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IWP–Discussion Papers No. 2001/3
May 2002

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Abstract

We discuss the effects of AD–protection in a standard Dixit model of entry deterrence. In an AD–regime, the newcomer is constrained by minimum–price rule in addition to existing irreversible entrance costs. For minimum prices which lie below the Stackelberg one, we find that AD–rules distort competition. We show that AD–protection increases the advantages of entry deterrence for a wide range of combinations of sunk costs and minimum prices. When entrance costs are high, consumer welfare is lower in an AD–regime than under free trade. Consequently, AD–protection facilitates the abuse of market dominance.
JEL–Classification: F13, L40
Keywords: Anti–dumping, abuse of market dominance, strategic firm behaviour

1 Introduction

Anti–dumping (AD–) actions are legitimate measures permitted under Article VI GATT/WTO rules, and are in by now the most frequently employed instrument of ’contingent protection’.[1] Over the past decades, almost 2,500 AD–cases where investigated and notified to the GATT. Of these, almost 50 percent were initiated by the four ’traditional’ user countries[2] and approximately 40 percent by developing countries, as e.g. Mexico, South Africa, or India.[3] Hence, AD–protection is a global phenomenon. Therefore, the effects of AD–measures deserve scrutiny.

The rationale of AD–laws is to protect domestic competition from ’unfairly’, low–priced imports. However, a large and still growing body of literature has argued that it is not dumping which undermines competition, but AD–policy, as AD–rules have unintended, anti–competitive

* Financial support from the Deutsche Forschungsgemeinschaft (Grand No.: Do–694/1–1) is gratefully acknowledged.
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1 Contingent protection refers to anti–dumping and countervailing duties (Article VI) and emergency protection under the GATT/WTO’s principal safeguards clause (Article XIX).

2 They are the European Union (EU), Australia, the United States (US) and Canada.

3 These figures are from UNCTAD (2000). A number of studies have also documented the recent increase in the global importance of anti–dumping. See e.g. Miranda et al. (1998), Kempton et al. (1999), as well as Finger and Schuknecht (1999).

side effects. Here, the bulk of literature has concentrated on the ’collusive impact’ of anti–dumping, i.e. on only one particular type of competition restricting behaviour.[4]

The objective of the present paper is to analyse whether AD–policy facilitates the ’abuse of a dominant market position’, which is another form of anti–competitive business conduct. According to an OECD–definition, the firm abuses its dominance, if ”it is systematically restricting the ability of actual or potential competitors to serve consumers, and is doing this without at the same time achieving efficiencies benefiting consumers” (OECD, 2000, p. 2). Consequently, the main question posed is, how AD–rules alter the capability of incumbent firms to defend their monopoly position vis–a–vis *potential* competition, in other words — how AD–legislation affects the contestability of a market.

To analyse this question, we employ a variant of the well–known Dixit model of entry deterrence, where an incumbent firm and a potential foreign rival interact.[5] We compare a free–trade regime with an AD–regime. Under free trade, market access of the potential foreign entrant is restricted only due to the existence of sunk costs. Under AD–rules, the newcomer faces a price restriction, which forbids him to undercut an exogenously specified minimum price, over and above the sunk costs.

The paper proceeds as follows: in section 2 we describe the institutional and legal framework of AD–legislation and explain why AD–rules serve to establish minimum prices. In section 3 we briefly present Dixit’s model. The effects of the minimum–price rule are analysed in section 4. We discuss our main results in section 5. Section 6 concludes.

2 Institutional and legal background

Article VI of the GATT–1994 and the WTO–AD–agreement (ADA) allow its signatories to impose duties on imports if two conditions are met: Firstly, products are dumped, i.e. they are introduced into the importing country’s market at less than their ’normal’ or ’fair’ value. Secondly, dumping causes ’material’ injury to the domestic firm. The ADA requires the AD–duties to be higher than the dumping margin (i.e. . the difference between the normal value and the import price). Moreover, the imposition is only allowed alter dumping and injury have been proven in a formal investigation initiated by an application by or on behalf of the domestic industry[6]

4 For example, Prusa (1992) and Panagariya and Gupta (1998) demonstrate how AD–legislation can be used to *reach* an agreement, Fischer (1992), Reitzes (1993), Prusa (1994), Steagall (1995), and Pauwels et al. (1997) show how contingent protection may facilitate *tacit collusion*, while Staiger and Wolak (1989) as well as Hartigan (2000) discuss how AD–rules affect the ability to *sustain* collusion among domestic and foreign firms.

5 See e.g. Dixit (1980). There is a considerable amount of trade policy literature which applies the capacity commitment approach, or variations on it, to analyse entry–deterring behaviour. See the papers by Brander and Spencer (1987), Dixit and Kyle (1985), Ishibashi (1991), and Campbell (2000). However, none of the contributions actually applies the Dixit framework. Moreover, most of the papers assume that the foreign firm is the incumbent and, hence, discuss the role of trade policy to ’promote’, instead of deter entry. The exception is Campbell (2000) who discusses the effects of an import quota on entry–deterring behaviour in a Milgrom/Roberts–type model.

6 The term ’material injury’ is not precisely defined in multilateral trade rules. In fact, the ADA lists 15 injury indicators. Yet, an affirmative finding can be established even if none of these indicators points towards the existence of material injury, since Article 3.4 ADA explicitly states that no fact are can give decisive guidance.

In section 4, an AD–legislation is modelled as a minimum price rule which forbids the foreign firm to undercut the ’normal value’ or the ’fair price’ of the product. Moreover, it is assumed that the normal value is exogenous to domestic and foreign firms. In the following, we briefly explain the reasons for these two assumptions.

The assumption that AD–legislation de facto establishes a minimum price, has two reasons: Firstly, WTO rules explicitly envisage the *direct* introduction of import minimum prices through the negotiations of so–called price undertakings. According to Article 8.1 ADA, authorities have the discretion to terminate or suspend proceedings without imposing duties if an exporter commits to ”revise its prices [...] so that the authorities are satisfied that the injurious effect of the dumping is eliminated.”[7] Moreover and secondly, minimum prices may also be established *indirectly*. For example, in the US, no duties as such are levied, but exporters are required to make cash deposits: if no dumping is found in the review investigation one year later, the exporter receives a full refund of the cash deposit, including interest. Hence, exporters have strong incentives to adjust their prices to the minimum price in order to avoid the duty payment.[8]

The assumption that the minimum price, i.e. the normal value of the product in question, is exogenous to the foreign firm at first seems to contradict the usual definition of price dumping. In fact, Article 2.1 ADA advises national authorities to establish the normal value of the similar product on the basis of the exporter’s home market price. This seems to imply that the foreign firm always has the option to avoid dumping by sufficiently raising the price it charges on its domestic market. However, if there are ”not enough sales in the ’ordinary’ course of trade in the domestic market of the exporting country” (ADA, Article 2.2), authorities may choose between two alternative methods of the normal value calculation. The first alternative is to ’construct’ the normal value, i.e. a ’reasonable’ profit margin is added to the the production costs in the foreign local market. The second alternative is to establish the fair value on the basis of the foreign producer’s export price to a third country. Obviously, national authorities have considerable discretion (and firms little direct influence besides lobbying) in determining the reasonableness of a certain profit margin, or the choice of an adequate third country. It follows that — at least in all cases where dumping is not defined as price dumping[9] —, it is sensible to assume that the normal value is a politically specified minimum price, which is exogenously imposed on the firms.[10]

7 See Moore (2000b) and Pauwels and Springael (2000) for a review of the practices of undertaking–acceptance in the US and the EU, respectively.

8 The situation is different in the EU, where a prospective duty system is employed: the level of the duties is set on the basis of past performance and applies to all future exports until the AD–order expires. However, exporters can apply for a review and claim refunds if they can show that they are dumping no longer. Moreover, the Commission can impose additional (retro–active) tariffs if the foreign firm continues to dump. Again, there are considerable incentives for foreign firms to refrain from undercutting the minimum price.

9 Even in this case, the normal value is frequently established on the basis of the ’facts available’, if foreign firms are found to only partially co–operate in the investigation process. In this case, home market prices are determined on the basis of rough allegations of the complaining domestic industry. See Palmeter (1991) and Moore (2000a) for more details as well as for reasons why firms frequently fail to co–operate with AD–authorities during the investigation process.

10 Finger (1993, p. viii) also concludes that ”dumping is whatever you can get the government to act against under the anti–dumping law”.

3 The basic model

A variant of the Dixit (1980) model is applied to analyse the effects of AD–regulations in form of a minimum price rule. Although it is well understood, we present it elaborately as the analysis of the model below closely follows the Dixit one.

3.1 Demand, cost, and profit functions

A two–stage model of perfect information is considered. In the first period t_1, a domestic firm (H) operates on the market. It has the opportunity to extend its production capacity k_H. At the end of the first period, a foreign firm (F) decides whether or not to enter the market. In the second period t_2, both firms simultaneously choose the quantities. In deciding on the next period's capacity level, the domestic firm anticipates both the entry decision of the foreign firm and the outcome of the second–stage quantity game. Similarly, when the foreign firm decides on entrance, it anticipates the outcome of the second–stage game.

The firms face a time–invariant demand function. It is assumed to be linear, so that the inverse demand function can be written as

$$p(q_H, q_F) = a - b(q_H + q_F), \tag{1}$$

where q_H and q_F denote the quantities supplied by the domestic and foreign firm, respectively. The parameter a is the reservation price.

In the first period t_1, the domestic firm may expand its capacity k_H. One unit of capacity is required to produce one unit of the consumption good. When the incumbent's output is less than the previously installed capacity in t_2, it incurs a constant unit cost c and fixed costs of rk_H to maintain the capacity level. Given the domestic firm owns a capacity level k_H at the beginning of t_2, but wishes to produce more than k_h units of output, it has to extend the capacity level. This causes costs of $r(q_H - k_H)$ over and above the production costs when $q_H < k_H$. Therefore, the incumbent's cost function reads

$$C_H = \begin{cases} cq_H + rk_H & \text{if } q_H < k_H, \\ (c+r)q_H & \text{if } q_H = k_H \end{cases} \tag{2}$$

for the entry period t_2

When the previously installed capacity level is sufficient for the desired output, the marginal costs are c. In contrast, the latter equal $c+r$, when the firm chooses to extend the capacity in the second period. Hence, the incumbent's ability to install capacity units in the pre–entry period t_1 gives him a cost advantage.

In t_1, the foreign firm is not present in the market, so that it has to install the are required capacity on entrance. For the foreign firm, the operating costs are $c+r$ per unit of output. However, entering the domestic market is associated with irreversible expenses z. As the domestic firm is already operating in the market, those expenditures are not applicable for the incumbent. The foreign firm's cost function can be written as

$$C_F = (c+r)q_F + z. \tag{3}$$

Both firms face a two–stage decision problem. In the first stage, the incumbent chooses the next period's capacity level and the foreign firm decides whether or not to enter. Conditional on the strategies chosen in the first period, the second stage is formed by the simultaneous quantity choice of both firms. Clearly, each firm will take the actions, which promise the highest profits, where the profit function is given by

$$\pi_i = p(q_H, q_F)q_i - C_i \quad i = H, F. \tag{4}$$

In selecting the own quantity, the firms regard the opponent's quantity as given. The firms' best response function can be derived with

$$q_i = \frac{S - q_j}{2} \quad i = H, F, \quad i \neq j, \tag{5}$$

where $S := (a - c - r)/b$ is the total quantity supplied when the price equals the marginal costs $c + r$.

3.2 The strategies

The incumbent has two advantages over a potential entrant. By installing capacity in the pre–entry period, he commits himself to a certain output. This gives him a cost advantage as the next period's marginal costs are lower. Yet, he has also is strategic advantage since the first move enables him to choose his most desired outcome.

In deciding on the capacity level, the domestic firm has several options. Given the threat of entry is credible, the incumbent may defend its market by installing a capacity level rendering a non–positive profit for the potential entrant. Alternatively, the domestic firm may allow entrance. In this situation it acts as the Stackelberg leader.

Whenever the incumbent chooses the latter option, he picks a point on the foreign firm's reaction function, which maximises his own profit. Inserting the entrant's reaction function into the incumbent's profit and maximising the latter with respect to the quantity results in $q_H^S = S/2$. The entrant's output can be derived with $q_F^S = S/4$. In a Stackelberg situation, the domestic firm's profit is given by

$$\pi_H^{FS} = \frac{b}{2}\left(\frac{S}{2}\right)^2, \tag{6}$$

where the superscript F stands for free trade and indicates that no AD–regulation exists. The superscript S marks variables specific for a Stackelberg outcome. Similarly, the entrant earns a profit of $\pi_F^S = b(S/4)^2 - z$. Clearly, the foreign firm only enters the market profits are expected to be positive. Accordingly, for entrance costs satisfying

$$z \geq z^B := b(S/4)^2,$$

the exporting firm stays out of the market and entry is blocked. For those entry barriers, the threat of entrance is not credible, so that the domestic firm behaves as a monopoly.

If the domestic firm decides to defend its market, he chooses a capacity in t_1 and an equivalent level of output in t_2, so that entry is unprofitable for the potential exporting firm. The entrant's best response to every possible output level of the incumbent is given by equation

(5). This results in a profits of $\pi_F = b(S - q_H)^2/4 - z$. It can be shown that the profits are non–positive whenever the following inequality holds:

$$q_H \geq k_H FD := S - 2\sqrt{z/b}, \tag{7}$$

where the superscript D denotes 'deterring' and k_H^{FD} is the limit capacity in the free trade situation. If the foreign firm observes an installed capacity level of $k_H \geq k_H^{FD}$ and believes that the incumbent fully utilises this capacity level in case of entry, it will not enter the market, since entrance would result in non–positive profits. Hence, entry is deterred whenever $k_H \geq k_H^{FD}$.

Whether or not the incumbent deters entry depends on the profits associated with the appropriate alternative. Let π_H^{FD} denote the profit resulting from the deterrence strategy. Then, the incumbent defends his market as long as $\pi_H^{FD} > \pi_H^{FS}$, where π_H^{FS} is given in equation (6).

Using equation (5) together with (2) in the profit function and noting that q_F equals zero when entry is deterred, yields

$$\pi_H^{FD} = 2b\sqrt{\frac{z}{b}}\left(S - 2\sqrt{\frac{z}{b}}\right). \tag{8}$$

Comparing both profits shows that $\pi_H^{FD} > \pi_H^{FS}$ when z is higher than $z^{DL} := bS^2(3 - 2\sqrt{2})/32$ and lower than $z^{DU} := bS^2(3 + 2\sqrt{2})/32$ (cf. appendix). As $z^{DU} > z^B$, $z \geq z^{DU}$ is irrelevant.

Depending on the level of the entrance costs, the incumbent chooses three strategies. When entrance costs are high, i.e. for $z \in [z^B, \infty)$, the entry thread is not credible, so that the domestic firm behaves as a monopoly. In this situation it produces $q_H^m = S/2$ units and receives the monopoly profit $\pi_H^m = b(S/2)^2$. If the entry barrier is lower, i.e for $z \in [z^{DL} z^B)$, the incumbent finds it profitable to deter entry. The produced quantity is equivalent to the capacity specified in equation (7) and yields profits of π_H^{FD}. For entrance costs satisfying $z \in [0, z^{DL})$, the domestic allows the foreign firm to enter the market. Then, it supplies the quantity of the Stackelberg leader $S/2$ and obtains profits of π_H^{FS}.

4 The model with an anti–dumping regulation

This section introduces an AD–regulation into the above described model. It is assumed that the AD–measures are enforced whenever the market price is lower than an exogenously specified norm price p^n. However, in models with perfect information, the AD–measures need never to be executed. Rather, the normal value imposes an additional restriction on firms. Apart from the normal value, the model is identical to the one presented in the previous section.

It is reasonable to assume that a norm price is higher than the market price under perfect competition $c + r$, but lower than the monopoly price p^m, i.e $p^n \in [c + r, p^m]$. After the foreign firm has entered the market, AD–measures cannot be enforced as long as the market price p exceeds the norm price, i.e. $p \geq p^n$. This established a price restriction influencing the foreign firm's entry decision. As the firms set quantities, it is convenient to transform the price restriction into an equivalent quantity restriction. Employing the inverse demand curve (1), each norm price has a corresponding norm quantity Q^n, $Q^n = (a - p^n)/b$. It follows that the price restriction $p \geq p^n$ is satisfied if the total quantity supplied Q is lower than the norm quantity, i.e. when

$$Q \leq Q^n. \tag{9}$$

It can also be is presumed that the norm quantity will take a higher value than the monopoly quantity Q^m and a lower quantity than the competitive one S. Hence, the valid range for the norm quantity is $Q^n \in [S/2, S]$.

4.1 The entrant's reaction function

In the second stage of the game, the foreign firm chooses its quantity q_F, so that profits are maximised. As opposed to the last section, two situations can be distinguished: the one in which the price restriction or equivalently the quantity one are binding from the one in which the restriction is ineffective. Maximising the profit function subject to the quantity restriction given in equation (9) yields the exporting firm's reaction function with (cf. appendix)

$$q_F = \begin{cases} b(S - q_H)/2 & \text{if } q_F < Q^n - q_H, \\ Q^n - q_H & \text{else.} \end{cases} \tag{10}$$

The upper line specifies the behaviour of the entrant if the quantity restriction is ineffective. It is identical to the one in equation (5). It shows that the entrant increases its supply by two units when the incumbent reduces its output by one unit. In case the the quantity restriction is binding, the second line is relevant. Then, the exporting firm's reduction in production has to meet the incumbent's increase in output. Otherwise, the market price would fall below the normal value and the AD–measures would be enforced.

4.2 The incumbent's options

It is worth mentioning that the incumbent can always produce a quantity so that the price restriction is binding due to his first–mover advantage. As a consequence, the domestic firm can choose between two sets of strategies: the free–trade and the AD–strategies. We refer to free–trade actions whenever the incumbent behaves as though no AD–regulation exists, i.e. when the latter is ineffective. In contrast, AD–strategies are those capacity levels which leads to a binding restriction. As the free–trade strategies where presented in the last section, only the AD–ones are examined here.

When the quantity restriction (9) is constraining, the entrant's reaction function is given by the lower line in equation (10). The incumbent's profits can readily be found to be $\pi_H^P = (S - Q^n)q_H$ and are obtained whenever $q_H \geq 2Q^n - S$. The quantity supplied by the domestic firm will not exceed the norm quantity, so that $q_H \leq Q^n$. The appendix shows that the incumbent's optimal output is given by

$$q_H = Q^n \quad \text{if } q_H \in [2Q^n - S, S]. \tag{11}$$

The equality between the incumbent's output and the norm quantity results since the profit function fails to be strictly concave in the quantity q_H when the restriction (9) is binding. The intuition behind this result is simple. The incumbent knows exactly that expanding the output by one unit will induce the exporting firm to reduce his output by the same amount. As a consequence, the price cannot drop below the normal value. In addition, equation (11) shows that no entry occurs as long as the price restriction is binding. Inserting (11) into the profit function and noting that q_F is zero yields the incumbent's profit with

$$\pi_H^{PS} = bq_F^* Q^n. \tag{12}$$

However, the domestic firm does not need to actually produce the norm quantity in order to prevent market entry. The best response of the exporting firm to an arbitrary level of output q_H is given by the lower line of equation (10). The corresponding profit is $\pi_F = b(S - Q^n)(Q^n - q_H) - z$. Accordingly, the entrant would earn non–positive profits when actually entering the market if

$$q_H \geq k_H^{PD} := Q^n - \frac{z}{b}\frac{1}{q_F^*}, \quad q_F^* = S - Q^n, \tag{13}$$

where q_F^* is the foreign firm's output determined by the intersection of the reaction functions (10) for the cases when the restriction is binding and not binding. Here, k_H^{PD} is the limit capacity under the AD–rules. Therefore, entry is deterred for the incumbent's quantities specified in (13). When the incumbent chooses and output level equal to the entry deterring capacity, his profits are

$$\pi_H^{PD} = b\left(q_F^* + \frac{z}{b}\frac{1}{q_F^*}\right)\left(Q^n - \frac{z}{b}\frac{1}{q_F^*}\right). \tag{14}$$

Given the quantity restriction is binding, whether the incumbent produces the norm quantity or an output equivalent to the entry deterring capacity in (13) depends on which alternative promises the higher profit. Therefore, the domestic firm selects the entry deterring capacity, whenever $\pi_H^{PD}\pi_H^{PS}$. Comparing both profit functions shows that the incumbent supplies the entry deterring quantity for entrance barriers z lower than $\tilde{z} := bq_F^* q_H^*$ (cf. appendix). $q_H^* := 2Q^n - S$ is the incumbent's output associated with the point at which the reaction function for situations with a binding and a non–binding quantity restriction intersect.

Similar to the situation with no AD–regulation, the AD–strategy chosen by the domestic firm depends on the entrance costs z. Given that the price restriction is binding, the incumbent produces the entry deterring quantity for low entry barriers, i.e. for $z \in [0, \tilde{z})$. When the entrance costs are higher, i.e. if z lies in the interval $[\tilde{z}, z^B)$, the incumbent's supply equals the norm quantity. As a firm can never receive a higher profit than the monopoly one and the entrance is blocked for $z \in [z^B, \infty)$, the incumbent supplies the monopoly quantity and those situations.

5 Anti–dumping regulations as entry barriers

5.1 The effects of a minimum price rule

Until now, the fact was accepted that, for some entry barriers z, some levels of the normal value are binding and others are ineffective. To determine the effect of an AD–regulation, the question has to be answered which levels of the norm quantity and, hence, which normal values are constraining.

In general, the quantity restriction can be regarded as completely ineffective when the firms behave as though no AD–regulation exists. This involves two prerequisites: (i) the minimum price rule has to be physically ineffective and (ii) the normal value has to leave the firms' strategic behaviour unaffected. For a given entry barrier, case (i) requires the norm quantity to be larger than the total quantity supplied in a free–trade situation. Henceforward, norm quantities satisfying case (i) are referred to as physically ineffective ones. However, there may be situations in which the existence of an AD–regulation change the firms' strategic behaviour although the restriction is physically ineffective. Accordingly, case (ii) requires that the firms behave as if no restriction exists. For the given entry barrier, norm quantities satisfying this requirement (ii) are called strategically ineffective. As a consequence, normal values for which case (i) and (ii) are met, are completely ineffective.

In a free–trade situation, the domestic firm applies three different strategies: behaving as a monopoly, deterring or allowing entry. As the entrance is blocked for high entry barriers, i.e. for $z \in [z^B, \infty)$, the incumbent has a monopoly. The total quantity supplied equals the monopoly output $S/2$. The domestic firm deters entry when $z \in [z^{DL}, z^B)$, so that the total output is equivalent to the entry deterring capacity $S - 2\sqrt{z/b}$. For still lower entrance costs, i.e. for $z \in [0, z^{DL})$, the incumbent allows entry, so that the total output equals the Stackelberg quantity $3S/4$. Therefore, the norm quantity is physically ineffective if

$$Q^n \in \begin{cases} [3S/4, S) & \text{for } z \in [0, z^{DL}), \\ [S - 2\sqrt{z/b}, S) & \text{for } z \in [z^{DL}, z^B), \\ [S/2, S) & \text{for } z \in [z^B, \infty). \end{cases} \tag{15}$$

It is also worth mentioning that the maximum quantity the incumbent produces to defend the domestic market is larger than the total output in the Stackelberg situation. This can be seen by replacing the entry barrier z by the definition of z^{DL} in equation (7) and noting that $3\sqrt{2}S/4$ exceeds $3S/4$, the Stackelberg quantity. This result suggests that norm quantities $Q^n \geq 3\sqrt{2}S/4$ are ineffective for all levels of the entry barrier. However, it is shown below that this conclusion is misleading as it neglects the second condition that has to be being met.

The requirement (ii) refers to the strategic behaviour of both firms. In examining which set of normal values are strategically ineffective for a given entry barrier, only the incumbent's profits have to be analysed. This can be seen by noting that the domestic firm has the first–mover advantage to choose to capacity and, hence, the quantity in the pre–entry period t_1. The foreign firm observes the incumbent's decision and optimally responds. Accordingly, the domestic firm chooses the AD–strategies whenever doing so yields the higher profit than applying the free–trade strategies.

Proposition 1. *There is no normal value p^n different from the one equal to the price under perfect competition, such that it is is strategically ineffective for all $z \in [0, z^B)$.*

Proof. See appendix. □

Reversely stated, the result confirms that for any normal value $p^n \in (p^c, p^m]$ there exists at least one level of the entry barrier for which the incumbent applies the AD–strategy. Keeping in mind that no entry occurs in an AD–regime, this is surprising, especially for normal values close to the price under perfect competition. Comparing the limit capacities for a free–trade and an AD–regime reveals that the capacity (and the output) necessary to deter entrance is

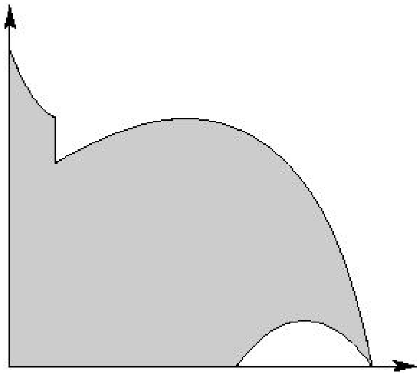

Figure 1: Situations with strategically effective AD–rules

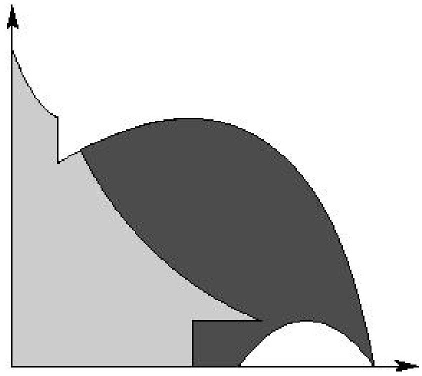

Figure 2: Situations with strategically effective but physically ineffective AD–rules

generally lower under AD–protection.[11] This property of the AD–regulation induces the result of proposition 1.

In figure 1, the grey shaded area marks the combinations of the entry barrier z and the norm quantity Q^n for which the latter proves to be strategically effective, i.e. for which the incumbent adopts the AD–strategy.[12] Accordingly, the white area illustrates the (z, Q^n) combinations for which the incumbent chooses the free–trade strategies — the AD–regulation is strategically ineffective. The white area to the lower right side of the figure reveals that market entry occurs for certain values of the norm quantity. The fact that the grey area extends over the entire interval $[S/2, S)$ for the norm quantity illustrates proposition 1.

In figure 1, the (z, Q^n) combinations were not required to be physically ineffective. Additionally using the information given in the equation (15) ensues in figure 2. Here, the medium grey region displays the combination of the entry barrier and the norm quantity where the domestic firm chooses the AD–strategies although the minimum price regulation is physically ineffective. The dark grey area depicts (z, Q^n) combinations for which the corresponding minimum price rule proves to be completely ineffective.

The existence of an AD–regulation may also affect the total quantity supplied. When no AD–regulation exists, the total quantity produced is given by

$$Q^F = \begin{cases} 3S/4 & \text{for } z \in [0, z^{DL}), \\ S - 2\sqrt{z/b} & \text{for } z \in [z^{DL}, z^B). \end{cases} \tag{16}$$

The first line applies whenever the foreign firm enters the market due to low entry barriers and both firms play the Stackelberg game. The second line is associated to situations in which the domestic firm finds it profitable to deter entry. Since the incumbent is a monopoly when $z > z^B$ independent of the existence or a non–existence of AD–regulations, we do not consider these cases here. Similarly, we can summarise the total quantities produced whenever the AD–

11 Moreover, the difference $k_H^{FD} - k_H^{PD}$ increases in the norm quantity for $y > q_F^*$.

12 Since the calculation of those combinations is straightforward, although tedious, a formal derivation is not presented here.

regulation proves to be binding:

$$Q^P = \begin{cases} Q^n - z/(bq_F^*), & \text{for } z \in [0, \tilde{z}), \\ Q^n & \text{for } z \in [\tilde{z}, z^B). \end{cases} \tag{17}$$

A situation is defined to be pro–competitive, whenever $Q^P > Q^F$, and to be anti–competitive, whenever $Q^P < Q^F$.

The next two results deal with the question under which circumstances the AD–rules exert an anti–competitive effect, and whether or not they may have a pro–competitive effect.

Proposition 2. *There are anti–competitive effects for some normal values and entry barriers in* $z \in [z^{DL}, z^B)$

Proof. See appendix. □

Proposition 3. *There is a pro–competitive effect for some combinations of* (z, Q^n)*, and the pro–competitive effect is restricted to* $z \in [0, z^{DL})$.

Proof. See appendix. □

5.2 Discussion

As mentioned above, the maximum quantity that the domestic firm produces to defend the market in absence of an AD–regulation equals $3\sqrt{2}S/4$. This suggests that normal values corresponding to larger norm quantities are completely ineffective for all levels of the entrance costs. However, proposition 1 confirms that there is no normal value in the range of $(p^c, p^m]$, which is neither physically nor strategically ineffective for all entry barriers. Reversely stated, every normal value different from the price under perfect competition distorts the market outcome for at least some levels of the entry barrier.

This also implies that reducing the entry barriers for foreign firms is not sufficient to ensure a market entrance. It can be illustrated by focusing on the special case of $z = 0$. With no entrance costs for the foreign firm, the incumbent finds it unprofitable to defend the home market in the free–trade situation. Under an AD–regulation, market entry occurs only for combinations of the entry barrier and the normal quantity in the white (dark grey) area to the lower right of figure 1 (and 2). The lowest norm quantity, where the market entry is possible, exceeds the total Stackelberg quantity of $3S/4$. As a consequence, even if no entrance barriers exist, entry occurs only for special normal values. In addition, these normal values have to be considerably lower than the price in the Stackelberg situation. This implies that even 'innocent' looking minimum prices have a distorting effect on competition.

The main subject of this paper is to show whether AD–rules facilitate the abuse of market dominance. The abuse of market dominance requires that entrance and consumer's welfare are restricted. It is worth mentioning that the domestic firm abuses its incumbency even under free trade. The incumbent's ability to do so depend solely on the level of sunk costs. This can be seen in figure 3. In the latter, the dashed graph illustrates the total quantity supplied in a free–trade situation. For low entry barriers, i.e. for $z \in [0, z^{DL})$, the incumbent finds it profitable to allow entry since the limit capacity is high. For higher entrance costs, i.e. for $z \in [z^{DL}, z^B)$,

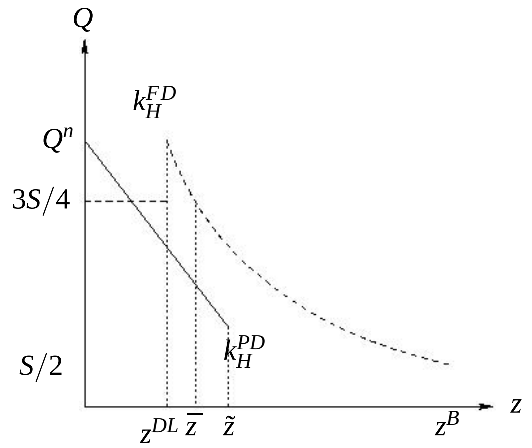

Figure 3: Total quantities supplied in a free–trade and an AD–situation

no market entry occurs. Yet, if the level of the entrance barrier is in the interval $[z^{DL}, \overline{z})$ the incumbent does not abuse its dominant position, as the total quantity supplied exceed the one in the Stackelberg situation. Therefore, the consumer's welfare is higher even though no market entry occurs. However, for all entrance costs $z \in [\overline{z}, z^B)$, the domestic firm abuses its dominant position since neither market entry occurs nor is the total quantity supplied higher than the Stackelberg one.

In the AD regime, however, the profitability of the deterrence strategy depends on the interaction between the level of sunk costs and the level of minimum prices. To analyse this case, it is convenient to distinguish between the low–entry–costs situations, i.e. $z \in [0, z^{DL})$ and high–entry–cost ones, i.e. $z \in [z^{DL}, z^B)$.

Concerning the first prerequisite, figure 2 demonstrates that entry is deterred for some normal values although it would be generally allowed in the free–trade regime for the low–entry–cost case. Therefore, it can be concluded that entry deterrence is facilitated for those normal values. In the high–entry–cost case, entrance is deterred in both regimes. However, an immediate implication of the propositions 2 together with 3 is that whenever the normal value is such that the incumbent chooses the AD–strategies for the high–entry–cost cases, the entry deterrence quantity is lower as compared to the free–trade regime. Again, deterring entry is facilitated for those normal values.

As proposition 3 confirmed, an AD–regulation can exert a pro–competitive effect for the low–entrance–cost cases. Figure 3 illustrates one of these situations. However, these effects require the normal value to be lower than the free–trade price, i.e. here the one of the Stackelberg situation. This corresponds to norm quantities higher than the total quantity in the Stackelberg game, which can be seen in figure 3. In particular, we find a pro–competitive effect increasing the consumer welfare for the combination of low entrance costs and moderate normal values. For those combinations, the incumbent does not abuse its dominant position even though no market entry occurs.

In contrast, for the high–entry–cost case, the total quantity produced is lower when the incumbent applies the AD–strategies as compared to the free–trade situation. Again, figure 3 illustrates this result. Hence, it is easier for the incumbent to deter entry in an AD–regime. Consequently, the AD–rules produce an anti–competitive effect. If entrance costs are high, entry deterrence under free trade ensues in a lower consumer welfare as it was implicitly confirmed by proposition 3. Yet, the total quantity produced is still higher than under AD–protection. Accordingly, AD–rules facilitate the abuse of market dominance.

6 Conclusion

Our analysis has important implications for the interface between trade policy on competition policy. The current administration of AD–legislation as minimum price protection is frequently inconsistent with the objective of a competition friendly international trading system, in which both policy fields support each other in maintaining market access and market contestability. It has been shown that minimum price protection not only alters the strategic interactions among actual competitors, but additionally among incumbents and potential competitors. Hereby, even seemingly 'innocent' minimum prices, i.e. minimum prices, which are equal or below the competitive prices (i.e. the 'true normal value') distort the behaviour of firms. Examples comprise the market deterrence for low entry costs and the abuse of market dominance for high entry costs. Hence, our analysis suggests that avoiding undesirable anti–competitive side effects of anti–dumping policy is not only a matter of removing biases and distortions in the calculation of the normal or fair value of the product.

The argument can be further strengthened. In general, it may be assumed that the entry barriers consist of two complements: administrative and non–administrative ones. Examples for the former may be trade tariffs etc. One may argue that the level of the administrative entry costs can be determined so that the AD–legislation can at least in principle find normal values which are physically and strategically ineffective. In contrast, non–administrative entrance costs, as e.g. expenses to establish a distribution network for the products or to gain consumer confidence, are market specific. They may vary between industries and even firms. In addition, one may find it impossible to determine the level of the relevant non–administrative entrance costs. Yet, if the level of the total entrance costs is uncertain it is impossible to determine the normal value which leaves the market undistorted.

Appendix

A Reaction functions and entry deterrence

A.1 The foreign firm's reaction function

As a Stackelberg follower, the foreign firm maximises its profits given the output of the domestic firm q_H. The profit maximisation is constrained by the quantity restriction (9). Using the profit function (4) and the cost function (3), the Lagrange function reads:

$$L = b(S - q_H - q_F)q_F - z + \lambda(Q^n - q_H - q_F),$$

where λ is the shadow price. The first–order conditions can be obtained with

$$b(S - q_H - 2q_F) = \lambda,$$
$$Q^n - q_F - q_H \geq 0 \quad \text{and} \quad \lambda(Q^n - q_H - q_F) = 0.$$

If the shadow price equals zero, the restriction is not binding and $q_F = (S - q_H)/2$. If the shadow price is positive, the restriction is binding. In that case, $q_F = Q^N - q_H$.

A.2 The domestic firm's reaction function

When the quantity restriction is ineffective, the incumbent's maximisation problem reads

$$\max_{q_H} \quad \pi_H^F = \frac{b}{2}(S - q_H)q_H,$$
$$\text{s.t. } q_H \leq 2Q^n - S.$$

The Lagrangian is given by $L = b(S - q_H)q_H/2 + \lambda(2Q^n - S - q_H)$. Applying the method of Kuhn–Tucker, the first–order conditions can be written as

$$\frac{b}{2}(S - 2q_H) = \lambda,$$
$$2Q^n - S \geq q_H \quad \text{and} \quad \lambda(2Q^n - S - q_H) = 0.$$

If the shadow price is zero, the inequality restriction is satisfied and the incumbent chooses $q_H = S/2$. We need not to consider the case when the inequality is not satisfied as this situation is subject of the following maximisation problem.

Given that the quantity restriction is binding, the domestic firm's maximisation problem reads

$$\max_{q_H} \quad \pi_H^P = b(S - Q^n)q_H,$$
$$\text{s.t. } q_H \geq 2Q^n - S,$$
$$q_H \leq Q^n.$$

Here, the Lagrangian can be written as $L = b(S - Q^n)q_H + \lambda(q_H - 2Q^n + S) + \mu(Q^n - q_H)$. The first–order conditions can be derived with

$$b(S - Q^n) = \mu - \lambda,$$
$$q_H - 2Q^n + S \geq 0 \quad \text{and} \quad \lambda(q_H - 2Q^n + S) = 0,$$
$$Q^n - q_H \geq 0 \quad \text{and} \quad \mu(Q^n - q_H) = 0$$

Assume $q_H > 2Q^n - S$, then, λ equals zero. From the first of the first–order conditions follows that $\mu = b(S - Q^n)$ and consequently $q_H = Q^n$. Let q_H equal $2Q^n - S$. Hence, $q_H < Q^n$ and μ equals zero. It follows from the first of the first–order conditions that $\lambda = b(Q^n - S)$. The latter expression should be positive, i.e. $Q^n > S$ is required. Yet, this contradicts the initial assumption that the norm quantity can reasonably be assumed to be from the interval $[S/2, S]$. Accordingly, q_H always equals the norm quantity Q^n when the quantity restriction is binding. Then, the reaction function for the domestic firm can be written as

$$q_H = \begin{cases} S/2 & \text{if } q_H < 2Q^n - S \\ Q^n & \text{if } q_H \geq 2Q^n - S \end{cases}$$

A.3 Entry deterrence under free trade

The incumbent chooses to deter entry as long as $\pi_H^{FD} > \pi_H^{FS}$. Let x be defined as $x =: z/b$. Using x in equation (8) together with (6), the condition becomes $2\sqrt{x}(S - 2\sqrt{x}) > (S/2)^2/2$. Rearranging yields $2\sqrt{x}S > 4x + (S/2)^2/2$. This is equivalent to $4xS^2 > (S/2)^4/4 + 16x^2 + 4x(S/2)^2$. By applying the quadratic completion, this inequality can be written as $S^4/8 > (4x - 3S^2/8)^2$. The latter expression is equivalent to $S^2/(2\sqrt{2}) > |4x - 3S^2/8|$. Using the definition of x renders two solutions to the inequality

$$z < b\frac{S^2}{32}(3 + 2\sqrt{2})$$
$$z > b\frac{S^2}{32}(3 - 2\sqrt{2})$$

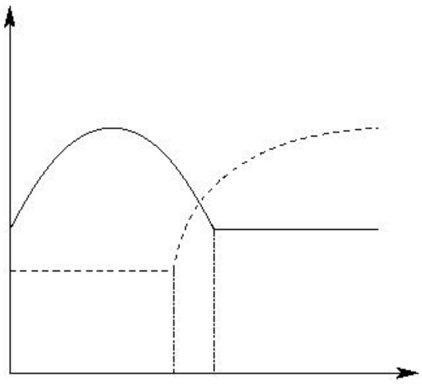

Figure 4: Profits as functions of the entry barrier

A.4 Entry deterrence under anti–dumping regulations

Using the definitions of the profit functions π_H^{PD} and π_H^{PS} shows that the former is larger than the latter, whenever $(q_F^* + z/(bq_F^*))(Q^n - z/(bq_F^*)) > q_F^* Q^n$. Collecting terms yields $(z/b)(Q^n/q_F^*) - (z/b)^2/(q_F^*)^2 - z/b > 0$. This is equivalent to $(bq_F^* q_H^* - z)z/(bq_F^*)^2 > 0$. It follows $\pi_H^{PD} > \pi_H^{PS}$ for entry barriers $z < \tilde{z} =: bq_F^* q_H^*$.

B Proof of Proposition 1

The proof proceeds in three steps. Firstly, it is demonstrated that there are some $z \in [0, z^B)$ so that the incumbent chooses the AD–strategy for any $Q^n \in (S/2, S)$. Secondly, it is shown that the AD–strategy is applied as well for $Q^n = S/2$. Lastly, it is verified that the free–trade strategy is chosen for $Q^n = S$.

Part 1: The incumbent's profits as functions of the entry barrier are illustrated in figure 4. Let $y := z/b$, then $\pi_H^{PD} - \pi_H^{FS} := (q_F^* + y/q_F^*)(Q^n - y/q_F^*) - S^2/8$. The difference is positive for $y \in ((\tilde{y} - Sq_F^*/\sqrt{2})/2, (\tilde{y} + Sq_F^*/\sqrt{2})/2)$, where $\tilde{y} = \tilde{z}/b$. The lower boundary is an inverse u–shaped function of the norm quantity and lies evidently everywhere below $\tilde{y}$. Let $y_l := (\tilde{y} - Sq_F^*/\sqrt{2})/2$. Then, this function reaches its maximum at $Q^{n*} = (6 + \sqrt{2})S/8$. The lower boundary for the entry barrier attains $y_l^* = S^2(2 - \sqrt{2})^2/64$ at this point. It can be shown that $y_l^* = y^{DL}$, with $y^{DL} = z^{DL}/b$. As $y_l \leq \min\{\tilde{y}, y^{DL}\}$, it follows that $(\forall Q^n \in (S/2, S) \setminus Q^{n*})(\exists z \in [0, z^{DL})) : \pi_H^{PD} > \pi_H^{FS}$. For $Q^n = Q^{n*}$, the function π_H^{PD} approaches π_H^{FD} from below as z increases and intersects the latter at z^{DL}. For $z \in [z^{DL}, z^B)$, the incumbent deters entry in the free–trade regime. As $y_l^* = y^{DL} < \tilde{y}$ for Q^{n*}, the domestic firm also chooses the deterring strategy in the AD–regime. However, it can be shown that $d\pi_H^{PD}/dy > d\pi_H^{FD}/dy$ at $(y^{DL} + \varepsilon, Q^{n*})$, for small $\varepsilon \in \mathbb{R}_+$. Consequently, there must be some $z > z^{DL}$ for which $\pi_H^{PD} > \pi_H^{FD}$.

Part 2: For $Q^n = S/2$, $\tilde{y}$ becomes zero, so that π_H^{PD} is irrelevant for all $z \in [0, z^B)$. As $\pi_H^{PS}|_{Q^n=S/2} = b(S/2)^2 > b(S/2)^2/2 = \pi_H^{FS}$, the incumbent again chooses the AD–strategy for $Q^n = S/2$.

Part 3: For $Q^n = S$, $\tilde{y}$ equals zero as well. Again, π_H^{PS} and π_H^{FS} have to be compared. Since $\pi_H^{PS}|_{Q^n=S} = 0 < b(S/2)^2/2 = \pi_H^{FS}$, the domestic firm prefers the free–trade strategy for this norm quantity.

C Proof of proposition 2

Note that an AD–regulation has an anti–competitive effect if the incumbent adopts the AD–strategy and the quantity supplied is lower as compared to the free-trade situation, i.e. if $\pi_H^P > \pi_H^F$ and $Q^P < Q^F$.

Let $\tilde{y} := \tilde{z}/b$ and $y^{DL} := z^{DL}/b$. Consider the case of $\tilde{y} > y^{DL}$. This corresponds to norm quantities in the interval $A := (S(6-\sqrt{1+2\sqrt{2}})/8, S(6+\sqrt{1+2\sqrt{2}})/8)$. Then, for values $y \in [y^{DL}, \tilde{y})$, the incumbent deters entrance in the free–trade as well a is in the AD–regime. For this case, the difference $Q^F - Q^P$ equals $Q^F - Q^P = (q_F^* - \sqrt{y})^2$, which is always positive. It follows that an AD–rule as an anti-competitive effect if the AD–strategies actually chosen. To verify this, consider a norm quantity of $3S/4 \in A$. Then, the threshold level $\tilde{y}$ is $\tilde{y} = S^2/8 > y^{DL}$. Calculating the appropriate profit functions at the point $(y, Q^n) = (y^{DL}, 3S/4)$ yields $\pi_H^{PD}(y^{DL}, 3S/4) = S^3(7+4\sqrt{2})/64$ and $\pi_H^{FD}(y^{DL}) = S^2(2\sqrt{6-4\sqrt{2}}-(3-2\sqrt{2}))/8$. As $\pi_H^{PD}(y^{DL}, 3S/4 > \pi_H^{FD}(y^{DL})$, the desired result follows.

D Proof of proposition 3

Part 1: Here, it is verified, that there are some (z, Q^n) combinations for which the AD–regulation yields a pro–competitive effect. Consider the case $(z, Q^n) = (0, 3S/4+\varepsilon)$, for small $\varepsilon \in \mathbb{R}_+$. For $Q^n = 3S/4$, the threshold for the AD–strategies is $tilez = b(S/4-\varepsilon)(S/2+1\varepsilon)$ which exceeds zero for $\varepsilon < s/4$. Hence, it remains to be demonstrated that $\pi_H^{PD} > \pi_H^{FS}$ for small ε. Calculating the respective values at this point shows that $\pi_H^{PD}(0, 3S/4+\varepsilon) - \pi_H^{FS} = b[S^2/16 - \varepsilon(S/2+\varepsilon)]$. As $\varepsilon(S/2+\varepsilon)$ is an increasing function in ε approaching zero as ε reaches zero, the desired result follows.

Part 2: Here, it is shown that there will be no pro–competitive effect for $z \in [z^{DL}, z^B)$. A pro–competitive effect is given if $Q^P > Q^F$. Depending on the value for the norm quantity, $\tilde{z}$ may be larger or smaller than z^{DL}. Assuming first that $\tilde{z} > z^{DL}$, a pro–competitive effect in $[z^{DL}, \tilde{z})$ requires that

$$Q^n - y/q_F^* > S - 2\sqrt{y}, \tag{18}$$

where $y = z/b$. Using the definition of q_F^* and rearranging the inequality yields $(q_F^* - \sqrt{y})^2 < 0$. Given the norm quantities such that $\tilde{z} > z^{DL}$ there will be no pro–competitive effect in the range of $z \in [z^{DL}, \tilde{z})$. For norm quantities such that $\tilde{z} > z^{DL}$ the considerations for the range of $[\tilde{z}, z^B)$ are identical to those studying the entire of $[z^{DL}, z^B)$ valid for norm quantities such that $\tilde{y} < z^{DL}$. In those cases, a pro–competitive effect is given if $Q^n > S - 2\sqrt{y}$. In addition, the incumbent has to apply the AD–strategy. Hence, $\pi_H^{PS} > \pi_H^{FD}$ is required. The profits in the AD–regime are larger than the one in the free–trade one if $bq_F^* Q^n > b2\sqrt{y}(S-2\sqrt{y})$. The latter inequality can be rewritten as $(S/2-2\sqrt{y})^2 > (Q^n - S/2)^2$. The inequality is satisfied by norm quantities $Q^n < Q_1 := S - 2\sqrt{y}$ and $Q^n < Q_2 := 2\sqrt{y}$. The requirement $Q^n < Q_1$ is a direct contradiction to inequality (18). Hence, if $Q^n < Q_1$, $Q^F > Q^P$ so that the quantity supplied under the AD–regime is lower than the one in the free–trade situation. For $Q^n < 2\sqrt{y}$, note that $Q_2 = 2\sqrt{y} < 2\sqrt{z^B/b} = S/2$. Hence, those norm quantities lie outside the considered range of $Q^n \in [S/2, S]$.

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