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**UNDERTAKINGS AND ANTIDUMPING
JUMPING FDI IN EUROPE**
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Abstract

This paper studies the effects of EU antidumping policy when foreign firms have the possibility to 'jump' antidumping measures by engaging in foreign direct investment (FDI) in the EU. Using a multi-stage framework, we study the EU administration's choice between an antidumping duty and a price-undertaking, taking into account the effect of these measures on the location decision of the foreign firm and the subsequent price competition between local and foreign firms. Our findings suggest that the EU administration acting purely in the EU industry's interest prefers a price-undertaking to a duty, if the latter leads to 'duty jumping' FDI. FDI toughens price competition in the EU market and leaves local firms worse off. Antidumping jumping FDI will only occur if the EU administration has broader objectives than just protecting the profitability of EU industry, if fixed costs of FDI are not too high, and if the cost advantage of foreign firms are, at least partially, firm-specific and transferable abroad. If foreign firms are able to act strategically taking into account EU antidumping policy, the presence of antidumping law can also *discourage* FDI that would have taken place under free trade conditions.

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I. Introduction

The theoretical literature on a tariff jumping motive for FDI is well established (e.g. Campa et al (1998), Horstmann & Markusen (1992), Motta (1992), Smith (1987)). These studies show under which conditions foreign firms prefer to set up local production units over exporting when serving distant markets. The trade-off foreign firms typically face in these models is based on the level of the tariff when exporting versus the fixed cost associated with setting up a manufacturing plant abroad. The focus of the models has been on the strategic effects of FDI and entry under different trade policy regimes. If the foreign exporter can move first, strategic FDI may occur with the sole objective to deter entry by domestic firms. If the domestic industry is able to move first, higher tariff levels may actually encourage entry and discourage FDI. A number of empirical studies have found support for the role of tariffs in inducing FDI (e.g. Culem (1988), Belderbos (1997)), while Campa et al. (1998) found evidence that the relationship between tariff levels and FDI depends on the level of concentration in the domestic industry.

As multilateral trade agreements have limited countries' ability to use tariffs and other trade restraints such as voluntary export requirements (VERs), antidumping measures have become increasingly popular trade policy instruments. Recent empirical work on the effects of antidumping measures has found evidence that the FDI response to antidumping actions is not uncommon. Most of this work has focused on the responses to antidumping actions by Japanese firms. Barrel and Pain (1999) found that Japanese FDI flows to the EU and the US in the 1980s were positively affected by the overall increase in the number of antidumping actions in the two jurisdictions. Girma et al. (1999), using 4-digit sector level data, found a positive impact of antidumping actions on Japanese FDI in the UK. Belderbos (1997), using firm level data for the Japanese electronics sector, found that antidumping duties in the EU had a substantial impact on the probability that Japanese firms set up manufacturing plants in Europe.[1] Empirical evidence has also suggested important differences in the magnitude of 'antidumping jumping' FDI in the EU and the US. Belderbos (1997) estimated the FDI response in the US case as about half the size of the FDI response in the EU. Blonigen (1998) confirmed this feature of US antidumping practice in a firm level study of

Japanese investments in the US. The more limited occurrence of 'antidumping jumping' in the US can be explained from foreign firms' ability to obtain lower antidumping duties through a system of administrative reviews by the Department of Commerce. If the exporter can show that it has increased its export price such that dumping no longer occurs, duty payments are not required. The US system is therefore often characterized as a 'duty avoidance' system while EU antidumping practice is characterized as a 'duty payment' system [Belderbos (1997), Van Bael and Bellis (1990)]. The EU system does however allow foreign firms to avoid paying duties by raising prices, but this is not automatic: the EU commission has the discretion to agree on price undertakings with foreign exporters in lieu of imposing duties. The criteria used by the Commission to decide which measures to take remain intransparant [Tharakan (1991)] and appear to involve political factors as well as the expected monitoring costs or price undertakings.

Given the demonstrated importance of FDI responses to antidumping actions, it is surprising that the theoretical literature on the effects of antidumping law have by and large ignored the issue of 'antidumping jumping'. Blonigen and Ohno (1998) focus on the strategic interactions between exporters from different countries facing the possibility of antidumping measures. In a two-period model, they show the possibility of a 'protection building equilibrium' where a foreign firm that intends to engage in second period FDI will increase its first period export in order to increase the level of protection faced by the rival foreign firm that continues to export in the second period. Haaland and Wooton (1998) are concerned with the effects of economic integration involving the abolition of antidumping law. In a symmetric model of two countries considering reciprocal (anti-)dumping and reciprocal FDI, they find that producers in both countries would gain from the abolition of (reciprocal) antidumping law. This result is obtained because antidumping that induces FDI increases competition and leaves lower producer profits.

In this paper we analyze the occurrence of FDI and the welfare effects of antidumping law using a model that closely follows actual EU antidumping practice. Contrary to the symmetric model of Haaland and Wooton (1998), we explicitly take on board cost asymmetries, i.e. a cost advantage of the foreign firm. Such a cost advantage is the most likely reason for intense price competition by foreign exporters

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[1] This impact was conditional on a sufficient level of competitiveness possessed by the Japanese firms.

leading to antidumping petitions.[2]. We allow marginal costs to be either 'firm-specific', in which case cost advantages are internationally transferable through FDI, or 'location specific', in which case local production forces the foreign firm to relinquish its cost advantage and produce at the same marginal cost as those of domestic producers. In the model, the EU intervenes first while taking into account that foreign firms may respond to antidumping measures by setting up manufacturing facilities in Europe. A major focus of the paper is the rationale behind the choice by the EU administration to settle antidumping actions by duties or undertakings. In practice, the EU is a frequent user of price-undertakings. Hence it is opportune to explicitly consider it as an alternative outcome of antidumping procedures.[3] We analyze the EU antidumping decision under two alternative objective functions of the EU administration: maximizing domestic firms' profits and maximizing total EU welfare. The latter objective corresponds most closely to the 'Public Interest' clause in EU antidumping law, which demands that the EU administration takes into account the effects of proposed measures on all affected parties in he EU (including consumers and user industries). The former objective corresponds to the more basic objective of protecting EU industry. A last aspect of EU antidumping practice included in our analysis is that antidumping measures are in most cases designed to stop foreign firms from undercutting EU producers' prices and 'meet the competition' on the EU market (Vandenbussche 1995). This implies that antidumping duties and undertakings are determined by the level of price undercutting. The extent of foreign price-undercutting in turn is a function of the prevailing cost asymmetry between the foreign and the domestic firm.

While other papers in the FDI literature have compared VERs with tariffs (Konishi et al.1998; Levinsohn (1989); Hillman and Ursprung (1988)), our paper is the first to compare the effects on FDI of antidumping duties with the effects of price-undertakings. Konishi et al (1998) show that VERs may be preferred to tariffs by local

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[2] Given the documented strong bias in favor of a finding of positive dumping margins implied by the administrative procedures [Finger (1992), Van Bael and Bellis (1990)]. Some evidence is provided by the importance of cases targeting low cost producers. Out of 246 EU antidumping cases initiated at the product level between 1985-90, 70 percent targeted exporters from low wage countries (Vandenbussche et al., 1999).

[3] See also Laird (1999). Among 249 EU AD-cases examined by the European Commission during 1985-1990, 21 percent were terminated without any measures, 30 percent ended in a price undertaking and 49 percent ended in duties (figures based on Official Journal of the EC, L-series, 1985-95).

administrations because they generate higher lobbying contributions, but also because VERs may have a stronger FDI deterring effect. Since foreign firms gain from a VER, FDI it is less likely to occur. The choice between undertakings and antidumping duties modeled in this paper has similar features, with price undertakings being able to dissuade foreign from engaging in FDI. Duties that trigger FDI increase local competition and adversely affect home profits, but consumers may gain from lower prices. Price-undertakings in contrast benefit domestic firms, while hurting consumers through higher prices.

The remainder of the paper is structured as follows. In section II we discuss the main features of EU antidumping practices and present the model. In section III we discuss our results and section IV concludes.

II. Stylized Facts, Model, and Assumptions

We consider a three-stage model involving the EU administration, a domestic EU firm, and a foreign firm. In the first stage, the EU antidumping administration decides whether to take antidumping measures, and if so which form these measures take: a price undertaking or a duty. In the second stage the foreign firm chooses between exports and FDI. In the third stage the foreign firm is engaged in price competition with the EU firms on the European market. This sequence of moves implies that the FDI versus export decision is a response to the trade policy measure.[4] By solving the model through backward induction, we analyze how the threat of FDI may induce the administration to adapt its choice of trade policy measure. Since the model follows closely actual EU practice, some stylized facts are summarized in section 2.1 before the model structure is detailed in section 2.2.

2.1 Stylized Facts of European Antidumping Practice

European antidumping law stipulates that antidumping measures can be imposed on foreign imports if these imports are dumped on the European market and cause material injury to EU industry. The most common form of what is regarded as dumping in the legal sense is international price-discrimination between countries

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[4] In paragraph 3.3 we relax this assumption.

where the price in the export market is lower than the price of a product in the home market. Measures can be taken when the foreign product is considered a 'like product', i.e. similar to the product manufactured by EU producers. A major feature of EU antidumping practice is that the degree of injury to EU industry caused by the dumped imports is usually measured as the extent to which import prices are undercutting EU industry prices (Vandenbussche 1995). A related feature is that the level of antidumping duties is set specifically to eliminate this injury as measured by the extent of foreign price undercutting. Or to put it differently, antidumping measures are aimed at ensuring equal prices for the European and the foreign products in the EU.[5] The Administration's power to pursue this objective has been strengthened substantially by an amendment to EU antidumping law in 1988 that included an 'anti-absorption clause'. This clause entails that in case exporters do not increase prices with the amount of the duty, the domestic industry can petition for a new investigation in which the duty will be treated as a cost for the exporter when calculating dumping margins. If the exporter is found to have 'absorbed' the duty, further (retroactive) duties can be levied.[6]

An antidumping measure can come in two forms; a duty or a price-undertaking. While a duty in the EU system functions as a tariff that increases the costs of the foreign firm to supply the EU market, a price-undertaking is a commitment by the foreign firm to set its price at an agreed level. The EU objective to force the foreign firm to 'meet the EU price' implies that the price undertaking obliges the foreign firm

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[5] Although EU antidumping law stipulates that measures imposed should offset the smaller of the dumping or injury margin (this is called the 'lesser duty rule'), case evidence has revealed that in the majority of cases, duty levels are set equal to the (smaller) injury margin (Vermulst and Waer (1991); Vandenbussche (1995)). This practice contrasts with US antidumping rules, which stipulate that duties have to be set equal to the dumping margin. US antidumping in this sense are not designed to offset injury but rather to eradicate dumping.

[6] The anti absorption clause has in practice been used effectively a number of times. For instance, anti-absorption investigations launched against imports of electronics weighing scales from Singapore and television broadcasting cameras from Japan resulted in new antidumping duties at levels substantially above the original antidumping order. See Council Regulation (EC) No 1952/97 of 7 October 1997 amending Regulation (EC) No 1015/94 imposing a definitive anti-dumping duty on imports of television camera systems originating in Japan, Official journal NO. L 276, 09/10/1997 P. 20-28, and Council Regulation (EC) No 2937/95 of 20 December 1995 amending Regulation (EEC) No 2887/93 by imposing an additional anti-dumping duty on imports of certain electronic weighing scales originating in Singapore, Official journal NO. L 274, 17/11/1995.

to equate its price to the price set by domestic producers.[7] The EU Commission has considerable discretion in choosing between undertakings and duties, while the rules governing this choice are not defined in antidumping law and remain non-transparent.

A last feature of EU antidumping practice relevant for our analysis concerns the the 'Public Interest' clause included in EU antidumping law.[8] Article 21 of the EU antidumping law states that: "measures... may not be applied where the authorities.... can clearly conclude that it is not in the Community interest to apply such measures".[9] In other words, the administration is held to verify that adopting measures, while favouring the petitioning industry, does not have disproportional adverse affects on other affected parties, such as consumers and user industries. Until the late 1980s, this verification was not very elaborate and observers of antidumping practice have concluded that the administration equated the 'Community interest' with the interests of EU producers.[10] In recent years, the public interest clause has been further defined and its role has been strengthened with the granting of the right of legal representation in antidumping procedures to consumer groups and user industries [Tharakan (1999)]. However, the administration maintains an important level of discretion in the implementation of the clause and it remains unclear to what extent the objective of antidumping actions has evolved from protecting EU producers to protecting the interests of all affected parties in the EU. In the model below, we will therefore analyse the interactions between antidumping measures and FDI under two alternative objective functions. A 'limited' objective function consisting of EU producer profits only, and an 'inclusive' objective functions including profits, consumer surplus, and tariff revenue. [11]

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[7] Given the observed EU practice in duty setting, this conclusion is evident. It should however be noted that this cannot be verified empirically since the content of price undertakings is never disclosed.

[8] Such a clause is also included in Canadian antidumping law, but is absent in US antidumping law.

[9] See Council Regulation No 384/96 of 22 December 1995.

[10] See Bellis (1990), where it is noted that until 1988 the European Commission had only once formally invoked the Community interest clause.

[11] Not included in the objective functions are the profits in vertically related industries. See Sleuwaegen, Belderbos and Jie-A-Joen (1999) for a model on trade policy effects with vertical relations.

2.2 Model and Assumptions

The analysis will concentrate on the EU market and abstract from modeling the foreign market. The focus of the analysis is on the injury margin induced by cost asymmetries between local and foreign producers. Without modelling explicitly the prices in the foreign market, the dumping condition is exogeneously imposed on the model.[12] For simplicity we develop the model using linear demand functions. Demand functions for the European (q) and the foreign firm (q*) in the EU market are given by

$$q = a - p + k.p^* \qquad (1)$$

$$q^* = a - p^* + k.p \qquad (2)$$

where p refers to the price of the European product and p^* refers to the price of the foreign product in the EU market. The parameter a represents the size of the EU market for the products. The parameter k is a measure of the degree of product differentiation between the domestic and the foreign product and determines the intensity of price competition. For $k = 0$ products are completely independent and competition is absent. With k close to 1 products are only marginally differentiated and price competition is intense. Since antidumping actions involve 'similar' products, k will typically be closer to 1. In the model we let k vary but we assume cross-price effects to be smaller than own price effects ($0 \le k < 1$).

Let c denote the (constant) marginal cost of production for the EU firm and c* the marginal cost of production for the foreign firm in its home market. The marginal cost of serving the EU market through export for the foreign firm is $c^* + s$, with s denoting unit transport costs. We assume that the foreign firm has a cost advantage in the Free Trade case such that $c^* + s < c$. This assumption ensures that the Free Trade equilibrium is characterized by price-undercutting by the foreign firm (p* < p). Foreign price-undercutting in our model thus reflects a cost advantage rather than an unfair trade practice by the foreign importer. The extent of price undercutting determines the

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[12] The reciprocal Haaland & Wooton (1998) model explicitly analyses both domestic and foreign markets. Dumping arises in their model, even with symmetric costs, because of price discrimination motives.

degree of injury found in the antidumping investigation and may eventually lead to the imposition of antidumping measures.

The cost advantage of the foreign firm may stem from a comparative advantage of the foreign location (e.g. low wage costs in case of labor intensive industries, or low input costs of raw materials in case of process industries) or a competitive advantage of the foreign firm (e.g. a technological advantage leading to greater efficiency or product quality). In order to bring out clearly the consequences of these different types of costs, we analyse the two polar cases of 1) full location specific costs, in which case cost advantages are not transferable, and 2) full firm-specific costs, in which case cost advantages are completely transferable. In case of location specific costs, FDI implies a production cost for the foreign firm in the EU market equal to c, the production cost that applies to the EU firm. In case of firm specific costs, FDI allows the foreign firm to produce in the EU at marginal cost c* and hence allows the firm to reduce marginal costs by transport cost s, as compared to the Free Trade case. FDI is of course much more likely to occur in case of transferable firm-specific cost advantages[13]. In paragraphs 3.1 and 3.2 we focus on the two polar cases, while in paragraph 3.3 the results in case of intermediate levels of transferability are discussed.

We first illustrate the effects of duties and undertakings on equilibrium prices in the absence of FDI responses. The profit functions of the domestic and foreign firm[14] under *Free Trade* are:

$$\pi_{FT} = (p_{FT} - c).q_{FT} \tag{3a}$$

$$\pi^*_{FT} = (p^*_{FT} - c^* - s).q^*_{FT} \tag{3a}$$

In case the foreign firm is exporting while a *duty*, or a *price undertaking (und)* prevails, its profits are:

$$\pi^*_{duty} = (p^*_{duty} - c^* - s - t).q^*_{duty} \tag{4b}$$

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[13] The theory of the multinational firm suggests that an important element in firms' decisions to move abroad is the extent to which firms possess intangible, firm-specific assets that are transferable abroad (e.g. Dunning, 1988; Caves, 1995). The transferability of cost advantages also depends on external factors such as whether the foreign firm faces local content rules for its manufacturing operations. In the latter case 'location specific' costs are more important.

[14] Since the number of firms is given in the model, the entry-deterring motive for FDI (e.g. Smith (1987)) is not considered.

$$\pi^*_{und} = (p^*_{und} - c^* - s).q^*_{und} \tag{4c}$$

In accordance with the 'stylized facts' of EU antidumping practice we assume that both price undertakings and duties force the foreign firm to 'meet' the price set by the European producer of the 'like product' in the European market, eliminating the 'injury'. Hence, we assume that the duty level is set such that equal prices result ex-post. Although the foreign firm could (partly) absorb the tariff, duty levels can be adjusted as long as there is no price equalization, as the anti-absorption legislation of 1988 stipulates. With duties and price-undertakings leading to identical prices, foreign firms will typically prefer price-undertakings. While foreign profits are reduced by the duty payments, the foreign firm fully retains the benefits from higher prices in case of price-undertakings. In the case of a duty, part of the foreign profits are shifted to the EU in terms of duty revenue. Domestic firms will be ambivalent towards the choice of measures: with the foreign price equal under undertakings and duties, domestic profits are also equal.

Figure 1 shows the best response functions of the two firms and the shift in equilibrium prices as a result of the imposition of duties or undertakings. Given the cost advantage of the foreign firm in case of Free Trade, the Free Trade equilibrium is characterized by price undercutting ($p^*_{FT} < p_{FT}$). Hence, the intersection of the home and foreign firm's best response functions is situated below the 45°-degree line. If the EU imposes a duty t, this results in an upward shift of the foreign firm's best response function $R^*(p)$. The duty is set to offset the injury to the domestic firm which implies that prices should be equal, with the new equilibrium on the 45°-degree line. The duty which accomplishes this is equal to the cost difference between the two firms ($t = c - c^* - s$) as shown in Vandenbussche et al. (1997).

Insert FIGURE 1 here

In case of a price undertaking, the foreign firm is committed to 'meet the price' set by the local firm such that $p^* = p$. The home firm's best response function is left unchanged, while the foreign firms' best response function becomes the 45°-degree

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(p=p*) line.[15] The intersection of the domestic firm's best response and the 45°-degree line gives the equilibrium with a price-undertaking, which is equal to the equilibrium attained under a duty of the size t= c-c*-s.

In summary, the imposition of antidumping measures (a duty or a price-undertaking) raises the foreign firm's price, and must also lead to an equivalence in home and foreign prices: $p^*_{duty} = p^*_{UND} = p_{duty} = p_{UND}$. The ranking of prices for the domestic firm thus becomes: ($p_{FT} < p_{duty} = p^*_{UND}$) and similarly for the foreign firm.

III. EU Antidumping and FDI Reponses

In this section, EU antidumping policy is analyzed taking into account the possibility of FDI choice by the foreign firm. We will present the model results separately for two polar cost cases: location specific costs (paragraph 3.1) vs. firm-specific costs (paragraph 3.2). In the final paragraph we discuss extensions of the model including the case of intermediate levels of cost advantage transferability.

3.1. Location Specific Costs

We solve the model backwards, starting with the price game under different trade policy measures, moving to the FDI versus export choice of the foreign firm and ending with the decision problem for the EU administration.

The foreign firm

In the last stage of the model, several outcomes can arise. In case the foreign firm engages in FDI, its profit function is

$$\pi^*_{FDI} = (p^*_{FDI} - c).q^*_{FDI} - F \qquad (5)$$

where F represents the fixed cost of setting up a plant in the EU and subscript *FDI* denotes FDI equilibrium. Given that costs are location specific, marginal costs of production are equal for the two firms in the FDI equilibrium, and prices are also equal

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[15] It is assumed that both firms continue to move simultaneously after a price undertaking. See Vandenbussche et al. (1997) for an analysis of price-undertakings assuming that these bestow the local firm with a first mover advantages, turning it into a Stackelberg leader.

($p^*_{FDI} = p_{FDI}$). In case the foreign firm exports, the foreign firm's profits function under Free Trade (*FT*), a duty, or a price undertaking (*und*) are as described in (4). Recall that $p^*_{duty} = p^*_{UND} = p_{duty} = p_{UND}$. Because the duty is set to equalize marginal costs, price equilibrium under antidumping measures is the same as under FDI. The ranking of prices for the foreign firm thus becomes: ($p^*_{FT} < p^*_{duty} = p^*_{UND} = p^*_{FDI}$).

The foreign firm's profit ranking given equilibrium prices determines the choice between exporting and FDI. Under Free Trade, the foreign firm prefers export to FDI since it faces higher marginal cost of production abroad and at the same time has to incur the fixed FDI cost F. In the case of a duty of the size t=c*-c-s the foreign firm prefers to export as long as the fixed cost F is positive. This is because FDI in case of location specific costs, while allowing the firm to avoid duty payments, also forces it to relinquish its cost advantage. Hence, with the duty level set equal to the level of cost asymmetry, variable profits under FDI are equal to profits under export with duties, but under FDI the foreign firm has to incur F. In case of a price-undertaking the foreign firm is even more inclined to choose for export. Under export the foreign firm can produce at a lower marginal cost(c+s) than when it engages in FDI (c).

To conclude, with location specific costs the foreign firm always prefers export to FDI whatever antidumping measure is imposed. No 'antidumping jumping' FDI occurs because antidumping duties and price undertakings, being restricted to eliminate price undercutting, cannot compensate the cost increase resulting from switching production to the EU.

The EU Administration

Taking into account the foreign firm's FDI versus export choice and consequent price competition, the EU antidumping administration decides whether to take antidumping measures and if so, whether these take the form of a duty or a price undertaking. The administration can take decisions either on the basis of a 'limited' objective function that only includes domestic profits, or an 'inclusive' objective function corresponding more closely with the 'Community interest'. The latter can be represented by the EU

welfare function W, consisting of the sum of EU consumer surplus (CS), European firm's profits and possibly duty revenue:[16]

$$W = CS + \pi + t.q^* \tag{6}\backslash$$

In case the EU administration employs a 'limited' objective function, it will always reach an affirmative decision, as antidumping measures increase the EU firm's profts. Given that equilibrium prices are the same under undertakings and duties, the domestic firm and the EU administration are ambivalent towards the choice of measure. In case the EU administration employs the 'inclusive' welfare function in (6) to determine antidumping policy, it will always prefer to levy a duty. This can be shown as follows. For the duty to be preferred two conditions should hold. A positive duty should yield higher welfare, and a duty should provide greater welfare benefits than an undertaking. It can be shown that a duty will indeed always increase EU welfare as $\left.\dfrac{\partial W}{\partial t}\right|_{t=0} > 0$ (the derivation is relegated to the appendix).[17] It is also easily verified that duties lead to higher welfare than undertakings. Since a duty and a price-undertaking lead to the same equilibrium prices and quantities, consumer surplus and the EU firm's profits are equal, but a duty generates duty revenues that accrue to the EU. The outcome in case of location specific production costs can be summarized as follows:

> *With location specific production costs, no 'antidumping jumping' FDI occurs. The EU administration using an 'inclusive' welfare function corresponding with the 'Community interest' will levy duties. In case the EU administration uses a 'limited' objective function focused on EU firm profits, both undertakings and duties are equally preferred. In any case, the foreign firm will continue to export to the EU.*

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[16] Ignored in this welfare function is any advantage to the local economy from FDI, such as improved domestic employment (Brander and Spencer, 1987) or positive spillovers leading to improvements in local firms' productivity (Blomström & Kokko, 1992).

[17] It should be noted that this result no longer strictly holds if duty revenue is omitted from the EU welfare function.

3.2 Firm Specific Costs

In this paragraph we assume that the foreign firm when engaging in FDI can continue to produce at its lower marginal cost c*, while avoiding transport costs s. This situation occurs if firm specific cost advantages are perfectly transferable abroad. To study FDI reponses to EU antidumping policy, we start again by describing the foreign firm's payoff structure.

The foreign firm

When the foreign firm engages in FDI its profits are:

$$\pi^{*}{}_{FDI} = (p^{*}{}_{FDI} - c^{*}).q^{*}{}_{FDI} - F \tag{7a}$$

Because the foreign firm can produce at its lower firm-specific cost in the EU and avoid paying transport costs s, the price for the foreign product is now lower than the price set by the EU firm: $p^{*}{}_{FDI} < p_{FDI}$, and prices for both firms are lower with FDI than in case of Free Trade ($p^{*}{}_{FDI} < p^{*}{}_{FT}$ and $p_{FDI} < p_{FT}$).[18]

When the foreign firm exports, its profit functions under free trade, a duty, and a price-undertaking are:

$$\pi^{*}{}_{FT} = (p^{*}{}_{FT} - c^{*} - s).q^{*}{}_{FT} \tag{7b}$$

$$\pi^{*}{}_{duty} = (p^{*}{}_{duty} - c^{*} - s - t).q^{*}{}_{duty} \tag{7c}$$

$$\pi^{*}{}_{und} = (p^{*}{}_{und} - c^{*} - s).q^{*}{}_{und} \tag{7d}$$

It is worth recalling that prices in the EU market in case of effective antidumping duties or undertakings are higher than in the Free Trade case (as illustrated in figure 1), which results in the following ranking of foreign firm's prices:
$$p^{*}{}_{FDI} < p^{*}{}_{FT} < p^{*}{}_{duty} = p^{*}{}_{UND}$$

We can now analyze the foreign firm's choice between export and FDI. In the case of Free Trade, the foreign firm prefers to export if the fixed cost F is large relative to the transport cost s, as can be seen by comparing (7b) and (7a). We denote the critical level of fixed costs that induces a switch from export to FDI under Free Trade by $F^{*}{}_{FT}$. With $F < F^{*}{}_{FT}$ the Free Trade case will see the foreign firm engage in FDI.

Since in that case there would be no exports to the EU, no dumping or injury occurs and anti-dumping law is inconsequential.

In case of a price-undertaking, the foreign firm faces a similar trade off between transport costs s and fixed FDI costs F (compare (7d) en (7a)). Since exporting under a price-undertaking leads to higher prices and profits than under Free Trade (see figure 1), the critical fixed cost that will induce a switch from export to FDI has to be smaller than under Free Trade: $F^*_{Und} < F^*_{FT}$, with the difference between the two depending on the cost advantage of the foreign firm. This implies that there is a range of fixed cost levels under which the foreign firm would not engage in FDI in case of an undertaking, while it would invest under free trade, before antidumping can be taken.

In case of a duty, marginal costs under exports include the duty t in addition to transport costs s. Given the higher marginal costs, the foreign firm can only be discouraged from engaging in FDI by higher levels of fixed costs: $F^*_{Duty} > F^*_{FT}$. The difference between F^*_{Duty} and F^*_{FT} is a function of the duty level, and therefore again depends on the cost advantage of the foreign firm.

The above implies the following ranking of critical fixed costs: $F^*_{Duty} > F^*_{FT} > F^*_{Und} > 0$.[19] Table 1 summarizes the foreign firm's decisions depending on the level of fixed costs and the presence or absences of antidumping measures. In case of high fixed costs (column 4) export is a dominant strategy and FDI will never be chosen. For intermediate levels of fixed costs, as in column (3), 'antidumping jumping' FDI arises when duties are imposed. Undertakings would maintain the export outcome. For lower levels of fixed cost (2) the foreign firm prefers FDI except when an undertaking is imposed, in which case it would prefer to export. Note that since the foreign firm prefers exporting with an undertaking, if it could, it would want to invoke an undertaking decision by the EU government. Strategically committing not to engage in FDI could induce such an undertaking decision. In the absence of strategic foreign firm behavior, however, the firm's decision in free trade circumstances to incur fixed cost F and produce in the EU makes antidumping law inconsequential as exports are reduced

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[18] This can be seen from figure 1. In the case of firm specific costs, the reaction function of the foreign firm in case of FDI lies below its Free Trade one. Therefore, the intersection with the home firm's best response function will result in equilibrium prices that lie below Free Trade values for both firms.

[19] The full specification of the critical fixed cost functions is provided in appendix B.

to zero. In this case FDI occurs, but it is not of the 'antidumping jumping' kind. The same applies when fixed costs are even lower, leaving FDI to be the dominant choice, as in case (1). With anti-dumping policies inconsequential, columns (1) and (2) are not relevant for further analysis of government policy in this section, but they are nevertheless included for the sake of completeness.

Table 1: Exports versus FDI decision of the foreign firm depending on fixed costs

		F^{*}_{Und} <F< F^{*}_{FT}	F^{*}_{FT} <F< F^{*}_{Duty}	F> F^{*}_{Duty}
	(1)	**(2)**	**(3)**	**(4)**
Free Trade	FDI	FDI	Export	Export
Duty	(FDI)	(FDI)	FDI	Export
Undertaking	(FDI)	(Export)	Export	Export

Note: choices within brackets are hypothetical since antidumping actions cannot be taken in the absence of exports

The European Administration

The administration has to decide between imposing measures or not and if so, the type of measures, taking into account the export versus FDI choice of the foreign firm and subsequent price competition in the EU market. We again distinguish between the use of a 'limited' and 'inclusive' objective function. The possible equilibria as a function of critical fixed costs and the degree of production cost asymmetry between the foreign and EU producer are illustrated in figure 2.[20] As we move to the right on the horizontal axis, the production cost asymmetry (c*/c) between the EU and foreign firm becomes smaller.

We consider first the case of an inclusive objective function. The top area in the figure corresponds with column (4) in table 1 and indicates the area where levels of fixed costs are so high that the foreign firm will never engage in FDI. The EU administration anticipating the foreign firm's decision, will levy an antidumping duty. The duty revenue and increase in the EU firm's profits compensate for the loss in consumer surplus. Hence EU welfare is higher than under Free Trade. For a given level of FDI costs F, this outcome becomes less likely the larger is the cost advantage of the

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[20] The parameters values used to compute figure 2 are: a=12, c=2, s= 0.5, k=0.7, and 0 < c* < 1.5.

foreign firm, because cost asymmetry increases the duty level and hence increases the incentives for FDI.

In the intermediate area where the fixed cost of FDI lies in between the critical values that induces a switch from FDI to export under a duty and under Free Trade ($F^*_{FT} < F < F^*_{dut}$), we can observe duties imposed, followed by 'antidumping jumping' FDI. In this area, duty revenues are irrelevant since duties are always jumped. But EU consumer surplus increases as FDI reduces the marginal costs for the foreign firm, increases price competition, and reduces prices. While profits of the EU firm decrease, this effect is smaller in magnitude, bringing total EU welfare to a higher level. The EU Government foreseeing duty jumping FDI still prefers to levy duties, since in the absence of duties or with an undertaking, the consequent export equilibrium fails to generate duty revenues and lowers overall EU welfare. The range of fixed costs for which this duty jumping FDI occurs becomes markedly smaller as the cost differential between the foreign and the domestic firm narrows. A smaller cost differential leads to a smaller duty level and makes the FDI decision more similar to the decision under Free Trade.

In the bottom two areas of figure 2, FDI costs are as low as to induce FDI under Free Trade. Hence, no initial export takes place and antidumping law is inconsequential. The FDI that occurs is not of the jumping kind, since it prevails in the absence of duties. Although the imposition of a price-undertaking could have prevented the foreign firm from engaging in FDI, at least in the area where $F > F^*_{dut}$, antidumping actions cannot be initiated and this equilibrium is never reached.[21]

In case the EU administration adopts a limited objective function, some equilibrium outcomes are affected. The main difference between limited and inclusive objective functions occurs in the area of intermediate fixed FDI costs[22]. If only the benefits to EU producers count, the EU will impose price-undertakings instead of duties and the foreign firm will export. Antidumping jumping FDI will therefore not

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[21] The F^*_{und} is upward sloping because with smaller cost differentials, undertakings lead to smaller price increases and are less beneficial to the foreign firm. Although the FDI option also becomes less profitable as the associated decrease in marginal costs is reduced, the effect on undertakings is larger, such that a higher fixed cost is necessary to keep the firm from investing.

[22] In case of high fixed costs and moderate or low cost asymmetries in the top area of figure 2, the EU administration may still choose to impose duties. But since undertakings have the same effect on the EU firm's profits and are equally effective in case of a limited objective function, undertakings may equally be chosen. In any case, no FDI is observed.

occur as in the case of an inclusive welfare function.[23] The price-undertaking increases both the home and the foreign firm's profits above the free trade level and dissuades the foreign firm from engaging in FDI. But consumer surplus is strongly reduced compared with its free trade level.

In summary, 'antidumping jumping' FDI can only occur in case the EU administration adopts an inclusive objective function taking into account consumer interests. In addition, the fixed FDI costs should neither be too high, since this makes the FDI option too unattractive, nor too low, since then FDI would be occurring irrespective of antidumping actions. The larger is the cost advantage of the foreign firm, the more likely that antidumping jumping FDI occurs. In contrast, if the EU administration adopts a limited objective function, price-undertakings would be the preferred measure, leaving no incentives for jumping FDI.

> With intermediate levels of fixed FDI costs ($F^*_{FT} < F < F^*_{Duty}$), FDI as a response to EU antidumping duties is observed, but only if the EU administration adopts an 'inclusive' objective function taking into account consumer interests. In case of a 'limited' objective function that only takes into account EU industry profits, a price undertaking will result and 'antidumping jumping' FDI is not observed.

It is worth noting that in case of 'antidumping jumping' FDI, the domestic producer sees its profits decline compared with the free trade case. A forward looking EU producer that possesses perfect information and does not face uncertainty concerning the outcome of EU antidumping proceedings, would choose not to petition for antidumping actions. However, the uncertainty surrounding the objective function that the EU administration is using, may have EU firms petition for protection expecting the use of a limited objective function (resulting in undertakings) rather than a a more inclusive function. In practice, the EU administration has attempted to reduce the harmful effect of antidumping jumping FDI on EU firms' profits by legislating the 'screwdriver plant' amendment in 1987, which allowed the administration to impose

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[23] It could also be noted that in case the EU administration, acting in home producers' interest, did *not* have the option to impose undertakings, it would prefer not to take any antidumping measures in this

cost raising local content requirements on the foreign firms [see Belderbos (1997)]. Local content requirements makes costs more location specific and cost advantages less transferable. In case of partially transferable cost advantages of the foreign firm, FDI can be associated with a profit increase of the EU firm. This scenario is briefly discussed in the next section.

3.3 Extensions

In this paragraph we discuss some possible extensions to our model and the robustness of our results with respect to changes in the model.

Imperfectly Transferable Cost Advantages

In order to illustrate the importance of the type of cost advantages, we have analysed the interactions between antidumping decisions and FDI for the two polar cases of completely location-specific costs vs. prefectly transferable cost advantages. We can model intermediate cases of transferability or location specificity as follows. Let the marginal cost of the foreign firm in case of FDI be: $c^*_{FDI} = c^* + \gamma(c - c^*)$, where $0 \leq \gamma \leq 1$ measures the extent of location-specificity. A value of one implies full location specific costs, and a value of zero full transferability. If γ takes on higher positive values, both the F^*_{duty} line and the F^*_{FT} line shift downwards while the slopes of the lines decrease: with less transferable cost advantages, the critical fixed cost levels dissuading the foreign firm from FDI are smaller, while the sensitivity of fixed costs with respect to the marginal cost advantages becomes smaller. It can be shown that the larger effect is on the F^*_{duty} line, such that the area in which antidumping jumping FDI occurs decreases in size with larger values of γ. Hence the less transferable is the cost advantage of the foreign firm, the less likely it is that the foreign firm would engage in anti-dumping jumping FDI, c.p.

While the foreign firm is less likely to prefer FDI when cost advantages are less transferable, the welfare implications in the cases in which it does choose for FDI have also altered. With the cost advantages less transferable through FDI, the pro-

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case. As such, the provision for undertakings embedded in EU antidumping law can be seen as increasing the incidence of affirmative antidumping cases.

competitive effect of FDI with its associated increase in consumer surplus is also smaller. At the same time, the EU firm may benefit from a FDI response, at least within a certain range of cost parameters. This in case FDI leads to an increase in the marginal cost of the foreign firm, allowing the domestic firm to increase its price. The foreign firm's marginal costs increase compared with the Free Trade equilbrium if $c_{FDI}^* > c^* + s$, which implies $\gamma(c - c^*) > s$: cost increasing FDI is more likely to occur if the location specificity parameter γ takes higher values, the cost advantage of the foreign firm is greater, and the transport cost s is relatively low.

Whether the EU administration will impose anti-dumping duties of the jumping kind in case of cost increasing FDI depends on the the objective function of the EU administration. In case of a limited objective function, the administration still prefers undertakings over duties, since the former always has the most substantial effect on the EU firm's profits. In case of an inclusive objective function, the decision to levy duties depends on the trade-off between changes in consumer surplus and EU profits. The main variable affecting this trade off is the extent of the cost disadvantage of the domestic firm. The larger this cost disadvantage, the lower the profitability of the EU firm, and the less likely that any profit increase can compensate for reductions in consumer surplus.

The Foreign Firm as First Mover

A second extension of the model concerns the order of moves. In the basic model, we have assumed that the foreign firm decides on export vs. FDI after the EU administration has decided on its antidumping policy. What happens if we allow the foreign firm to decide first whether to invest or not, taking into account the behaviour of the EU administration? With high fixed costs (F> F^*_{Duty}), export is a dominant choice and will be the outcome irrespective of the order of moves.[24] With intermediate fixed FDI costs, we can observe FDI in *anticipation* of the imposition of antidumping duties. In the area where ($F^*_{FT} < F < F^*_{Duty}$), the foreign firm will prefer FDI since it foresees that an export choice will result in the imposition of duties by the EU administration, at least if the latter adopts an inclusive objective function. With duties

and undertakings giving equal prices and quantities, the former yield duty revenues to the EU. Hence 'antidumping jumping' FDI can occur in the absence of any actual duties being imposed.[25] However, if the foreign firm is uncertain whether the EU administration will adopt a limited or inclusive objective function, it will pay to wait until the outcome of the antidumping procedures is certain. If an undertaking decision could be expected, the foreign firm prefers to export.

When fixed costs are within the limits F^*_{FT} and F^*_{und}, a similar outcome will prevail, if a duty is the anticipated outcome of an anti-dumping procedure. But if a limited objective function is expected to result in an undertaking decision, the foreign firm will refrain from FDI and continue exporting. Recall that if the foreign firm would not be a first mover, it would invest in the EU, leaving anti-dumping actions inconsequential. But if the foreign firm decides first on its strategy for serving the EU market through export, taking into account potential EU antidumping measures, it will refrain from FDI knowing that the ensuing antidumping actions will lead to undertakings that increase profits more than FDI. Hence, strategic behaviour by the foreign firm can alter antidumping policy by the EU administration. The implication of this is that in case the foreign firm moves first and behaves strategically, there is a distinct possibility that the presence of antidumping law *discourages* FDI. This result is akin to the results of Motta (1992) and Smith (1987) that there need not be an unequivocal positive relationship between trade restraints and FDI once the possibility of strategic investments by foreign firms is taken into account.

If the foreign firm moves first taking into account antidumping rules followed by the EU administration, 'antidumping jumping' FDI can arise in the absence of observable anti-dumping measures. On the other hand, with not too high levels of fixed FDI costs ($F^*_{und} < F < F^*_{Duty}$), the antidumping rules followed by the EU administration adopting a limited objective function, can discourage FDI with otherwise would have taken place, as the foreign firm prefers price increasing undertakings to FDI.

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[24] Similarly, with very low fixed costs ($F < F^*_{Und}$), FDI is a dominant choice whatever the administration's decision.

[25] FDI in anticipation of antidumping actions avoids the costs of legal representation in antidumping cases and any possible negative reputation effect in the EU market stemming from 'dumping' charges. Obviously, antidumping anticipating FDI makes the precise quantitative effect of antidumping law on FDI much more difficult to establish empirically.

IV. Conclusion

In this paper we have analyzed the incentives for foreign firms to engage in FDI under European antidumping policy. For this purpose we used a three stage model. In the first stage, the EU administration decides whether to take antidumping measures, and if so, whether to levy a duty or allow a price undertaking. In the second stage the foreign firm decides whether to serve the EU market through export or FDI. In the third stage, the foreign firm is engaged in price competition with a local firm on the EU market. Injury arises from a production cost advantage of the foreign firm, which may either be location specific or firm-specific. In the latter case, the foreign firm maintains its production cost advantage in case of overseas production. We examined the effect of antidumping when the EU administration adopts a 'limited' objective function consisting of EU industry profits only, and when it adopts an 'inclusive' objective function consisting of total EU welfare (including consumer surplus). Our findings suggest that in case costs are location specific and cost advanages not transferable, duty levels set on the basis of injury margins (the rule followed in the majority of EU antidumping cases) are not high enough to create incentives for FDI. Only if the foreign firm is able to internalize and transfer abroad (part of its) intrinsic cost advantages, 'antidumping jumping' FDI can be observed. This provided that the EU adopts an 'inclusive' objective function and that fixed setup cost for FDI are not too high.

In case the EU administration uses a 'limited' objective function, it is more likely to negotiate price-undertakings with the foreign firm instead of imposing duties. FDI triggered by a duty toughens the price competition for the home firm whenever the foreign firm can operate in the EU market at a lower marginal cost due to the transferability of firm specific assets. In order to avoid the increased competition the EU can opt for a price-undertaking that dissuades the foreign firm from engaging in FDI. Since a price-undertaking is a price fixing agreement with effects similar to a VER it makes exporting more attractive for the foreign firm.

If the setup of the model is altered to allow the foreign firm to move before the EU administration decides on antidumping policy, two additional outcomes can arise. First, 'antidumping jumping' FDI can occur in *anticipation* of antidumping measures,

while actual antidumping measures are never imposed because of the reduction in exports associated with FDI. Second, if levels of fixed costs are such that the foreign firm would prefer to export with an undertaking, but would choose FDI in case of duties, it would refrain from FDI if an EU decision to settle antidumping actions through price-undertakings can be anticipated. The export choice allows antidumping actions to take place, and provides the local industry with the benefits of the price fixing arrangement. Hence, the presence of antidumping law can also *discourage* FDI.

Our findings allow to shed a different light on the empirical evidence with respect to 'antidumping-jumping' FDI. Empirical work has either focused on cases involving antidumping duties (Belderbos, 1997) or has not made a distinction between the type of measured used (Pain ,1999; Girma et al., 1999). Moreover, all studies to date have focused on Japanese firms, which in most cases possessed transferable competitive advantages and at the same time have been unsuccessfull in negotiating undertakings with the EU administration (Tharakan, 1991). These are all circumstances pointed out by our analysis to favour duty-jumping FDI. Our findings suggest that extending the empirical analysis to exports from non-market economies and low-wage countries (where cost advantages are more location specific) is likely to show a much smaller FDI response to antidumping actions. Likewise FDI responses are predicted to be much more muted in case antidumping actions lead to undertakings.

Our results concerning the difference between undertakings and duties also connect to the observed smaller incidence of FDI in US antidumping cases. The administrative review system (the 'duty avoidance' system) adopted by the US can in fact be characterized as a system in which voluntary price undertakings by foreign firms allow them to avoid duty payments. The major difference with EU law and practice is that such 'undertakings' are automatic, while the EU administration has a high degree of discretion whether to grant undertakings or not.

Since in the US case foreign firms can choose freely whether to raise prices, the initiative lies with the foreign firms, and US antidumping is more akin to a situation in which the foreign firm 'moves first'. This implies that in US antidumping practice the 'strategic export' scenario in which the foreign firm induces antidumping actions in order to benefit from price undertakings, is a conceivable course of events. This kind of 'protection building' trade is rather different from the case described in Blonigen and Ohno (1999). In the latter analysis, foreign firms planning to invest in the US increase their export in order to induce imposition of antidumping duties that hurt

competing exporters. Our results suggest that it is also conceivable that foreign firms maintain high export levels and do not implement profitable FDI plans in order to 'build protection' in the form of profit increasing price fixing arrangements. The antidumping order allows the firms to increase prices without the threat of legal actions under competition law, as shown by Prusa (1992). This strategic interaction between US antidumping law and FDI decisions could be an additional explanatory factor for the observed limited investment response in case of US antidumping actions.

A last remark concerns the empirical and theoretical analysis of EU antidumping decisions and the objective of EU antidumping policy. The frequent occurrence of FDI in EU antidumping cases targeting Japanese firms appears to indicate that the EU administration in a number of cases had broader objectives then simply protecting profits of EU firms. This may involve consumer interests as in our analysis, but political imperatives may also imply explicit consideration of positive effects of FDI on employment generation and the wage bill. Future empirical and theoretical work could extend the analysis to examine antidumping decisions under objective functions in which FDI makes a more direct contribution to EU welfare. Another avenue for research could be the use of a common agency approach whereby the parties affected by the antidumping policy are allowed to pay lobby contributions to the EU administration which are related to their relative gains and losses from antidumping protection. The EU's decision would then endogenously depend on these opposing forces.

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Appendix A: Effect of a duty on EU welfare

The EU welfare function in case of the imposition of a duty is:

$$W = CS + \pi + t.q^*$$

The derivative of the welfare function with respect to the duty is calculated as:

$$\left.\frac{\partial W}{\partial t}\right|_{t=0} = \frac{1}{\Delta}.(\Psi.c + \Phi.a - \Omega.c^*)$$

where
$$\Delta = (-4 + k^2)^2$$
$$\Psi = k^5$$
$$\Phi = (4 + 4.k + 3.k^2 + 3.k^3 + k^4)$$
$$\Omega = (4 - k^2 - 2.k^4)$$

It is derived that:

for k=0
$$\left.\frac{\partial W}{\partial t}\right|_{t=0} = \frac{a - c^*}{4} > 0$$

for k=1
$$\left.\frac{\partial W}{\partial t}\right|_{t=0} = \frac{15.a + c - c^*}{9} > 0$$

Appendix B: Critical fixed costs

The critical fixed costs that induce a switch from FDI to export can be derived as follows:

$$F^*{}_{Duty} = (7a) + F - (7c) = \frac{\delta.^2}{(4 - k^2)^2} - \frac{\xi^2}{(2 - k)^2}$$

$$F^*{}_{FT} = (7a) + F - (7b) = \frac{(\delta - 2.s + k^2.s).s}{4 - k^2}$$

$$F^*{}_{Und} = (7a) + F - (7d) = \frac{\delta.^2}{(4 - k^2)^2} - \frac{\xi.\left[a + c - (c^* + s)(2 - k)\right]}{(2 - k^2)^2}$$

where $\delta = c.k + a.(2 + k) - c^*.(2 - k^2)$ and $\xi = a - c.(1 - k)$.
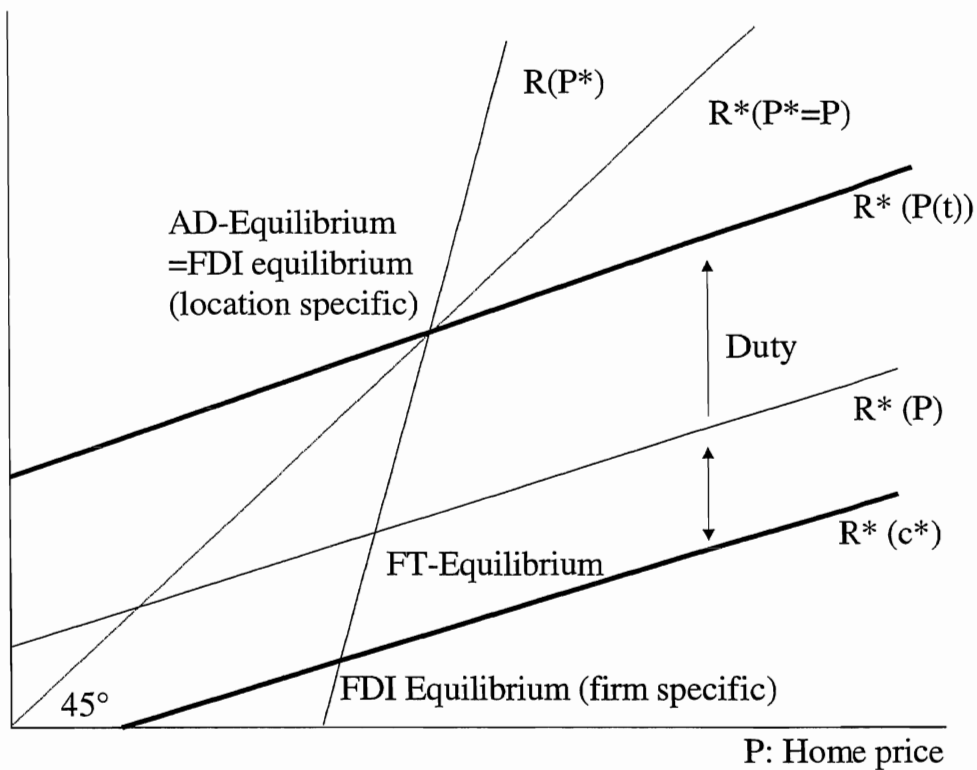
27

P*: Foreign price

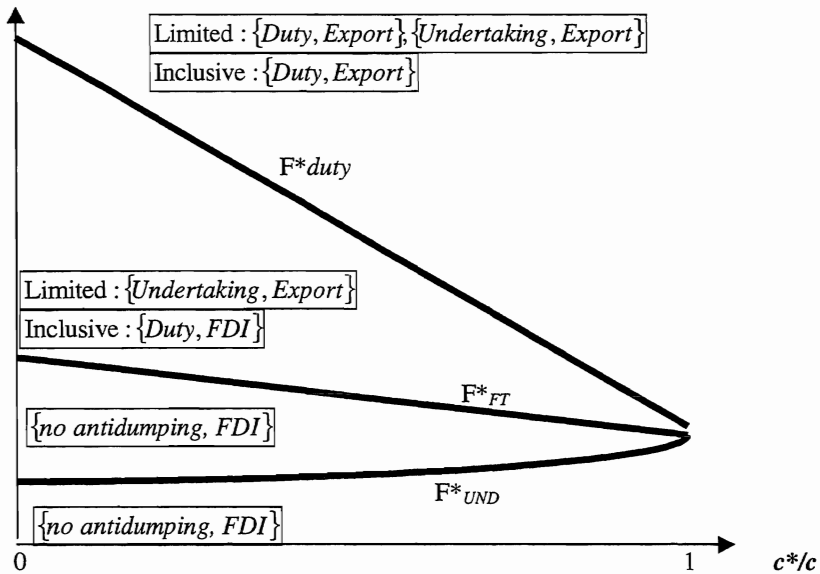R(P*)

R*(P*=P)

R* (P(t))

AD-Equilibrium
=FDI equilibrium
(location specific)

Duty

R* (P)

R* (c*)

FT-Equilibrium

45°

FDI Equilibrium (firm specific)

P: Home price

Figure 1:   EU Antidumping Measures under Bertrand
Competition

Fixed costs

Limited : $\{Duty, Export\}, \{Undertaking, Export\}$
Inclusive : $\{Duty, Export\}$

F*$duty$

Limited : $\{Undertaking, Export\}$
Inclusive : $\{Duty, FDI\}$

F*$_{FT}$

$\{no\ antidumping,\ FDI\}$

F*$_{UND}$

$\{no\ antidumping,\ FDI\}$

0   1 $c*/c$

Note: limited refers to a limited (EU industry profits) objective function of the EU administration while inclusive refers to an inclusive (EU welfare) function

Figure 2: Equilibria as a function of fixed FDI costs and cost asymmetry

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