^*c/g = (n+n^*)p(Z^*) + (nx^*+n^*y^*)p'(Z^*) - nc/g - n^*c$

If we let $N = n + n^*$, we can rewrite equation 7 as

$$Np(Z) + Zp'(Z) = Np(Z^*) + Z^*p'(Z^*) - nt + n^*t$$

Without any loss of generality we can assume that there are at least as many domestic firms as foreign firms or that $n \geq n^*$. This implies that

$$Np(Z) + Zp'(Z) \leq Np(Z^*) + Z^*p'(Z^*),$$

and since

$$\frac{d[Np(Z) + Zp'(Z)]}{dZ} = (N + 1)p'(Z) + Zp''(Z) < 0,$$

we know that $Z \geq Z^*$. But this means that $p(Z) \leq p(Z^*)$ or

(8) $p - t < p^*$.

Thus, it is clear that if $n \geq n^*$ and foreign firms sell into the domestic market, then they will dump into it.[14]

Now, to prove that firms in the flooded market will also dump, we first note that profit maximization in both the foreign and domestic market implies that

$$p(Z) + xp'(Z) - c = p(Z^*) + x^*p'(Z^*) - c/g, \text{ or}$$

$$p(Z) + xp'(Z) = p(Z^*) + x^*p'(Z^*) - t$$

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[13]For the sake of clarity, I have included the arguments of p and p* in certain stages of this proof. However, throughout the proof $p = p(Z)$ and $p^* = p(Z^*)$.

[14]It is important to note here that the ability of firms in the non-flooded market to dump into the flooded market is contingent on the condition that $p>c/g$. The price level in the domestic market is crucially dependent on the number of domestic firms, and therefore if n is large enough there will be no foreign penetration of the domestic market, but, as Theorem 3 will demonstrate, domestic firms will nonetheless continue to dump into the foreign market.

Dumping will occur if $xp'(Z) < x^*p'(Z^*)$.

Suppose that this condition does not hold, then

$$xp'(Z) \geq x^*p'(Z^*).$$

Recalling the Novshek condition and the fact that $Z \geq Z^*$, it is clear that $Z^*p'(Z^*) \geq Zp'(Z)$, or

(9) $$nx^*p'(Z^*) + n^*y^*p'(Z^*) \geq nxp'(Z) + n^*yp'(Z).$$

But by the counter assumption, this equation means that

$$n^*y^*p'(Z^*) \geq n^*yp'(Z), \text{ or } y^*p'(Z^*) \geq yp'(Z).$$

The first order conditions for profit maximization then imply that

$$p + yp' - c/g = p^* + y^*p^{*\prime} - c, \text{ or}$$

$$p - c/g \geq p^* - c.$$

which can be rewritten as

(10) $$p - t \geq p^*$$

But this cannot be if equation 8 is true. Therefore $xp'(Z) < x^*p'(Z^*)$ and $p > p^* - t$.

Thus far, the analysis has been predicated on the assumption that no arbitrage can occur between the two markets. However, there is no *a priori* reason to rule out the possibility that an arbitrager might want to exploit the the international price differentials and ship goods from one market to the other. Therefore, we now demonstrate that the presence of an arbitrager that moves simultaneously with the firms will not have any effect on this equilibrium. Let the arbitrager pick a quantity Δ to ship from one of the markets to the other. Without a loss of generality, Δ can be assumed to be the flow of goods from the domestic market to the foreign market. Thus, $\Delta \in [0, Z]$. In this case, the arbitrager's profits will be

$$\pi^a = [p(Z^* + \Delta) - p(Z - \Delta) - t]\Delta$$

Suppose that the firms do not change their production decisions in the presence of the arbitrager. Since the domestic firms are dumping we know that

$$p(Z^*) - p(Z) - t < 0$$

But this means that the bracketed term in the profit equation is negative for all possible values of Δ and that the arbitrager's optimal strategy is not to sell any output at all. Thus, if the firms continue to play their equilibrium strategies in the presence of the arbitrager, the arbitrager will ship nothing and the equilibrium will be unaffected. The reason that arbitrage does not occur in this equilibrium is that the dumping in this model arises because the firms absorb some of the transportation costs and thereby prevent the price differential between the two markets from ever exceeding t.

Unilateral Dumping

The analysis in the previous section was based on the assumption of an interior solution, i.e. that firms sell in both markets. This assumption was needed in the original Brander and Krugman paper because, with only one firm in each country, the only corner solution possible was one in which transportation costs were so high that no trade whatsoever took place. In the multi-firm case, however, while that trivial corner solution is still possible, there is also a more interesting corner solution in which the firms in one country are not able export, but the firms in the other country can and do export. The basic intuition here is that in any domestic market, foreign firms act like high cost firms while domestic firms act like low cost firms. Hence, if there are a sufficient number of low cost domestic firms, they can drive the domestic price down to a level that is above their marginal cost but below the cost of production plus transportation. This means that foreign firms cannot export to the domestic market but domestic firms can still export abroad. To see this more clearly, first note that if p is equal to c/g, then equation 5 indicates that the foreign firms will not sell anything in the domestic market. Because p monotonically declines in output and $\lim_{Z\to\infty} p(Z) = 0$, there exists a unique Z^c such that

(11) $p(Z^c) = c/g$

We now want to find an n^c such that a Cournot equilibrium with this number of firms will result in the aggregate output of domestic firms equalling Z^c. Ignoring the integer problem, equations 4, 6, and 11 can be written as three equations in n, x, and Z that uniquely determine n^c as shown below:

$$n^c = \frac{Z^c}{x^c}, \text{ where } x^c = -\frac{t}{p'(Z^c)}.$$

It is important to remember, however, that provided that there are less than n^c firms in the foreign market, the aggregate output of the foreign firms in the foreign market, n^*y^*, will be less than Z^c and the domestic firms will continue to export into the foreign market. In this situation, one would find that the domestic price would equal c/g but the foreign price would be higher. As Proposition 3 demonstrates, this would result in unilateral dumping because the domestic firms would continue to dump despite the inability of the foreign firms to penetrate the flooded domestic market.

Proposition 3 (Unilateral Dumping): If the flooded market has an autarkic price that is equal to or less than c/g but the non-flooded market autarkic price is greater than c/g, then if $p(u) = p^*(u)$ for $u \geq 0$, no firms operating out of the non-flooded market will sell in the flooded market and firms in the flooded market will dump into the non-flooded market.

Proof:

Suppose that in a state of autarky, $p \leq c/g$ and $p^* > c/g$. Since price in the domestic market is below (or at most equal to) the marginal cost at which a foreign firm can export profitably, there will be no foreign penetration of the domestic market. The proof that domestic firms will dump is essentially the same as the proof of Proposition 1. Since $p < p^*$, Z must be larger than Z^*. Noting that $y \equiv 0$, the rest of the proof is essentially the same as that of the second half of Proposition 1.

This result can best be understood by thinking of each market as containing both high cost foreign firms and low cost domestic firms. To make the discussion a little clearer, call the home country, "country A" and the foreign country, "country B". In a standard Cournot model with constant marginal costs, low cost firms produce more output than high cost firms. Thus, for example, if the firms selling in country A were ten low cost (country A) firms and one high cost (country B) firm, the price in country A would be lower than if there were ten high cost (country B) firms and only one low cost (country A) firm. By the same logic, with ten country A firms and one country B firm, the price in country B would be higher than the price in country A. If there are a sufficient number of country A firms then they will drive the country A price down to cost plus

transportation cost, and no country B firms will be able to sell any output in country A. However, since country A firms are high cost firms in country B's market, they will not produce as much as they do for domestic consumption, and so the price in country B will be higher than in country A. This will permit the firms in country A to export into country B but prevent the firms in country B from exporting into country A.[15]

One is tempted to think that a firm in the non-flooded market is necessarily going to earn higher profits than a firm in the flooded market since dumping by firms in the flooded market cannot drive the price in the non-flooded market below c/g, but firms in the flooded market must face heavy competition by low cost firms at home. However, the ability of firms in the flooded market to sell in two different markets can offset the losses of having a more competitive domestic market and enable them to earn higher profits.[16] Suppose that unilateral dumping occurs with n^c firms operating out of the flooded market. These firms will mark-up their production destined for their own market by t and will mark-up their production for sale in the non-flooded market by less than t because we know from Proposition 3 that these firms must be dumping. Since the price in the non-flooded market must be greater than the cost of producing and shipping the units into that market (c/g), firms operating out of the non-flooded market must have higher mark-ups over cost in their domestic market than firms in the flooded market have in their domestic market. This creates a paradoxical situation in which the firms from the flooded market have lower mark-ups in both markets but earn higher profits. This seemingly contradictory state of affairs can be understood by recognizing that although the firms in the flooded market have a lower per unit

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[15]A brief comment about welfare is in order. Since Brander and Krugman have already discussed the welfare implications of dumping in detail, there is no need to investigate the welfare implications of dumping here. Basically, dumping has two effects on welfare. The added competition improves welfare by lowering prices, but the cross-hauling of goods between the countries reduces welfare. Brander and Krugman show that a free-entry equilibrium generates higher welfare than autarky. However, if transport costs are just high enough to prevent trade, a marginal drop in transportation costs will decrease welfare because it simply induces cross-hauling. This latter argument also applies to the case of unilateral dumping, where a marginal drop in transportation costs may be welfare decreasing because it would generate cross-hauling by allowing firms in the non-flooded market to sell in the flooded market without having a significant effect on prices.

[16]The reader may wish to verify that with a constant elasticity to scale demand curve the following parameter values will produce higher profits for domestic firms in an equilibrium in which they unilaterally dump:
n=2, n*=1, elas.=0.71, g=0.3; a second set of values with more domestic firms that produces the similar results is n=25, n*=2, elas.=0.20, g=0.8.

mark-up, because they can sell in two markets, they are able to sell more output and thereby earn higher profits.

This asymmetry in the profits accruing to firms in two countries implies that there may be reasons for specialization that are not in the least connected to demand conditions or production technologies. It is important to remember that a difference in profitability between foreign and domestic firms can arise solely from the fact that there are more domestic firms than foreign ones. Had the numbers of foreign and domestic firms been reversed, the profits of the foreign firms would have been higher. This implies that if one country can develop a competitive industrial base ahead of other countries, its firms will tend to dump into foreign markets and by so doing earn higher profits even though they have no cost advantage in the production of the product.

Dumping at Prices Below Average Cost

Thus far, the analysis has treated dumping as if it were simply price discrimination and has not addressed the issue of whether price discriminatory dumping differs from dumping at prices below cost. While it should be clear from the structure of this model that it is not possible to ever have situations in which firms dump at prices below marginal cost, it is possible to find cases in which firms sell abroad at prices below average cost. Because firms dump, mark-ups must be higher on sales in the domestic market than on sales in the foreign market. Now, if fixed costs are high enough so that firms just break even, then each unit sold domestically must bring in more revenue to cover the fixed costs than a unit sold abroad. However, this means that if firms break even then all firms that dump will sell abroad using FOB prices that are below average cost. This notion is formalized below.

Proposition 4 (Below Average Cost Dumping): If firms break even and dump, then the FOB price will be below average cost.

Proof:

Suppose that domestic firms are dumping. This implies that $p > p^* - t$. In addition since the firms are breaking even, the following equation must also hold:

$$F = (p - c)x + (p^* - c/g)x^*$$

Average costs can be written as

$$AC \equiv \frac{F+cx+cx^*}{x+x^*}$$
$$= \frac{xp+x^*p^*-tx^*}{x+x^*}$$

Suppose that the proposition is not true, then

$$\frac{xp+x^*p^*-tx^*}{x+x^*} \leq p^* - t$$

which can be rewritten as

$$xp + x^*p^* - tx^* \leq xp^* - tx + x^*p^* - tx^*$$

or

$$p \leq p^* - t$$

But this contradicts the initial assumption that firms were dumping in the foreign market. Therefore, the proposition must be true.[17]

Often sanctions against firms that dump are based on evidence that the firm is selling abroad at prices below cost. Proposition 4 states that not only is selling abroad at prices below average cost not evidence for predatory dumping, but since more competitive industries are more likely to be closer to the break even point, regulations that target firms that export at prices below average cost may punish relatively competitive firms more than less competitive firms. This analysis, therefore, suggests that the conventional justification for antidumping regulation may be completely backwards. We see from Propositions 2 and 3 that antidumping laws protect domestic monopolies and oligopolies from relatively competitive foreign sectors. Furthermore, Proposition 4 indicates that the cases in which the laws and tariffs are applied with the most vigor–cases in which the FOB price is below cost–are precisely the cases in which the foreign sector is likely to be the most competitive.

[17]It is interesting to note that like Proposition 1, Proposition 4 is a model-free proposition that does not depend on the assumptions necessary for Propositions 2 and 3.

Conclusion

Although dumping has traditionally been seen as a phenomenon that is similar to predatory pricing, in reality the practice may simply be a reflection of the tendency of competitive rent-seeking firms to expand into less competitive markets that have high rents. Since selling abroad does not lower prices in the domestic market, firms are willing to sell at lower profit margins abroad (i.e. dump) whenever prices in a foreign market are sufficiently high to cover production and transportation costs. The dumping of products from more competitive markets into less competitive markets implies that even if production technologies and demand conditions are identical, trade will arise as a means of equalizing rents in various national markets. However, it is important to recognize that although this form of dumping equates the marginal revenues and marginal costs of each firm, aggregate profits will depend vitally on whether the firm is based in a flooded or non-flooded market.

If it is true that by flooding a market with firms a country can eliminate foreign entry and have more profitable firms, then this provides additional support for arguments in favor of developing infant industries and competitive industrial bases. The existence of large domestic oligopolistic firms will generate significant rents in the domestic market that will tend to encourage foreign firms to dump products into the home market and drive the trade account into the red. Although careful empirical testing of this effect is difficult, there is some circumstantial evidence to support the claim. A cursory glance at international industry concentration statistics reveals that Japanese firms tend to be smaller and more numerous than US firms. For many years, many analysts have held that Japanese firms try to maximize sales in some way at the expense of direct profit maximization while US firms are only concerned about making very profitable sales. According to this model, both the higher per sale mark-ups accruing to US firms as well as the need of Japanese firms to obtain large market shares abroad should be linked closely with the relative levels of competitiveness in the two markets. Thus, the explanation for why Japanese firms constantly face charges of dumping, are able to achieve large market shares in the US, and drive US firms out of business may be related to Japan's competitive domestic market structure.

When policy makers speak of improving the competitiveness of US industries as a method of reversing trade deficits usually they mean improving the efficiency of domestic firms: thereby enabling them to produce at lower prices. The analysis of this paper suggests that increasing domestic competition alone may achieve many of the results desired by governments without any of the expensive subsidy programs that characterize current attempts to improve competitiveness of industries. Furthermore, Japanese producers have long held that the factor that prevents US entry into their markets is not tariff or non-tariff barriers against US products but rather highly competitive domestic industries. If the Japanese market is indeed relatively less concentrated than the US market, then the model presented in this paper predicts that Japanese firms will tend to be more successful in penetrating US markets than US firms in Japan.

While this form of dumping does tend to reduce individual firm profits to the point of perhaps driving some companies into bankruptcy, the significantly lower prices that result from the added competition greatly increase consumer surplus in both markets. Provided that a large number of domestic firms do not go out of business as a result of the added competition and that the loss of resources due to cross shipping goods is not too great, dumping will be beneficial to consumers in both the long- and short-run and a welfare enhancing practice overall.

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