

Inflicting injury through product quality: how European antidumping policy disadvantages European producers

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Abstract

In this paper, we show how an industry characterized by vertical product differentiation may be affected by European antidumping policy. Using a two-stage model where quality choice is determined before price competition takes place, we show that EU antidumping policy that takes the form of price-undertakings protects domestic firms at the price competition stage, but is disadvantageous to domestic firms once the effect on quality choice is taken into account. European antidumping policies may therefore disadvantage European producers through reversals of quality ranking. © 2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

European antidumping legislation (A-D policy hereafter) allows a protectionist response whenever a foreign product “similar” to a European one is “dumped” on the

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European market (Official Journal of the EC, EC Regulation 386/94). The procedure follows two main steps. If dumping (i.e., price discrimination between national markets) has been established,¹ the legislation aims at eliminating price-undercutting of European products in the European market. The protectionist policy is justified by “unfair competition”, and as a compensation for the resulting “injury” caused to the European industry. More specifically, the A-D policy aims at eliminating the injury as measured by the extent of the “injury margin”, defined through the extent of foreign price-undercutting in the European market (Vermulst and Waer, 1991). In order to eliminate the injury, the European Commission may either impose a duty or accept a price-undertaking. Price-undertakings are commitments by foreign competitors to match the price of the European product in the European market.² A price-undertaking thus compels the foreign firm to ‘meet’ the price set by the European producer of the ‘like product’ in the European market. In this paper, we focus on such price-undertakings, which are arguably the most common type of antidumping measures used by the European Commission.³ According to Tharakan (1994), undertakings accounted for about 72% of the antidumping/countervailing duties cases terminated by the European Commission during the period 1980–1987. Tharakan (1994) studies the determinants of this preference. According to his empirical analysis, trade policy considerations seem to play an important role in the choice between undertakings and duties.⁴

The way the European Commission calculates the injury margin in European antidumping cases has often been criticized.⁵ The relation between observed price-undercutting and real dumping is also subject to criticism. Veugelers and Vandenbussche (1999) show how foreign price-undercutting can reflect a cost advantage of foreign firms selling differentiated products on the EU market, rather than any idea of “unfair” trade practices. Here, we shall show how perverse effects are induced by the A-D policy and we cast doubt on the economic rational of “injury” determination.

According to the A-D regulation, the legislator allows for price differences between a European and a foreign product when there are differences in product characteristics (EU regulation 386/94 §3 section D.10). However, there are cases where quality differences between domestic and foreign products are acknowledged, but no price adjustments were made. For example, in 1987, a Russian importer of ‘standardized electrical motors’ in the EU was accused of dumping and causing injury to the Community industry, by selling at a price below that of the European standardized

¹ Legal dumping occurs whenever the price charged by a foreign producer on its own market is higher than the price charged in its export market (in the present case the European one).

² It has even been argued that price-undertakings could to a certain extent be viewed as “a legal substitute for illegal price fixing” (Stegeman, 1990).

³ The case of a duty will briefly be discussed in the paper but results under a duty will be quite similar to those obtained under price-undertakings.

⁴ For a detailed study of the EC’s practices on trade protection issues, the reader is referred to Schuknecht (1992).

⁵ Vermulst and Waer (1991) provide a detailed analysis of the difficulties as well as of the possible arbitrariness involved in computing the injury margin.

electrical motors. The Russian exporter argued that the Commission, when making a price comparison between European and Russian motors, should take into account ‘the differences in physical characteristics, the poor brand image of USSR products, the lower quality of raw materials and the lower efficiency of after sales service compared to Community products’ (Official Journal of the EC, Council Regulation 864/87, L 83/4 27.3.1987). A (former) GDR exporter of motors accused of dumping and causing injury in the same case, pointed out to the Commission that ‘its products contained a lower active material content than most motors manufactured by Community competitors’. It was furthermore argued that there were other technical differences between the motors such as ‘electricity input, axle height, noise and vibration levels of motors’, which should be taken into account when comparing prices (L 83/4 27.3.1987).

In response to these objections, the Commission replied that ‘these differences did not affect price comparability and therefore no allowances were made’. More in particular, the Commission argued that “given the large degree of international standardization in the manufacturing of such motors, each type of motor originating abroad constitutes a ‘like product’ to the same type of Community-standardized motor, although there may be differences in quality” (L 280/69, 1.10.1986).

Other cases involving obvious quality differences can be found. See, for instance, case 3651/88 involving Japanese dot matrix printers (Official Journal of the EC, L 317/33-44, of date 24.11.1988) or case 3946/88 involving polyester yarn from the US, Mexico, Taiwan and Korea (Official Journal of the EC, L 348/49-55, of date 17.12.1988).⁶ A more systematic treatment of such cases is called for, but lies beyond the scope of the present paper. The cases listed above however illustrate the Commission’s general position towards dumping cases involving quality differences.⁷ These cases show that the Commission can acknowledge the difference in quality that may exist between the foreign and European products, but nevertheless decide to consider the products as similar. A lower price for the foreign product in the EU market is then considered to be injurious for the European industry and antidumping protection become justified. A-D policies may therefore be implemented, even though products are accepted as differing in quality. The types of “differences” that arose in the above case fall into the definition of vertically differentiated goods. Therefore, we have a motivation for studying the implications of A-D policies on quality choices.

Our argument in the paper can be summarized as follows. Let us consider products with different, but sufficiently close, quality levels. When products are vertically differentiated, equilibrium prices reflect quality levels. A foreign producer selling a low-quality good must then set a low price in the EU market in order to sell. If the foreign product is considered to be “similar” to a European product by the European Commission, the foreign producer runs the risk of being subject to a price-undertaking under the EU antidumping laws. Then, if compelled to match the price of the European

⁶ Mc Gee (1996) mentions several cases involving direct comparisons of products exhibiting objective quality differences.

⁷ There is no indication to suggest that the Commission’s policy in this respect has changed over time.

product, the low-quality foreign product would not survive. This risk spills over to the quality decision stage. We will show that, with a price-undertaking, the foreign producer is less inclined to choose low quality. As a result, both foreign and domestic firms' incentives with respect to quality choices are directly affected by the threat of A-D actions at the price competition stage.

Following this line of argument, we analyze the effects of price-undertakings on price competition and quality choices when vertically differentiated products might be considered 'similar' in an antidumping investigation. If similar only refers to horizontally differentiated goods, the foreign importers of vertically differentiated goods should have no reason to worry about the antidumping laws in place. When they have shown that their product is of lower quality than the European one, they should be allowed to charge a lower price. However, the previous examples suggest that the definition of similar can involve vertically differentiated (quality differences) goods.

In the following, we shall model demand for vertically differentiated products along the lines of Mussa and Rosen (1978). We will show that, although the price-undertaking relaxes price competition for the domestic firm when qualities are given, equilibrium quality choices are affected in a way that is invariably detrimental to the European firms compared to free trade. The reason is that the possibility of a price-undertaking tends to make the foreign firm more aggressive in the quality game. When the foreign firm is a low-quality producer under free trade, a price-undertaking will turn it into a quality leader in the market. To adopt low quality is no longer profitable when a price-undertaking is in place. The domestic European firm therefore faces a more aggressive opponent at the quality stage and is more prone to adopt low quality.

Thus, our model suggests that a price-undertaking can lead to a reversal of the quality ranking. Long-run foreign quality is upgraded, and domestic quality is downgraded compared to free trade. The domestic firm loses because of profit diversion. Europe's antidumping policy therefore tends to induce "perverse" leapfrogging in vertically differentiated industries. Quality upgrading of foreign imports as a response to the imposition of a quota or a VER is well-known.⁸ Our analysis points to a similar phenomenon under antidumping measures.

In Section 2, we set out our model of vertical product differentiation and characterize the associated subgame perfect equilibria under free trade. We then look at the same two-stage game in the presence of a price-undertaking. The subgame perfect equilibrium of the modified game shows how antidumping protection changes quality choices and price competition. Section 3, reviews the main results and comments on their robustness. Section 4 concludes.

2. The model

We consider a duopoly where a European (D) and a foreign firm (F) sell vertically differentiated products in one market (which we take to be the EU). Firms choose quality in the first stage (long run) and compete in prices in the second stage (short run).

⁸ See Feenstra (1988) for evidence under a VER and Aw and Roberts (1986) under a quota.

Consumers in the European market are willing to buy one unit at most of the good and have heterogeneous preferences, identified by their taste for quality x which is uniformly distributed on the interval $[0, 1]$.⁹ The net utility of consuming good i for the consumer with taste x is $u^i = x s^i - p^i$, where u^i refers to utility, s^i to quality and p^i is the unit price of good i . The default utility of no-consumption is 0. With respect to quality choices in the first stage, we assume that $s^i \in [0, 1]$. In order to keep the exposition simple, we assume zero cost for quality in the first stage and zero production cost in stage 2. Neglecting costs mainly allows us to highlight those effects that are exclusively imputable to price competition and in particular to the way price-undertakings distort the price game. Once this mechanism, which is independent of quality costs has been revealed, the role of such costs becomes relatively straightforward. We postpone a discussion of this assumption until Section 3. We stress, however, that relaxing this assumption does not affect the qualitative implications of our results.

2.1. *The free trade equilibrium*

Under the above-stated assumptions, in the absence of trade intervention, there exist two subgame perfect equilibria in pure strategies: one firm sells the best available quality product and the other firm chooses an optimal degree of product differentiation, i.e. sells a low-quality product. In the continuation price equilibrium, the price of the high-quality product is larger (i.e., $p^h > p^l$) so that both firms have a positive market share. This standard result is summarized in the following lemma.

Lemma 1. *In the quality–price game, there are two subgame perfect equilibria. The high quality firm chooses the best available quality (i.e., $s^i = 1$) while the low-quality firm differentiates to a ratio of 4:7. In all price subgames the equilibrium is unique and in pure strategies.*

In Appendix A, we develop the argument that leads to Lemma 1, but since this result is fairly standard, we omit a full proof.¹⁰ As they stand, the particular value of qualities in equilibrium essentially reflects the normalization we have made, so that Lemma 1 should not be taken literally. Note however that the existence of an optimal degree of differentiation and the multiplicity of equilibria are robust results.

The following comments are in order. First, under free trade, product differentiation always prevails in equilibrium. For the firms, it is never optimal to choose identical qualities because this would lead to pure Bertrand competition, i.e. 0 profits for both.

⁹ Note that our assumption on the distribution of consumers' types ensures that the market is not covered in equilibrium.

¹⁰ The interested reader is referred to Choi and Shin (1992) or Wauthy (1996) for such a proof.

Note however that from a welfare point of view, the first best precisely involves both firms choosing the best available quality and a price equal to marginal cost. Since we have just seen that there is product differentiation in a subgame perfect equilibrium, welfare is lower compared to the first best for three reasons. First, there is under-provision of quality. Second, because of product differentiation, price competition is relaxed, hence, equilibrium prices are above marginal costs and some of the consumers refrain from buying any of the two products: given product qualities, prices are too high. Third, from a domestic welfare point of view, the foreign producer always makes positive profits, which are not included in domestic welfare. We define the part of the industry's profits that go abroad as profit diversion. Due to this "profit diversion", a domestic government is not indifferent between the two subgame perfect equilibria (SPE hereafter) identified in Lemma 1. The equilibrium where the domestic producer is the quality leader is strictly preferred.¹¹

Under free trade, two quality rankings are possible in the pricing subgames. Either the domestic firm is the high-quality producer and the foreign firm is the low-quality producer ($s^D = 1$, $s^F = 4/7$) or vice versa ($s^D = 4/7$, $s^F = 1$). It is only in the former case that the foreign firm runs the risk of being subject to antidumping legislation. In the case where it produces the high quality product and hence charges a higher price in the EU market, there is no foreign price-undercutting and thus no risk for the A-D legislation to apply.

A first result emerges: antidumping policy cannot affect price competition in the cases where the foreigner is the quality leader. Hence, we focus hereafter on pricing games where the domestic firm sells the high quality product and the foreign firm sells the low-quality product. We keep in mind, however, that the alternative quality hierarchy remains an equally likely candidate SPE.

2.2. Price-undertakings and quality choice

Let us assume that the European authorities have decided on an antidumping law at time $t = 0$. The terms of the law are the following. First, a domestic firm is allowed to file a complaint in case of dumping. Following Veugelers and Vandenbussche (1999), we do not explicitly model the existence of dumping and just assume price discrimination between the foreign and EU market with a lower EU price. A variety of circumstances combining supply conditions and differences in demand and competitive conditions could support such a situation. For instance, even though demand is lower in the local market (which may typically be the case for less developed exporting countries), the foreign firm could benefit from a domestic monopoly position by

¹¹ We assume here that the domestic firm is indeed owned by domestic shareholders. Note however that irrespective of firms' ownership a domestic government prefers the equilibrium with a high quality domestic product because domestic production is larger. Also, the domestic firm may be a source of political support for the government.

charging a higher price in its local market than abroad. When there is dumping, the government will evaluate the injury, defined as the positive difference between domestic and foreign prices. In case the European and the foreign products are considered similar and injury is detected, either a price-undertaking or a duty on imports is implemented. The discussion of a duty is left for Section 3. A price-undertaking by definition consists of a commitment by the foreign firm to match the domestic price. A penalty is imposed on the foreign firm if the injury is not eliminated.

Formally, under a price-undertaking, the low-quality foreign firm's best reply consists of matching the domestic price, i.e. $p^D = p^F$ (see Veugelers and Vandenbussche, 1999). Given the previous specification of the antidumping policy, both firms anticipate that whenever $s^F \geq s^D$, the continuation price equilibrium does not lead to injury, whereas it is always likely to do so under the alternative quality hierarchy. Specifically, with the foreign firm selling the low-quality product, the antidumping law comes into play and affects the free trade outcome when products are similar. To capture this in our model, we parameterize the degree of similarity between the vertically differentiated goods by Δ . By definition, Δ identifies the largest quality differential that would lead the Commission to consider that products are similar. We have assumed that the quality chosen by the firms is indicated by s (s^i with $i = D, F$), which can lie between 0 and 1. The widest possible interpretation of similarity then involves a value of $\Delta = 1$. This implies that, whatever the quality difference between the European and the foreign products on, the European authorities will always consider the two as similar. We will first consider the case where $\Delta = 1$. This represents the most extreme case and as such will exaggerate the likely impact of the policy. However, it also provides a suitable benchmark for less extreme situations in which $\Delta < 1$, as discussed in Section 3.

In order to study the impact of the price-undertaking on quality choices, we first characterize equilibrium in price subgames that are subject to the price-undertaking.

2.2.1. *The second stage: best replies in prices*

Recall that the only price subgames affected by the EU policy are those where the foreign firm is the low-quality firm. In these cases, under free trade, the foreign firm will always set a price lower than that of the domestic firm.¹² In particular, the free trade best reply for the low-quality firm is always to choose an optimal discount on the high quality product's price. Thus, any possible free trade best reply causes "injury", i.e. under the assumption that price-undercutting leads to a price-undertaking, the foreign firm is always constrained in the price competition stage. Whatever the price set by the domestic firm, the foreign firm will have to respect the price-undertaking by meeting the European price. It follows from the definition of vertical differentiation that, in this case, the foreign firm cannot have a positive demand and so earns 0 profits: since it sells a lower quality product at the same price as the domestic firm, all consumers will prefer the high quality product. A price-undertaking thereby turns the domestic producer into a

¹² See Appendix A for a detailed analysis.

monopolist and the optimal price for the domestic firm is the monopoly price. The foreign firm is forced to match this price despite its lower quality and sells nothing.

As mentioned, $\Delta = 1$ leads to the most extreme form of protection: a price-undertaking is beneficial at the price stage to the domestic firm by completely relaxing price competition in the market. However, we will now show that in the long-run, the conclusion is reversed.

2.2.2. *The first stage analysis: best replies in qualities*

We need only to study the best replies in quality under the hierarchy $s^D \geq s^F$. Recall indeed that, in the alternative hierarchy, antidumping is ineffective, so that the analysis of quality choices exactly replicates free trade: against a high foreign quality, the domestic producer optimally differentiates with a lower quality. Therefore, $(s^D = 4/7, s^F = 1)$ remains a SPE of the full game with price-undertaking. We consider now the alternative hierarchy. From the analysis of the price subgames, we know that, in the presence of a price-undertaking, the European producer is a monopolist whenever selling the high quality. It is immediately evident that, in this case, the domestic firm's best reply in quality is independent of the other firm's action, and consists of choosing the highest possible quality. Therefore, against any $s^F < 1$, the best reply of the domestic producer is $s^D = 1$. On the other hand, against $s^F = 1$, the domestic firm is better off differentiating. Recall that, if products are identical, there exists a unique symmetric equilibrium (the pure Bertrand equilibrium) in the corresponding price subgame where no injury prevails.¹³

To choose a lower quality, as in the case of free trade, is no longer optimal for the foreign producer. If it were to do so, its market share in the pricing game would be 0 under a price-undertaking. Matching the domestic quality results in a 0 profit outcome. By slightly improving upon the domestic quality, the foreign firm can secure positive profits. In other words, under the hierarchy $s^D \geq s^F$, the foreign best reply is invariably $s^F = s^D$. But we also know that foreign profits are increasing at $s^F = s^D$. From the free trade analysis, we know that the payoff of a high-quality firm is monotonically increasing in its own quality. In other words, because of the price-undertaking, the foreign firm is always better-off by matching and even improving upon the domestic quality. Its best reply is then invariably equal to 1, whatever the domestic quality.

The previous analysis of the best replies at the quality stage of the game shows that in the presence of the price-undertaking, there is a unique SPE exhibiting $s^D = 4/7, s^F = 1$, i.e. the equilibrium in which the domestic firm optimally differentiates with a lower quality. We have therefore established the following proposition.

¹³ Note that, even if we assume that a price-undertaking applies in the case of homogeneous products, the unique equilibrium is still the Bertrand equilibrium exhibiting marginal cost pricing. The reason is that, although the foreign firm can no longer undercut, the domestic firm still can and finds it profitable to do so. Any price differential is matched by the foreign firm, whereas any tie is undercut by the domestic firm, so that the unique equilibrium is the 0-profit one.

Proposition 1. *When the foreign product is regarded as similar to the European product regardless of the quality difference between them ($\Delta = 1$), European antidumping policy taking the form of a price-undertaking results the unique subgame perfect equilibrium ($s^D = 4/7$, $s^F = 1$).*

An immediate corollary is then established.

Corollary 1. *A price-undertaking hurts the domestic producer.*

The proof of Corollary 1 is straightforward. We only have to compare the unique equilibrium induced by the possibility of a price-undertaking, henceforth the ‘undertaking’ equilibrium ($s^D = 4/7$, $s^F = 1$), to the two equilibria under free trade: $\{(s^D = 1, s^F = 4/7), (s^D = 4/7, s^F = 1)\}$. Note first that consumers are indifferent as to who is selling what, so that the two equilibria are strictly equivalent from a European consumer welfare viewpoint. The only difference comes from the fact that the high-quality firm makes higher expected profits. The antidumping policy precisely selects as the unique possible equilibrium, the equilibrium in which the foreign producer is the quality leader.

The protection offered to the domestic firm by a price-undertaking applies only at the price competition stage. Note however that we confine our analysis to a purely non-cooperative analysis. As argued in Stegeman (1990), price-undertakings could also be viewed as a “legally” implemented collusive device. As argued in Hillman and Ursprung (1988), foreign firms are eager to comply with such “protection” policies. In the present context however, the forces at work are different because firms do not collude at all. The relaxation of price competition has however long-run implications. As a result of the price-undertaking, the foreign firm cannot survive with a lower quality. The only way out is to be more aggressive at the quality stage. The price-undertaking allows the foreign firm to credibly commit to the best available quality, against any possible quality chosen by the domestic firm.

3. Comments

The result established in Proposition 1 can be compared to Bocard and Wauthy (1998), where it is shown that a quota on foreign imports, which relaxes price competition in the last stage, also results in more aggressive behaviour in the quality stage by one of the firms. In the case of a quota however, it is the domestic firm that behaves more aggressively.

Proposition 1 is also reminiscent of some results obtained in the literature on leapfrogging (see the survey by Herguera and Lutz, 1998). This literature focuses on the conditions under which a domestic government can induce leapfrogging by the domestic firm in equilibrium through an adequate choice of policy instruments (subsidies, tariffs, quota, or minimum quality standards). In our model, “perverse” leapfrogging occurs as a result of A-D policy, which turns a low-quality foreign producer into a high quality one.

Here, leapfrogging is an undesirable side-effect of the antidumping policy, whereas domestic leapfrogging is the objective pursued by governments in Herguera and Lutz (1998). In fact, we have shown that the price-undertaking leaves the foreign firm no choice but to leapfrog the European one. As pointed out by a referee, the leapfrogging issue is even more relevant under a sequential setting where the domestic firm plays first.¹⁴ Assuming again that quality is costless,¹⁵ the domestic firm would always choose the high quality under free trade, whereas, in the presence of the price-undertaking, it would choose low quality, i.e. leapfrogging always occurs.

The idea that trade policy affects firms' quality choices and more specifically results into quality upgrading by importers, is supported by several recent empirical studies. Feenstra (1988) showed that the US VER between 1981 and 1985 affected the price and quality of Japanese cars. Aw and Roberts (1986) evaluated the effects of the 1977–1981 quota on footwear from Korea and Taiwan and found that the quota lead to the quality upgrading of most import bundles throughout this period. No empirical evidence exists for the case of price-undertakings. Our analysis suggests that similar effects could be observed. Moreover, price-undertakings are often viewed as VERs “in disguise”. In fact, after liberalization of tariffs and VERs, new types of protection, mainly in the form of antidumping duties and price-undertakings¹⁶ have been introduced in forms which are less transparent and more selective.

Since we have used a stylized model, we now discuss the implications of relaxing several of our assumptions. Proposition 1 holds under more general settings. Antidumping policies of the type we have discussed are very likely to hurt domestic firms and decrease welfare once the impact on quality choice is fully taken into account.

Consider first the case where the definition of “similar” product does not cover the entire quality spectrum. This amounts to assuming that $\Delta < 1$. As previously, the free trade equilibrium involving a high quality foreign product is not affected. As for the alternative quality configuration, two cases are possible. First, for $\Delta < 3/7$, the free trade equilibrium involving $s^D = 1$, $s^F = 4/7$ is not affected either. To see this, consider the following: by choosing a quality level $s^F = 4/7$, the foreign firm is in no danger of “injuring” the domestic industry because products are sufficiently different in quality, i.e. they are not considered as similar ones.

For $\Delta \in [3/7, 1]$, the free trade equilibrium with the foreign firm selling the lower quality would induce a price-undertaking, since products would be viewed as similar. However, in this case, the foreign firm cannot credibly commit to the best available quality against any domestic quality choice. In particular, against a high s^D , the best response in quality by the foreign firm is to choose a quality level that lies “just below” the limit of what is considered to be “similar” by the European antidumping authorities ($s^F = 1 - \Delta$). We therefore obtain a second SPE exhibiting ($s^D = 1$, $s^F = 1 - \Delta$). It is

¹⁴ See Donnenfeld and Weber (1992) for a general treatment of sequential entries in vertically differentiated industries.

¹⁵ The case of positive costs is considered below.

¹⁶ Laird (1999) refers to price-undertakings as “Voluntary Export Price Restraints”.

then a matter of computation to show that the corresponding domestic welfare is a decreasing function of Δ . This suggests that the European government would gain from adopting a restrictive view of “similarity”. Or in other words, the European government would be better off by exempting vertically differentiated goods from antidumping policies.

As previously mentioned, introducing a positive cost for quality does not affect the qualitative nature of our results. Indeed, the qualitative implication of Proposition 1 is that the foreign firm will be more aggressive at the quality stage because of the A-D policy. Assume that quality involves a sunk cost $c(s_i)$, as is usually done in the literature.¹⁷ This will clearly not affect the foreign firm’s incentives. More generally, the presence of a positive cost for quality is known to affect the extent of product differentiation (see Motta, 1993). By contrast, the argument underlying Proposition 1 rests exclusively on the incentives to differentiate, and more precisely on the necessity of relaxing price competition that is rooted in the demand side of the model. In any case, one of the firms must be the low quality one. Because of the antidumping legislation, the foreign firm is systematically “at risk” when choosing a lower quality. As a consequence, to choose a lower quality cannot be a valid equilibrium strategy for the foreigner, irrespective of costs. Still, introducing costs would allow us to take into account the possibility that domestic and foreign firms may not be equally efficient in producing quality. As argued by Herguera and Lutz (1998), two pure strategy equilibria in quality will exist as long as firms are not too different in the cost of providing quality. Of particular interest to us is the case where the foreign producer would be less efficient. An obvious possibility in this case is that the foreign firm cannot provide a high quality at a sufficiently low cost. The likely effect of the A-D policy is then to exclude the firm from the market, since selling a low quality is not profitable because of the undertaking. As a protectionist policy, this is very effective but the resulting impact on domestic welfare is less clear because the domestic producer has monopoly power in the market.¹⁸

Introducing costs may also be helpful in explaining the following paradox: our results clearly suggest that A-D policies may hurt domestic producers, so why do domestic firms lobby for it? In this respect, it is important to stress first that the kind of effects involved in our analysis is typically long-term, so that an explanation is to be found in firms being shortsighted. This explanation is clearly not entirely convincing, although it is worth noting that domestic firms sought import quotas, while the induced quality upgrading of imports was ultimately disadvantageous. If, on the other hand, domestic firms are confident that they have a cost advantage in producing high quality, then they could lobby for A-D policy, precisely in order to use this advantage to deter foreign entry. In this respect, our conclusions suggest that the threat of price-undertakings could in fact provide an incentive for foreign industries to improve their ability to produce high quality products before entering the European market.

¹⁷ See Lehmann-Grube (1997) for a general treatment of quality choices with sunk cost.

¹⁸ In the presence of costs of quality, the leapfrogging issue also can be reconsidered. Obviously, the presence of cost asymmetry between domestic and foreign firms could lead to other outcomes. For instance, if quality involves a large sunk cost, the threat of a price-undertaking could deter entry from foreigners whereas if a foreign firm enjoys a cost advantage, it could leapfrog the domestic one.

A limitation of our analysis is that we have confined ourselves to the case of price competition. In this respect, it is important to note that, under our 0 cost for quality assumption, no product differentiation would prevail under Cournot competition and free trade. It is indeed easy to show that the unique SPE of a two-stage game with quality choice followed by quantity competition involves both firms choosing the best available quality.¹⁹ In this case, the A-D legislation would not apply. Cournot competition yields product differentiation in equilibrium only if the cost for quality is strictly positive. If this cost is the same for both firms, there exist two symmetric SPE exhibiting product differentiation. Again, a price-undertaking will affect quality choice only in the case where the foreigner sells the low-quality product. Since the price-undertaking means that prices have to be equal, it will again be the case that foreign firms end up with 0 demand. We are then lead to conclude that, as under price competition, the incentive to adopt a low-quality profile is weakened for the foreign firm.

We have assumed that the government will impose a price-undertaking, but EU antidumping policy can also involve an antidumping duty on foreign imports. In principle, the purpose of the duty is the same as that of a price-undertaking, namely to eliminate the injury as measured by the extent of price-undercutting in the absence of measures. Absorption of the duty by the foreign firm is not allowed by law. Thus, when the foreign firm does not fully pass through the duty to consumers, it will be subject to an additional penalty. A duty thus results in identical market prices. In our particular setting, this leaves a low-quality firm with 0 demand. Qualitatively, firms' incentives regarding quality choice are approximately equivalent to those prevailing with the price-undertaking.

4. Conclusion

The purpose of this paper was twofold. First, we have shown how price competition between a domestic and a foreign firm selling vertically differentiated goods on the European market is affected by European antidumping protection. We have focused on the effects of price-undertakings on foreign imports. Second, we analyzed the long-term effects of such trade policies on qualities offered by the competing domestic and foreign firms. Our conclusions suggest that when account is taken of the effect on firms' quality choices in the long-run, whenever the antidumping policy leads to a departure from the free trade outcome, the domestic firm loses. If the domestic EU firm is predominantly owned by Europeans, we can conclude that the consequence is a loss for European shareholders and owners, resulting from EU's policies.

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¹⁹ See, for instance, Eaton and Harrald (1992) for a proof of this result.

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Appendix A. Price competition under vertical differentiation

Consider a two-stage game with quality choice in the first stage. In the second stage, two firms sell indivisible goods differentiated by their quality index, respectively denoted by s^h and s^l with $s^h > s^l$. Consumers in the market buy at most one unit of the good and exhibit heterogeneous preferences. More precisely, they are identified by their “taste for quality”, x , which is uniformly distributed in the interval $[0, 1]$. The net utility of consuming good $i = \{h, l\}$ for a consumer with taste x is defined by the following equation:

$$u^i = xs^i - p^i, \quad (\text{A.1})$$

where p^i is the unit price of good i . The default utility of no-consumption is assumed to be 0. We assume that firms choose qualities at 0 cost. The range of possible qualities is exogenously bounded between 0 and 1, i.e. $s^i \in [0, 1]$.

We develop the construction of firms’ best replies in the pricing game because they provide a very useful benchmark for the analysis of antidumping policies.

Observe first that for $i \in \{l, h\}$, the consumer located at $x^i = p^i/s^i$ enjoys 0 utility, hence, every consumer with taste $x > x^i$ is willing to buy product i at price p^i . Potential markets are thus $[x^l, 1]$ and $[x^h, 1]$, respectively. The second step is to identify the marginal consumer $\tilde{x}$ who is indifferent between the two products h and l . Solving for $\tilde{x}s^l - p^l = \tilde{x}s^h - p^h$, we obtain $\tilde{x}(p^l, p^h) = (p^h - p^l)/(s^h - s^l)$. Obviously, any consumer $x > \tilde{x}$ prefers h to l whereas the contrary prevails for $x < \tilde{x}$. Observing that quality levels can be re-scaled, we may set $s^h = 1$ so that demands are given by Eqs. (A.2) and (A.3)

$$D^l(p^l, p^h) = \begin{cases} \tilde{x} - x^l & \text{if } p^l \leq p^h s^l \\ 0 & \text{if } p^l > p^h s^l \end{cases} \quad (\text{A.2})$$

$$D^h(p^l, p^h) = \begin{cases} 1 - \tilde{x} & \text{if } p^l \leq p^h s^l \\ 1 - x^h & \text{if } p^l > p^h s^l \end{cases} \quad (\text{A.3})$$

The particular shape of demands reflects the fact that in vertically differentiated industries, the high quality firm may exclude the low-quality one from the market. The latter, in order to enjoy a positive market share must quote a price p^l significantly lower than p^h to compensate for a lower quality ($p^l < p^h s^l$). Note also that since $x \in [0, 1]$, the market cannot be covered in equilibrium, except perhaps for the case where $s^l = 0$.

The profit of the low-quality firm is given by Eq. (A.4)

$$\pi^l(p^l, p^h) = p^l \left(\frac{p^h s^l - p^l s^h}{s^l(1 - s^l)} \right). \quad (\text{A.4})$$

The solution to $(\partial \pi^l / \partial p^l) = 0$ is $\psi^l(p^h) = ((p^h s^l)/2)$. Since $\psi^l(\cdot)$ always lies strictly in the region where firm l enjoys a positive market share, the low-quality firm best reply is fully described by ϕ^l .

As for the high quality firm, two regions are of interest. The monopoly and duopoly region. In the monopoly region ($p^l > p^h s^l$), the best reply is the monopoly price $1/2$, which is feasible if and only if $p^l > s^l/2$. Otherwise, π^h is strictly increasing in the monopoly region and we always reach the duopoly region, where the profit is given by Eq. (A.5)

$$\pi^l(p^l, p^h) = p^l \left(1 - \frac{p^h - p^l}{1 - s^l} \right). \quad (\text{A.5})$$

The solution to $(\partial \pi^h / \partial p^h) = 0$ is $\psi^h(p^l) = ((p^l + 1 - s^l)/2)$ and this is feasible whenever $\psi^h(\cdot) \leq p^l/s^l \Leftrightarrow p^l \leq (s^l(1 - s^l))/(2 - s^l)$. Otherwise, $\pi^h(\cdot, p^l)$ is strictly increasing in the duopoly region and the frontier price p^l/s^l is optimal. Since we have $((s^l(1 - s^l))/(2 - s^l)) < (s^l/2)$, the best reply of firm h is

$$\phi^h(p^l, p^h) = \begin{cases} \psi^h(p^l) & \text{if } p^l \leq \frac{s^l(1 - s^l)}{2 - s^l} \\ \frac{p^l}{s^l} & \text{if } \frac{s^l(1 - s^l)}{2 - s^l} \leq p^l \leq \frac{s^l}{2} \\ 1/2 & \text{if } p^l \geq \frac{s^l}{2} \end{cases} \quad (\text{A.6})$$

Fig. 1 depicts a standard configuration for free trade best replies, where ϕ^h is drawn in plain bold and ϕ^l in bold dashed. As one can see in Fig. 1, the free trade equilibrium

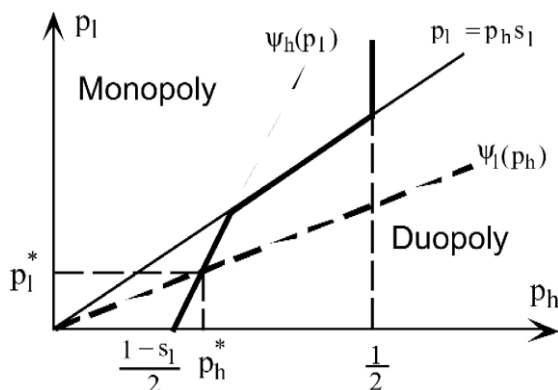


Fig. 1. The price equilibrium.

is given by the intersection of ψ^h and ψ^l , i.e. in the region where both firms enjoy a positive market share, which in turn requires that the low-quality firm names a price that is strictly lower the high quality one.

Using Eqs. (A.4) and (A.6), it is a matter of computations to show that the unique Nash equilibrium is defined by Eqs. (A.7) and (A.8)

$$p^{l*} = \frac{s^l(1-s^l)}{4-s^l}, \quad (\text{A.7})$$

$$p^{h*} = \frac{2(1-s^l)}{4-s^l}. \quad (\text{A.8})$$

Plugging these prices into Eqs. (A.3) and (A.5), we obtain the reduced forms for payoffs at the quality stage as a function of the products' quality ranking. Straightforward computations then establish Lemma 1.

References

- Aw, B., Roberts, M., 1986. Measuring quality changes in quota-constrained Import markets: the case of US footwear. *Journal of International Economics* 21, 45–60.
- Boccard, N., Wauthy, X., 1998. Import quotas foster minimal differentiation under vertical differentiation. CORE DP 9818.
- Choi, J.C., Shin, H.S., 1992. A comment on a model of vertical differentiation. *Journal of Industrial Economics* 60, 229–231.
- Donnenfeld, S., Weber, S., 1992. Vertical product differentiation with entry. *International Journal of Industrial Organization* 10, 449–472.
- Eaton, C., Harrald, P., 1992. Price versus quantity competition in the Gabszewicz–Thisse model of vertical differentiation. In: Gee, A., Norman, G. (Eds.), *Market Strategy and Structure*. Harvester Wheatsheaf, New York.
- Feenstra, R., 1988. Quality changes under trade restraints in Japanese autos. *Quarterly Journal of Economics* 103, 131–146.
- Herguera, I., Lutz, S., 1998. Oligopoly and quality leapfrogging. *The World Economy* 21, 75–94.
- Hillman, A.L., Ursprung, H.W., 1988. Domestic politics, foreign interests, and international trade policy. *American Economic Review* 78, 729–745.
- Laird, S., 1999. Patterns of protection and approaches to liberalization. CEPR Conference on New issues in the World Trading System, 19–20 February.
- Lehmann-Grube, U., 1997. Strategic choice of quality when quality is costly: the persistence of the high quality advantage. *Rand Journal of Economics* 28, 372–384.
- Mc Gee, R., 1993. Antidumping laws: a bright future for a bad idea. *Northwestern Journal of International Law and Business* 13, 491–562.
- Motta, M., 1993. Endogenous quality choice: price vs. quantity competition. *Journal of Industrial Economics* 41, 113–131.
- Mussa, M., Rosen, S., 1978. Monopoly and product quality. *Journal of Economic Theory* 18, 301–317.
- Official Journal of the EC, EC Regulation 386/94.
- Official Journal of the EC, Council Regulation 864/87 imposing a definitive antidumping duty on standardized electric motors, L83/1-83/13, 27/3/87.
- Schuknecht, L., 1992. Trade Protection in the European Community. Harwood Academic.
- Stegeman, K., 1990. EC antidumping policy: are price undertakings a legal substitute for illegal price fixing? *Welwirtschaftliches Archiv* 126, 268–298.

- Tharakan, M., 1994. The political economy of antidumping undertakings in the European Communities. *European Economic Review* 35, 1342–1359.
- Veugelers, R., Vandenbussche, H., 1999. European antidumping policy and the profitability of national and international collusion. *European Economic Review* 43, 1–24.
- Vermulst, E., Waer, P., 1991. The calculation of injury margins in EC antidumping. *Proceedings Journal of World Trade* 25, 5–42.
- Wauthy, X., 1996. Quality choice in models of vertical differentiation. *Journal of Industrial Economics* 64, 345–353.