Dumping in Developing and Transition Economies

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Abstract

We build a simple theoretical model to understand why developing and transition economies have increasingly applied anti-dumping laws. To that end, we investigate the strategic incentives of oligopolistic exporting firms to undertake dumping in these economies. We show that dumping may arise due to cross-country differences in income, and to the extent of tariff protection and of the exchange rate depreciations observed recently.

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1 Introduction

Times have changed in the world of anti-dumping activities. While anti-dumping actions were only used by major industrial countries less then a decade ago, they are now the trade policy of choice of developing and transaction economies as well. On a worldwide basis, India has since 2001 overtaken the US in terms of initiations of new anti-dumping cases. In terms of cases per dollar of imports, India's intensity of anti-dumping use is seven times the US figure, though this is less than Argentina's intensity, which is 20 times the US figure (Finger, Ng and Wangchuk, 2000). Noting that most anti-dumping investigations against Member States of the European Community emanate from countries like China, Czech Republic, Bulgaria, India, Russia, etc., the European community concludes: "Anti-dumping is now a global instrument and every country is now both a potential user and potential target of anti-dumping action" (EC, 2002, p.1).

The natural question that arises from these observations is what are the conditions that lead to dumping. In recent years, a number of theoretical models have been developed to examine the export behavior of firms under different market structure. The survey by Blonigen and Prusa (2003) thoroughly reviews the exisiting theory and empirics and describes the various market outcomes of resulting anti-dumping actions. The existing literature largely confirms attention to outcomes of anti-dumping laws in developed countries. However, dumping by Western firms is also observed in industries of developing and transition economies whose economic characteristics are different. The purpose of this paper is to examine the stragetic incentives of oligopolistic exporting firms to undertake dumping in poorer countries and to understand why the latter have increasingly applied anti-dumping laws. We shall focus on several important factors that influence firms to charge a lower price abroad than at home: a product quality gap, countries' differences in income and in tariffs and the exchange rate.

Though developing and transition economies differ in many respects, there are a number of common economic characteristics that have inspired our framework of analysis:

- A limited concern for quality standards has often driven firms in these economies to supply goods whose quality is inferior to that of Western firms. This is established in a number of empirical studies that show a quality advantage of imports over exports by comparing average unit values (Aturupane et al., 1999; Lankhuizen, 2000).
- There is also convincing evidence that a significant proportion of trade involves trade of vertically differantiated goods (Greenaway et al., 1994, 1995).

- The current nominal protection rates reveal high levels of tariff protection, from two to three times those of industrial countries (see the World Bank website)
- Trends in nominal exchange rates indicate a tendency towards depreciation and show fluctuations in currencies that are often larger than the applied tariff rates. Examples include the Russian Ruble and the Argentinian Peso.
- It is common that anti-dumping cases concern just two players, a local producer and a foreign exporter. This observation derives from anti-dumping proceedings of the US and the EC. For example, petitions which are filed by US industries against imports concern products which are usually classified under 10-digit subheadings of the Harmonized Tariff Schedule of the United States. Even in a large trading nation like the US, sources of supply at this level of disaggregation concern a few firms only. See, for example, USITC (2001, 2002).

The specific model we analyse is as follows. We model bilateral international trade by considering the market for a single (quality-differentiated) product in a two-country world, home and foreign. Domestic and foreign consumers have heterogenous preferences for the sole product attribute namely, quality. The distribution of consumer preferences is different in that foreign consumers have more sophisticated tastes. Also, as consumers may decide not to consume, market sizes at both locations are endogenous. Quality development is costly and the foreign firm is assumed to be more efficient with regard to quality development costs. In this environment, two types of quality are produced under free trade, the most efficient firm having the quality leadership. Trade takes the form of intra-industry trade in vertically diffentiated goods whose determinants relate to those found traditionally in the empirical literature (see Greenaway et al., 1995). However, free trade does not lead to a social optimum (in a second-best sense) and governments in both countires have incentives to impose an optimal trade policy.

The main result of this paper is that dumping is a natural strategy of firms in that it always takes place (under free trade). For a class of environments, unilateral dumping by the foreign firm in the poorer country is the most likely outcome; for a more restricted class of situations, reciprocal dumping occurs and a necessary condition is that at least a country levies a positive tariff on imports. In our model, dumping arises as a consequence of differences in the distribution of tastes across countries engaged in trade.

Another interesting result we derive is that as free trade is not optimal, the strategic incentive to dump may arise depending on the height of tariff protection imposed by both countries in the first

place. However, the optimal tariff protection being higher at home than abroad, unilateral dumping is the most likely outcome. Also, as exchange rate movements affect firms in opposite directions, an exchange rate depreciation (appreciation) increases the likelihood of unilateral dumping in the domestic (foreign) market.

The paper is organized as follows. In section 2, we lay out the general structure and describe the extensive form of the game. In section 3, we derive the market equilibrium and obtain the conditions for dumping. We also outline the effects of changes in the exchange rate level on dumping. In section 4, we discuss a game between governments which simultaneously decide whether or not to impose tariffs to maximize social welfare. We conclude in section 5. The appendix contains a glossary of symbols.

2 The Model

We analyze dumping in the context of markets in two countries, which we shall call *domestic* and *foreign*, the latter denoted by " $*$ ". The domestic country is meant to represent a developing or transition economy; the foreign country a developed economy. Suppose that a population of measure 1 lives at home and that preferences of domestic consumer θ are given by the quasi-linear utility function:

$$U = \begin{cases} \theta q - p & \text{if she buys a unit of a product of quality } q \text{ at price } p \\ 0 & \text{otherwise} \end{cases} \tag{1}$$

Consumers buy at most one unit. We assume the consumer-specific quality taste parameter θ is uniformly distributed over the set $\left[0, \overline{\theta}\right], \overline{\theta} > 0$.

Preferences of foreign consumers are also given by (1) but we allow for a population of measure $m^*(m^* \geq 1)$ to live abroad and for the foreign taste parameters θ^* to be uniformly distributed over the set $\left[0, \lambda^* \overline{\theta}\right], \lambda^* > 1$.

We assume there are two firms, one in each country. Let q and q_ℓ denote the quality produced by the home firm to be sold at home and abroad respectively. Likewise, let q^* and q_h^* denote the quality produced by the foreign firm to be sold locally and abroad respectively. Following Eaton and Schmitt (1994), we introduce production flexibility in this model by supposing that firms first develop one basic product, and then produce variations on these basic products at a lower cost. As firms incur fixed costs of quality development, flexibility amounts to assuming cost functions of the

form: $C(q, q_\ell) = c \max\{q, q_\ell\}^2 / 2$ and $C^*(q^*, q_h^*) = c^* \max\{q^*, q_h^*\}^2 / 2$. As c and c^* are expressed in different currencies, let us introduce e, the forward exchange rate given to the firms defined as the domestic currency price of foreign currency.[1] We assume $c > ec^*$, that is, the foreign firm is more efficient than the domestic firm in producing any quality level.

Given these assumptions, Moraga-González and Viaene (2004) show that it is optimal for a single firm to sell the same level of quality abroad and locally, i.e., $q^* = q_h^*$, and $q = q_\ell$. A second useful result is that the foreign firm will manufacture a product of higher quality than the domestic firm's, i.e., $q_h^* > q_\ell$ (see Motta et al., 1997; Moraga-González and Viaene, 2004). This result follows from an application of the risk-dominance selection criterion (Harsany and Selten, 1988) and hinges upon the fact that the foreign firm is more efficient than the local firm.

On the basis of these results, in what follows, we shall derive profits functions with two qualities, low quality q_ℓ and high quality q_h^*. We start by deriving domestic demands for both variants. Define first the corresponding prices charged in the domestic economy by p and p_h^*, with $p_h^* > p$. Denote by $\widetilde{\theta}$ the buyer who is indifferent between high quality or low quality. From (1), $\widetilde{\theta} = (p_h^* - p) / (q_h^* - q_l)$. Denote by $\widehat{\theta}$, the consumer indifferent between acquiring low quality or nothing. From (1), $\widehat{\theta} = p/q_l$. As we have identified two consumers that are indifferent at the margin, we know that the high-quality good is demanded by those consumers such that $\widetilde{\theta} \leq \theta \leq \overline{\theta}$ and the low-quality good by those consumers such that $\widehat{\theta} \leq \theta < \widetilde{\theta}$. Consumers in the interval $0 \leq \theta < \widehat{\theta}$ prefer not to consume. As θ is uniformly distributed on $[0, \overline{\theta}]$:

$$D_\ell(.) = \frac{p_h^* - p}{\overline{\theta}(q_h^* - q_h)} - \frac{p}{\overline{\theta} q_l}, D_h(.) = 1 - \frac{p_h^* - p}{\overline{\theta}(q_h^* - q_\ell)} \tag{2}$$

Note that domestic demand D_h of high quality is met by imports from the foreign firm at the price p_h^*. Foreign demands for both variants are obtained in a similar way. First denote p_ℓ and p^* as the price of low quality and of high quality charged in the foreign market, respectively and recall that the foreign preference parameter θ^* is uniformly distributed on $\left[0, \lambda^* \overline{\theta}\right]$, then:

$$D_\ell^* = m^* \left[\frac{p^* - p_\ell}{\lambda^* \overline{\theta}(q_h^* - q_h)} - \frac{p_\ell}{\lambda^* \overline{\theta} q_\ell} \right], D_h^* = m^* \left[1 - \frac{p^* - p_\ell}{\lambda^* \overline{\theta}(q_h^* - q_\ell)} \right] \tag{3}$$

Note that foreign demand D_ℓ^* of low quality is met by imports from the domestic firm at the price p_ℓ.

[1] The forward exchange rate remains fixed over the time horizon during which product quality is selected.

We study a three-stage complete information game. First, the domestic government and the foreign government choose a trade policy. This consists of the simultaneous announcement of an ad valorem tariff rate on imports; we denote these tariffs as t and t^* respectively. While they are able to choose a trade policy, it is assumed that governments cannot determine the exchange rate. In the second stage, firms select simultaneously their quality levels and incur the fixed costs of quality development. In the third stage, firms select their prices. We solve the model by backward induction.

3 Conditions for Dumping

We now proceed to derive the equilibrium outcome in stage 3 taking (i) any profile of quality choices (q_ℓ, q_h^*), (ii) trade policies (t, t^*) and (iii) the exchange rate as given. Using the derived domestic demands in (2), foreign demands in (3) and cost functions, the problem of the domestic firm is to select prices p and p_ℓ so as to maximize profits:

$$\pi = pD_\ell + ep_\ell(1-t^*)D_\ell^* - \frac{c}{2}q_\ell^2 \tag{4}$$

where $p_\ell(1-t^*)$ is the international price of low-quality exports and to convert it into domestic currency we multiply it by the exchange rate. Likewise, the decision problem of the foreign firm is to find p^* and p_h^* so as to maximize the following profit function:

$$\pi^* = p^*D_h^* + \frac{p_h^*(1-t)}{e}D_h - \frac{c^*}{2}q_h^{*2} \tag{5}$$

where $p_h^*(1-t)$ is the international price of foreign firm's high-quality exports and by dividing by the exchange rate foreign export receipts are converted into foreign currency. Solving the pair of best-response functions in prices, we obtain the subgame equilibrium prices of both variants:

$$p = \frac{\overline{\theta}q_\ell(q_h^* - q_\ell)}{\left(4q_h^* - q_\ell\right)}, p_\ell = \frac{\lambda^*\overline{\theta}q_\ell(q_h^* - q_\ell)}{\left(4q_h^* - q_\ell\right)} \tag{6}$$

$$p^* = \frac{2\lambda^*\overline{\theta}q_h^*(q_h^* - q_\ell)}{\left(4q_h^* - q_\ell\right)}, p_h^* = \frac{2\overline{\theta}q_h^*(q_h^* - q_\ell)}{\left(4q_h^* - q_\ell\right)} \tag{7}$$

Equilibrium prices depend on qualities and on the primitive parameters λ^* and $\overline{\theta}$. They are such that $pp^* = p_\ell p_h^*$, that is the product of domestic prices is equal to the product of export prices. More importantly, they lead to the following condition for dumping.

Proposition 1 *(i) Dumping by the foreign firm in the domestic market occurs if* $\lambda^* > (1-t)/e$; *(ii) dumping by the domestic firm abroad takes place if* $\lambda^* < 1/(1-t^*)e$; *(iii) reciprocal dumping arises if*

$$\frac{1-t}{e} < \lambda^* < \frac{1}{(1-t^*)e} \tag{8}$$

As a result, if tariff rates are positive dumping occurs always.

Proof. (i) This is the case if the international foreign currency price of high-quality exports is less than the local price, i.e. $p_h^*(1-t)/e < p^*$. Using (7), this implies $(1-t)/e < \lambda^*$. (ii) This is the case if $ep_\ell(1-t^*) < p$, which using (6) implies $\lambda^* < 1/(1-t^*)e$. (iii) This result follows from combining the previous two inequalities. ■

Condition (8) leads to a number of observations:

- First, dumping is a natural price strategy of firms in that, in the presence of zero or positive tariffs, it always takes place.

- Second, Tirole (1988) shows that θ in (1) is the opposite of the marginal utility of income. As θ is distributed over the set $\left[0, \overline{\theta}\right]$ and θ^* over the set $\left[0, \lambda^*\overline{\theta}\right]$, higher incomes are observed in the foreign country if $\lambda^* > 1$. In our framework, λ^* is therefore a measure of the difference in incomes across countries. As a result, condition (8) gives an interpretation to reciprocal dumping that differs from Brander and Krugman (1983).

- Third, dumping is intimately related to the existence of international tariff policies. As we have seen already, an important characteristic of developing and transition economies is the high amounts of duty imposed on imports. These measures raise question on the alleged positive correlation between tariff protection and the number of on-going anti-dumping investigations in these countries. It is argued that high import tariffs have the perverse effect of forcing a foreign company to dump in order to enter a market, subjecting itself to anti-dumping actions. This view has been repeatedly put forward by various international organizations and governments (see for example, EC (2003)). Condition (8) examines the theoretical premises of such conjecture. Assuming e=1, it is clear that as long as $\lambda^* > 1$ there is dumping by the foreign firm into the domestic market and the tariff rate is not instrumental. Dumping disappears only if $\lambda^* = 1$ and $t = 0$.

The following corollary of Proposition 1 clarifies the role of exchange rate changes on the extent of dumping.

Corollary. A depreciation of the domestic currency (increase in e) increases the likelihood by the foreign firm in the domestic market and decreases the likelihood of dumping by the domestic firm abroad.

This result follows directly from (8) and the fact that exchange rate movements affect firms in opposite directions. Ceteris paribus, an increase in e increases the gap between the international foreign currency price of high-quality and the local price abroad while it decreases the difference between the domestic currency price of low-quality exports and the domestic price.

We now examine firms' second-stage decisions: quality selection. In this stage firms take (i) trade policies (t, t^*) and (ii) the exchange rate as given and anticipate the equilibrium prices of the continuation game obtained in (6) and (7). The domestic firm selects q_ℓ to maximize reduced-form profits:

$$\pi_\ell = \overline{\theta}(1 + e(1-t^*)\lambda^* m^*)\frac{q_\ell q_h^*(q_h^* - q_\ell)}{(4q_h^* - q_\ell)^2} - c\frac{q_\ell^2}{2} \tag{9}$$

Likewise, the foreign firm chooses q_h^* to maximize:

$$\pi_h^* = 4\overline{\theta}\left[\frac{(1-t)}{e} + \lambda^* m^*\right]\frac{(q_h^*)^2(q_h^* - q_\ell)}{(4q_h^* - q_\ell)^2} - c^*\frac{(q_h^*)^2}{2} \tag{10}$$

Define μ as the quality gap between firm's product quality, $\mu = q_h^*/q_\ell > 1$. The ratio of first-order conditions with respect to qualities can be written as:

$$\frac{\mu^2(4\mu - 7)}{4(4\mu^2 - 3\mu + 2)} = \frac{c}{ec^*}\left[\frac{(1-t) + e\lambda^* m^*}{1 + e\lambda^* m^*(1-t^*)}\right] \tag{11}$$

This equation gives the equilibrium measure of product differentiation μ as an implicit function of relative costs in same currency units, ad valorem tariffs and the primitive parameters of the model. It is readily seen that there exists a unique real solution to this third degree polynomial; this solution can be expressed as follows:

$$\mu = F(\overset{+}{c}, \overset{-}{c^*}, \overset{-}{e}, \overset{-}{t}, \overset{+}{t^*}, \overset{+}{\lambda^*}, \overset{+}{m^*}) \tag{12}$$

The signs reported in (12) give the relationship between equilibrium quality gap and the primitive parameters of the model, as well as countries tariff rates.

Knowing μ and using the reaction functions in qualities, we can derive the market equilibrium of our model (demands, prices and qualities):

$$D_\ell = \frac{\mu}{(4\mu-1)},\ D_h = \frac{2\mu}{(4\mu-1)}$$

$$D_\ell^* = \frac{m^*\mu}{(4\mu-1)},\ D_h^* = \frac{2m^*\mu}{(4\mu-1)}$$

$$p = \frac{\overline{\theta}q_\ell(\mu-1)}{(4\mu-1)},\ p_\ell = \frac{\lambda^*\overline{\theta}q_\ell(\mu-1)}{(4\mu-1)}$$

$$p^* = \frac{2\lambda^*\overline{\theta}q_h^*(\mu-1)}{(4\mu-1)},\ p_h^* = \frac{2\overline{\theta}q_h^*(\mu-1)}{(4\mu-1)}$$

$$q_\ell = \frac{\overline{\theta}(1+e(1-t^*)\lambda^*)}{c}\frac{\mu^2(4\mu-7)}{(4\mu-1)^3}$$

$$q_h^* = \frac{4\overline{\theta}(\lambda^* m^* + (1-t)/e)}{c^*}\frac{\mu(4\mu^2-3\mu+2)}{(4\mu-1)^3}$$

A first characteristic of the market equilibrium is that the quality gap μ is also measure of price competition in the domestic and foreign market. Taking the ratio of prices:

$$\frac{p_h^*}{p} = 2\mu,\ \frac{p^*}{p_\ell} = 2\mu \tag{13}$$

An increase in product differentiation decreases therefore price competition in both markets. Also, the equilibrium exhibits intra-industry trade in vertically differentiated goods. The quantities D_ℓ^* and D_h represent domestic exports of low-quality products and domestic imports of the high-quality variant respectively. A second characteristic of the market equilibrium is that the Grubel-Lloyd (GL) index-volume depends only on relative population sizes:

$$GL = 100\left\{1 - \frac{|D_\ell^* - D_h|}{(D_\ell^* + D_h)}\right\} = 100\left\{1 - \frac{(m^*-2)}{(m^*+2)}\right\} \tag{14}$$

When measured at international prices, the GL index in values depends on all parameters of the model.

4 Trade Policies

In the first stage of the game each government chooses a tariff rate to maximize social welfare. As mentioned above, solutions for t and t^* are useful in determining whether reciprocal dumping can arise in equilibrium.

In each country, social welfare (W) equals the un-weighted sum of domestic consumer surplus (CS), domestic firm's profits (π) and tariff revenues (R). In the domestic country, consumer surplus is given by:

$$CS = \int_{\tilde{\theta}}^{\overline{\theta}} (\theta q_h - p_h) dF(\theta) + \int_{\hat{\theta}}^{\tilde{\theta}} (\theta q_\ell - p_\ell) dF(\theta) \tag{15}$$

Using equilibrium prices of the domestic country, consumer surplus can be rewritten more conveniently as follows:

$$CS = \frac{\overline{\theta}\mu^2(4\mu+5)}{2(4\mu-1)^2} q_\ell \tag{16}$$

The profits of the domestic firm are:

$$\pi = \overline{\theta}\left[\frac{1+e(1-t^*)\lambda^* m^*}{2}\right] \frac{(4\mu^3-3\mu^2+2\mu)}{(4\mu-1)^3} q_\ell \tag{17}$$

Finally, tariff revenues accruing from high-quality imports to the domestic country are:

$$R = t p_h^* D_h = 4\overline{\theta} t \frac{\mu^2(\mu-1)}{(4\mu-1)^2} q_\ell \tag{18}$$

Adding these three expressions we obtain the reduced-form expression for domestic social welfare:

$$W = q_\ell \cdot A(t, t^*, \mu, \lambda^*, m^*, \overline{\theta}) \tag{19}$$

where $A(.)$ collects terms (other than q_ℓ) of the components of social welfare.

An expression for foreign social welfare can be obtained following the same steps:

$$W^* = q_\ell \cdot A^*(t, t^*, \mu, \lambda^*, m^*, \overline{\theta}) \tag{20}$$

Though both welfare levels are proportional to q_ℓ, the factors of proportionality are different and such that $A^*(\cdot) > A(\cdot)$ under free trade ($t = t^* = 0$). The main reason is that foreign profits derived from high-quality production are much higher than those the domestic derives from low-quality production: $e\pi^*/\pi = 16c/ec^*$. This corroborates the assumption made at the start that the domestic country is the poorer country. Note that domestic welfare W is affected by t in two ways. First, it enters directly into the expression for W because of its extracting effect of foreign firm's profits; second it indirectly affects competitive conditions at home and abroad through μ (see equation (12)). Similarly, t^* captures rents from the domestic firm and alters the competitiveness of the international market.

Let us denote the right hand side of (11) as the relative development cost r and consider the following elasticities $\alpha = (\partial W/\partial\mu)(\mu/W) > 0$, $\beta = (\partial\mu/\partial r)(r/\mu) > 0$ and $\gamma = (\partial A/\partial t)(t/A) > 0$; also $\alpha^* = (\partial W^*/\partial\mu)(\mu/W^*) > 0$ and $\gamma^* = (\partial A^*/\partial t^*)(t^*/A^*) > 0$.

Proposition 2 *(i) Domestic trade policy is such that*

$$t = \frac{\gamma(1 + e\lambda^* m^*)}{\gamma + \alpha\beta} > 0$$

and foreign trade policy is characterized by

$$t^* = \frac{-\gamma^*(1 + e\lambda^* m^*)}{e\lambda^* m^*(\alpha^*\beta^* - \gamma^*)} \gtreqless 0$$

(ii) $t > t^*$ *as long as* $\alpha^*\beta > \gamma^*$.

Part (ii) of the proposition gives some justification for the observed difference in tariff rates between developed and developing economies. Part (i) indicates that while it is optimal for the domestic economy to levy a tariff the foreign economy may subsidize low-quality imports. Intuitively, the value of high-quality imports being large, it pays the domestic government to extract positive rents. In contrast, the value of low-quality imports being small, the rent extraction effect of a foreign tariff is small and the foreign government finds it optimal to subsidize imports to reduce the quality gap μ and increase competition in its local market. Regarding condition (8), setting $t^* < 0$ or $t^* = 0$ excludes reciprocal dumping and allows for dumping by the foreign firm in the domestic market only.

5 Appendix Glossary of Symbols

c, c^*	domestic, foreign quality development cost (in own currency)
CS	domestic consumer surplus
D_ℓ, D_ℓ^*	domestic, foreign demand for low quality
D_h, D_h^*	domestic, foreign demand for high quality
e	forward exchange rate (domestic price of foreign currency)
GL	Grubel-Lloyd index
m^*	population size abroad ($m^* \geq 1$)
p	domestic currency price of low-quality consumption
p^*	foreign currency price of high-quality consumption
p_ℓ	foreign currency price of low-quality exports
p_h^*	domestic currency price of high-quality exports
q_ℓ	low quality (produced at home only)
q_h^*	high quality (produced abroad only)
r	relative development cost
R	domestic tariff revenues
t	domestic ad valorem tariff rate ($t \gtrless 0$)
t^*	foreign ad valorem tariff rate ($t^* \gtrless 0$)
W	domestic social welfare
W^*	foreign social welfare
θ, θ^*	domestic, foreign taste parameter
$\overline{\theta}$	highest taste parameter observed at home
$\widehat{\theta}$	consumer indifferent between low quality or no purchase
$\widetilde{\theta}$	consumer indifferent between high and low quality
λ^*	relative taste parameter ($\lambda > 1$)
μ	quality gap (q_h^*/q_ℓ)

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