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## Tariff-jumping antidumping duties

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### Abstract

This paper examines the tariff-jumping response of all firm and product combinations subject to US antidumping investigations from 1980 to 1990 using a newly constructed database. Previous studies have focused only on Japanese FDI responses to antidumping protection and found large tariff-jumping responses. In contrast, this paper finds quite modest tariff-jumping responses and the evidence suggests that tariff-jumping is only a realistic option for multinational firms from industrialized countries. This may partially explain developing countries' concerns about addressing AD protection in the WTO. Despite high tariff-jumping responses, there is no evidence of a Japanese-specific propensity to tariff-jump, holding other economic factors constant. © 2002 Elsevier Science B.V. All rights reserved.

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### 1. Introduction

In August 1993, Eastman Kodak Company filed a US antidumping (AD) petition against US imports of photographic paper originating from plants owned by Fuji Photo Film in Japan and the Netherlands. By October of 1993, preliminary decisions in the case had found dumping margins of over 300% against the Fuji

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plants and ruled that the imports were injuring the domestic industry. While this led to an ensuing suspension agreement that led to substantially lower imports for a brief period, Fuji soon located a photographic paper manufacturing plant to the United States that was operational by March 1996. As reported by Komuro (1998), less than a year after its US plant opening, Fuji's share of the US photographic paper market had surpassed the market share Fuji had enjoyed before the US AD petition was filed by Kodak.

The above is an example of foreign direct investment (FDI) motivated by avoiding a trade protection barrier, or more commonly, tariff-jumping FDI. The phenomenon is important because it likely increases the competition between the foreign and domestic firms, thereby reducing, eliminating, or (in the case above) reversing the positive impact of the initial trade policy on the protected domestic firms. In turn, domestic consumers gain from increased competition, while the government loses direct revenue in the case of a tariff. Recent theoretical papers have broadened the issues connected with tariff-jumping FDI by considering models where the government and/or firms act strategically in the determination of trade policy when tariff-jumping FDI is possible.<sup>1</sup>

Tariff-jumping FDI connected with AD protection presents a number of interesting issues that are not present with other standard forms of trade protection because of how AD duties are determined and potentially changed over time. As in the Kodak–Fuji case above, AD duties are often quite high, averaging almost 34% (median of 20%) for all firms receiving US AD duties from 1980 through 1990. Unlike many other forms of trade protection, these duties are not determined by government and industry negotiations, but by technical calculations of the difference between the US price of the imports and a definition of 'fair' or 'normal' value. Thus, there is no indication that the government is acting strategically in the sense of setting a tariff that affords maximum protection to the domestic industry without inducing tariff-jumping, as in the theoretical model presented by Ellingsen and Warneryd (1999). Finally, AD duties are not fixed, but are recalculated by the US Department of Commerce (USDOC) over time as dumping behavior changes in what are called administrative reviews. These reviews allow firms to stop dumping and obtain refunds of AD duties subsequent to the case, which could provide a much lower incentive to tariff-jump. However, the USDOC often employs certain methods that lead to much higher AD duty calculations in reviews when the USDOC rules the foreign firm is not fully

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<sup>1</sup>A number of papers, including Brander and Spencer (1987), Levinsohn (1989), Haaland and Wooton (1998) and Ellingsen and Warneryd (1999) focus on a government's optimal trade protection policy when tariff-jumping FDI is possible. In contrast, Smith (1987), Motta (1992) and Flam (1994) highlight various equilibria that may arise in a game where both the trade-policy-setting government and foreign firm are acting strategically. Finally, Blonigen and Ohno (1998) examine a setting where two exporting firms with different costs of tariff-jumping FDI act strategically when facing possible protection in their common export market.

participating in the investigation or providing unusable data. This would increase incentives for firms to tariff-jump. In the end, the net effect of this process and USDOC methods on tariff-jumping FDI is not clear.

Despite the theoretical interest and importance of tariff-jumping FDI, few studies have focused on the issue empirically,<sup>2</sup> and even fewer papers have examined tariff-jumping FDI with respect to AD protection. One exception is Barrell and Pain (1999) that examines aggregate Japanese FDI flows into the United States and the European Union and finds that measures of country-level AD activity are positively correlated with country-level inward FDI from Japan. Blonigen and Feenstra (1997) examine the interaction between trade policy measures and Japanese FDI for the United States from 1980 to 1988 using 4-digit SIC industry-level data. The study finds that both actual and threat measures of AD activity are correlated with increases in industry counts of FDI.

Belderbos (1997) is the first study to match data on AD investigations and tariff-jumping FDI at the firm and product level. This is important since each AD case often involves just a handful of firms and very particular products. Disaggregated data is an appropriate way to examine firm-level incentives for tariff-jumping and, additionally, may reduce the likelihood of spurious correlation or aggregation bias. Belderbos examines the effect of US and European Community AD investigations on firm-level Japanese FDI across 36 particular electronics products. The study finds dramatic tariff-jumping effects. For a representative firm and product in his sample, Belderbos finds that an affirmative AD decision raises the FDI probability from 19.6 to 71.8% in the EC and, likewise, raises it from 19.7 to 35.9% in the US. While noting that the results are for a select group of products and particular import source country, Belderbos concludes from the paper's evidence of tariff-jumping that 'antidumping is not effective in acting against international price discrimination or below cost pricing by foreign firms' (p. 451).

This paper uses a newly-collected database on the comprehensive set of firm and product combinations involved in US AD investigations from 1980 through 1990 to show that Belderbos' tariff-jumping results are not general to the typical firm and product involved in US AD cases. Firstly, a descriptive look at the raw numbers finds that relatively few of the tariff-jumping FDI occurrences (30 out of 80 instances) are by non-Japanese firms, even though 80% of US AD cases involved non-Japanese firms. In fact, the propensity of Japanese firms to locate production in the United States after an affirmative case is 51.5% which is substantially higher than the 9.0% response by firms from other countries. Secondly, a probit regression finds that the US AD duty effect on FDI probabilities

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<sup>2</sup>There are numerous empirical studies of the determinants of FDI that often include some measures of trade policies as explanatory variables. For many of these studies, these measures are not of primary interest and often must rely on trade policy measures that are relatively crude. This is particularly true when the frequency of the data are at an aggregate industry level or higher, because of issues connected with aggregating often product-specific trade protection.

is quite modest, all else equal: a 10 percentage point increase in the AD duty increases FDI probability by only 0.8 percentage points from a 12.2% average probability of FDI at the means of the regressors to a 13.0% probability. Additionally, there is no evidence that methods used by the USDOC to increase AD duties in administrative reviews has much impact on tariff-jumping behavior.

One possible conclusion from the difference in magnitude of tariff-jumping effects between this study and previous studies is that there is a large (unexplainable) Japanese-specific FDI response to AD protection. However, the evidence does not support this conclusion as there is no significant increased propensity of Japanese firms to tariff-jump US AD duties, after controlling for other economic factors.

Instead, the most important factors that affect tariff-jumping responses for firms subject to US AD duties are previous multinational experience and whether the firm is exporting from a less-developed country (LDC). These two characteristics explain a large portion of the firm's tariff-jumping response when facing an AD duty. This is important for two reasons. Firstly, it reveals that we see significant Japanese tariff-jumping because Japanese firms are from an industrialized country and have previous multinational experience, not because of some inherent Japanese response to the trade protection. Secondly, it highlights that the distributional consequences of AD actions are quite different depending on which import sources are investigated. For example, this may explain why less-developed WTO-member countries regard antidumping protection as a more important matter than industrialized WTO-member countries.

## **2. Salient features of US antidumping law and administration**

Before turning to the empirical analysis, this section provides a brief overview of the relevant details connected with US AD investigations and administrative reviews. The US AD laws are administered by the USDOC and US International Trade Commission (USITC), each with distinct roles in the process. When an AD petition is filed, the USDOC determines whether the subject product is being sold at 'less than fair value' in the United States. In contrast, the USITC determines whether the relevant US domestic industry has been materially injured, or is threatened with material injury, by reason of the imports subject to its investigation.

The calculation of the dumping margin by the USDOC is usually not straightforward and revolves around how the USDOC measures what should be the 'fair value' of the product sold in the United States. Selling a product in the United States at less than 'fair value' is the definition of dumping and the difference between the US price and 'fair value' is the dumping margin. In theory, the USDOC defines 'fair value' as the exporting firm's price for the same product

in its own home market. However, if the firm's home market sales are deemed inadequate, then the USDOC may base 'fair value' on the exporting firm's prices in third country markets or on a constructed value for the product using manufacturing costs, selling, general and administrative costs, profits and packaging costs. These calculations obviously involve highly detailed and confidential data on the transactions of the investigated firm, which are requested by USDOC from the investigated firm. If the investigated firm does not comply sufficiently, the USDOC will turn to using the 'best information available', which is often information supplied by the US firms that filed the petition.

If an affirmative preliminary determination is made by both the USDOC and the USITC, then the importer must post a cash deposit, a bond or other security for each entry equal to the preliminary margin determined by the USDOC. This requirement stays in effect until either the USDOC or the USITC makes a negative final determination. If an affirmative final determination is made by both the USITC and USDOC, then USDOC issues an AD order to levy a duty equal to the estimated dumping margin on the subject product.

When a subject foreign product enters the United States, the importer must pay US Customs a cash deposit equal to the AD duty times the value of the subject product. However, these cash deposits do not necessarily represent the final amount of duties to be assessed on the subject imports. Rather, the margin determined in USDOC's final investigation is only used as a basis for *estimating* the duty liability of the importer. The actual liability of the importer may be determined in subsequent years by the USDOC. Before 1984, this was accomplished by automatic yearly administrative reviews by the USDOC. However, since 1984, such reviews have become voluntary; that is, unless an interested party requests a review, the duties assessed are those found in USDOC's final determination (or most recent administrative review). The purpose of an administrative review is to adjust the margin on subject imports to reflect changes in the difference between the foreign firm's US price and the fair value. If a subsequent review determines that the margin during the review period is different from the previous margin used as a basis for the importer's cash deposit, a bill (or refund) in the amount of the difference plus interest is assessed (or rebated).

### 3. A first look at FDI patterns of investigated firms

The paper examines tariff-jumping FDI with respect to US AD cases from 1980 through 1990. A starting date of 1980 is typical for studies of US AD protection because it corresponds with significant changes in the law that led to correspondingly higher AD activity in the United States. The sample ends in 1990 to allow ample time to observe tariff-jumping FDI after the later AD cases in the sample. From 1980 to 1990 there were 485 AD cases filed against imported

goods.<sup>3</sup> Of these cases, 189 (39%) led to affirmative decisions and AD duties, 183 (38%) received negative determinations, 109 (22%) were terminated, and four (1%) were suspended in lieu of a negotiated agreement. The 189 affirmative cases led to firm-specific margins for 431 firms at the time of the case, while there were 376 firms investigated for firm-specific margins in cases that were eventually terminated, suspended, or ruled negative.<sup>4</sup>

Before examining the data on tariff-jumping FDI, it is informative to discuss the duties and trade volumes for these cases. The average duty received by a firm specifically named in an affirmative case is ~34%, with a standard deviation of 38% and a median of 20%. Thus, the vast majority of affirmative decisions led to high ad valorem duties, which would suggest strong incentives for tariff-jumping. Another obvious factor affecting tariff-jumping incentives is the magnitude of trade affected by the investigation and/or AD duties. Data on the value of subject imports is not reported in about 20% of the cases because the information is classified 'business confidential'. However, one can estimate these values using import data and the publicly-listed TSUSA or HTS product codes for each case.<sup>5</sup> Using this method, there is information on subject trade volume (in dollars) for 405 of the 431 firms. The average value of the subject imports for each firm receiving a firm-specific duty in these cases is ~\$14 million, but the standard deviation is \$36 million and the median value is only \$4.3 million. This distribution of trade volumes suggests that, except for a few large cases, the value of the trade subject to the duties was not particularly large.

Table 1 presents tariff-jumping FDI responses of firms involved in affirmative US AD cases filed from 1980 through 1990, by select countries or regions, while Table 2 indicates tariff-jumping for nonaffirmative cases. Before examining the general patterns in Tables 1 and 2, there are a number of things to note about the data on tariff-jumping FDI. The collection and identification of tariff-jumping FDI by investigated firms in the subject product is not a straightforward task. A wide variety of sources with information on foreign-owned affiliates in the United States were examined, each with varying detail in the information they report (see

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<sup>3</sup>There were a number of AD investigations that led to separate margins for firms across more than one product. The most important example is USITC case 731-394 (antifriction bearings), for which firms could receive separate margins for (1) antifriction bearings, (2) cylindrical ball bearings, (3) spherical ball bearings, (4) spherical plain ball bearings, and (5) needle ball bearings. For purposes of analysis I treat each of these product categories as separate AD cases.

<sup>4</sup>There were an additional 717 firms affected by these affirmative decisions that did not receive firm-specific margins at the time of the case, but were revealed subsequently in administrative reviews. These were primarily firms that exported small amounts of the subject product to the United States at the time of the case or subsequently began exporting the subject product. These firms do not have a firm-specific margin and face the trade-weighted average of the firm-specific margins unless they request a review.

<sup>5</sup>Prusa (1997) employs the same method to estimate trade volumes of subject imports. See Appendix A for more details on data construction. In the probit estimates below, the tariff-jumping effects are found to be insensitive to elimination of the more inaccurate observations for this variable.

Table 1  
 Tariff-jumping foreign direct investment (FDI) responses of firms involved in affirmative US AD cases filed from 1980 through 1990, by country or region

Country or region	Number of firms in cases	FDI during case or within 3 years of case	FDI more than 3 years after the case	Total tariff-jumping FDI cases
All countries	431	65 (15.1%)	15 (3.5%)	80 (18.6%)
Japan	97	41 (42.3%)	9 (9.3%)	50 (51.5%)
Europe <sup>a</sup>	85	19 (22.4%)	2 (2.4%)	21 (24.7%)
Canada	22	0 (0.0%)	2 (9.1%)	2 (9.1%)
Taiwan	53	1 (1.9%)	0 (0.0%)	1 (1.9%)
Korea	48	3 (6.3%)	1 (2.1%)	4 (8.3%)
Other Southeast Asia <sup>b</sup>	14	1 (7.1%)	1 (7.1%)	2 (14.3%)
Central and South America <sup>c</sup>	48	1 (2.1%)	0 (0.0%)	1 (2.1%)
All other	64	0 (0.0%)	0 (0.0%)	0 (0.0%)

All measures of FDI refer to FDI by firm in the product subject to the associated affirmative US AD investigation. Percentages in brackets are with respect to total 'number of firms in cases' for the associated country or region. The final column, 'total tariff-jumping FDI cases', is the total of the previous two columns for the associated country or region. See Appendix A for more details on tariff-jumping identification and data sources.

<sup>a</sup> Includes Belgium, Finland, France, Germany, Greece, Italy, the Netherlands, Norway, Spain, Sweden and the United Kingdom.

<sup>b</sup> Includes Hong Kong, India, New Zealand, Singapore, and Thailand.

<sup>c</sup> Includes Argentina, Brazil, Columbia, Costa Rica, Ecuador, Mexico, Trinidad & Tobago, and Venezuela.

Appendix A for data sources used). One concern is whether an instance of FDI after an AD case occurs because of factors connected with the case or simply because market conditions have changed enough to alter the firm's FDI decision regardless of the previous AD case. As a result, Tables 1 and 2 show three different measurements of tariff-jumping FDI: (1) tariff-jumping FDI during the case or within 3 years after the case, (2) tariff-jumping FDI more than 3 years after the case, and (3) a total of these two measurements of tariff-jumping FDI. While this is an important concern, Tables 1 and 2 show most FDI in the subject product occurs during the most recent 3-year period and, in the end, the distinction has no qualitative impact on the empirical analysis below and the paper's overall conclusions.

The first column of Table 1 breaks the sample into countries and regions with

Table 2  
 Tariff-jumping foreign direct investment (FDI) responses of firms involved in nonaffirmative US AD cases filed from 1980 through 1990

Type of case	Number of firms in cases	FDI during case or within 3 years of case	FDI more than 3 years after the case	Total tariff-jumping FDI cases
All nonaffirmative	376	16 (4.3%)	8 (2.1%)	24 (6.4%)
Negative	239	10 (4.2%)	5 (2.1%)	15 (6.3%)
Terminated	122	1 (0.8%)	1 (0.8%)	2 (1.6%)
Suspended	15	5 (33.3%)	2 (13.3%)	7 (46.7%)

All measures of FDI refer to FDI by firm in the product subject to the associated US AD investigation. Percentages in brackets are with respect to total 'number of firms in cases' for the associated type of case. The final column, 'total tariff-jumping FDI cases', is the total of the previous two columns for the associated investigation decision. See Appendix A for more details on tariff-jumping identification and data sources.

significant numbers of firms that received AD duties in the United States for cases filed between 1980 and 1990. The second column gives the total number of firms from the associated region that received AD duties and the subsequent three columns display the three measurements of tariff-jumping FDI discussed above. Japan had the highest number of firms receiving AD duties during the sample (97 firms) and also displayed by far the largest amount of tariff-jumping FDI. Within the first 3 years, 41 of the 97 Japanese firms (42.3%) tariff-jumped the AD duty by locating production in the United States, and there are a total of 50 (51.5%) eventual occurrences of FDI in products subject to AD duties.

The rest of the table shows that Japan is largely unique in these responses. While Japanese firms represent less than a quarter of the sample firms, they accounted for over half (50 out of 80) of the total possible tariff-jumping FDI responses in the sample. Firms from European countries accounted for many of the remaining tariff-jumping FDI occurrences, but the percentage of European firms tariff-jumping is significantly smaller than for the Japanese sample of firms (24.7% versus 51.5%). The rest of the regions and countries display very little FDI responses. In fact, the two instances of tariff-jumping FDI from 'other Southeast Asia' involve two Japanese-owned subsidiaries in Singapore, while one of the tariff-jumping FDI instances for Canada involved a Japanese-owned subsidiary. As mentioned earlier, previous empirical studies of tariff-jumping of AD duties have focused solely on Japanese firms. Table 1 highlights that the behavior of Japanese firms is likely not representative of other firms' tariff-jumping responses. Thus, one focus of the empirical work below will be to examine whether this apparently

unique behavior by Japanese firms can be explained by observable economic factors.

Table 2 examines the data for possible tariff-jumping responses by firms involved in US AD investigations that were terminated, suspended, or ruled negative. The term ‘tariff-jumping’ for these cases refers to FDI motivated by either a higher perceived threat of future AD duties because of the prior case, or to other forms of trade protection that arose from the AD termination or suspension. For example, with respect to the latter, cases are suspended when foreign firms agree to lower trade volumes and/or higher prices. AD case terminations can occur for a number of reasons, but numerous steel cases in the early 1980s were terminated because of a subsequent VER agreement. However, as Table 2 indicates, there is very little tariff-jumping FDI by firms involved in nonaffirmative decisions, with only 6.4% of the firm–product observations displaying subsequent FDI in the United States. An exception is the suspended cases where almost half of the 15 observations saw subsequent FDI. This is driven by the semiconductor cases involving Japanese firms in the mid-1980s that led a suspension in lieu of the 1986 US–Japan Semiconductor Agreement. In fact, as with the affirmative cases, Japanese firms accounted for most of the tariff-jumping FDI with respect to these nonaffirmative cases — 15 of the 24 possible tariff-jumping responses.

#### 4. How do AD duties affect the FDI decision?

This section tests more formally to what extent US AD duties on a particular firm and product increase the probability the firm will locate production in the United States for that particular product using firm–product observations across a comprehensive set of countries and products subject to US AD investigations from 1980 to 1990.

##### 4.1. Empirical model specification

The empirical model used for this analysis is the following binary choice model:

$$\begin{aligned} \text{FDI}_{ij} &= 1 && \text{if } \Pi_{ij}^* > 0 \text{ and} \\ \text{FDI}_{ij} &= 0 && \text{if } \Pi_{ij}^* \leq 0, \end{aligned}$$

where FDI represents the FDI decision, (*i*) indexes firms, (*j*) indexes products, and  $\Pi^*$  represents the unobserved profit difference for the firm between FDI and its next best alternative, which is presumably either exporting or no sales to the foreign market. By further assuming that

$$\Pi_{ij}^* = \beta' X_{ij} + \varepsilon_{ij}, \quad (2)$$

where  $X_{ij}$  is a vector of explanatory variables and  $\varepsilon \sim N[0, 1]$ , the model is a standard univariate probit framework.<sup>6</sup>

#### 4.2. Variables and data

The main focus of the analysis is the effect of an affirmative US AD decision on the probability that the firm will locate production in the United States in the particular product. The tariff jumping effect is tested using data on the initial AD duty.<sup>7</sup> While the firm- and product-specific duty may change over time through administrative reviews, presumably higher initial AD duties still imply a higher effective level of trade protection and hence a more costly barrier to the firm, even if it chooses to take actions to reduce the AD duty through reviews. Thus, the hypothesis is that higher initial AD duties make FDI for firm  $i$  in product  $j$  more likely.

A number of other explanatory variables, that should affect the firm's FDI decision for a particular product relative to other options, are used as controls. Because of the diverse sample of countries and products there are some limitations to the controls one can employ. Firm characteristics used as controls include whether the home country of the firm is less-developed and whether the firm has prior experience in multinational activities (in the sense of having prior FDI or not). The less-developed country (LDC) variable (an indicator variable — see Appendix A for classification of countries) is expected to have a negative impact on the FDI probability for a firm in a particular product. One reason is the cost differences such a firm may experience from producing in the United States versus their home country. The ability of less-developed country firms to produce and sell goods in the world market may primarily stem from country-specific characteristics (e.g. abundant and cheap low-skilled labor) and is likely lost if they have to relocate production in the United States. Additionally, availability of capital may be a serious constraint for firms in some of these countries. Prior experience in multinational production is also specified as an indicator variable and is expected to have a positive impact on FDI probability. Presumably there are economies of scale/scope for FDI activities by a firm because of the large initial fixed costs of gaining knowledge and experience in locating production abroad, which once gained, can be applied across a variety of localities. Additionally, a number of previous empirical studies have found that previous FDI experience positively affects current FDI probabilities.<sup>8</sup>

With respect to product characteristics, measures of plant-level scale economies

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<sup>6</sup>A multinomial logit specification that specifically modeled a firm's decision between (1) FDI, (2) administrative review, (3) both FDI and administrative review, or (4) no action, gave similar conclusions to the probit results reported here.

<sup>7</sup>Appendix A provides more detail on the construction of variables used in the paper's analysis.

<sup>8</sup>These studies include Yu (1990), Kogut and Chang (1996) and Belderbos (1997).

and the value of the US imports are included as controls. Plant-level scale economies indicate larger fixed costs of entry and, hence, are expected to be inversely correlated with FDI entry probability. The measure of plant-level scale economies is average US plant size in the product's associated 4-digit SIC industry. The value of the product's imports is likely to be correlated with an increased probability of FDI. Buckley and Casson (1981) note that serving a market through local production (i.e. FDI) likely involves higher fixed costs than through exporting, though the marginal cost is lower with local production because of lower transportation costs. Thus, local production will have lower average costs than exporting only after a significant level of sales volume. Thus, higher import value should make FDI more likely. For the majority of products subject to US AD investigations, product import volumes and the number of foreign firms involved in the case are made publicly available. This allows estimation of product-level import volumes for the firms involved in these investigations.

An important issue in constructing a sample to estimate the model is the choice of control group. This paper uses firms and products involved in cases that were *not* ruled affirmative as the control group for a couple of important reasons. Firstly, it is clear that these particular products were being produced by the firm and exported to the United States.<sup>9</sup> It is often very difficult to obtain information on which particular products are produced and exported by firms. Secondly, the firm's involvement in the case often allows data on the level of the firm's export sales to the United States for the particular product. This information is even more difficult to obtain by firm and product for any given foreign firm, but is likely an important determinant of the firm's decision to invest production in the United States.

The potential disadvantage of this control group is the concern that nonaffirmative cases are leading to increased production in the United States as well. Thus, this control group would bias the estimated effect of affirmative AD decisions and duties on tariff-jumping toward not finding any effect. This concern is greatly mitigated by the relative number of FDI occurrences subsequent to nonaffirmative decisions shown in Table 2. When one excludes the handful of suspended cases, there is post-investigation FDI in the nonaffirmative products in less than 5% of the cases. Thus, the sample used for analysis below excludes these suspended cases.<sup>10</sup>

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<sup>9</sup>This is presumably a necessary condition for a firm to have any probability of locating production in the United States and, thus, inclusion of firm-product pairs where this is not true would be uninformative at best.

<sup>10</sup>There are other sample selection biases for which I cannot control. For example, domestic petitioners may try to target only foreign firms that would have difficulty tariff-jumping. Alternatively, foreign firms for which tariff-jumping FDI is difficult may take extra precautions to price such that they avoid antidumping investigations. These potential biases work against each other, so it is not clear what the net effect may be. However, my sample has substantial variation in tariff-jumping responses and firm and product characteristics, which suggests that these selection biases are not large.

### 4.3. Empirical results

Column 1 of Table 4 displays marginal effects from probit estimation of the model's base specification. All control regressors, with the exception of import value, have hypothesized sign and are statistically significant at the 5% level or higher. Overall fit of the estimation model is quite high. Over 90% of the observations are correctly predicted by the model and the pseudo- $R^2$  statistic is 0.44.

The estimates also suggest economically significant effects of some of the control regressors on FDI probabilities. Firms from less-developed countries have a 7.4 percentage point lower probability of FDI at the means of the regressors, everything else equal. This is a substantial effect given a sample average FDI probability of 12.2%. If the firm has previous multinational production experience, the probability of FDI at the means goes up 25.7 percentage points. Thus, multinational production experience can more than offset the disadvantages of location in a less-developed country. Plant-level scale economies have a modest impact on FDI probability with a standard deviation increase in an industries plant-level scale economies, leading to a 1.5 percentage point decrease in the FDI probability. The effect of import value has the wrong sign and is statistically insignificant. This is likely due to measurement error in this regressor which will be addressed below.

The estimates show statistically significant tariff-jumping effects, but the magnitude of the effect is quite modest relative to previous studies. A 10 percentage point increase in the AD duty increases FDI probability by only 0.8 percentage points from a 12.2% average probability of FDI at the means of the regressors to a 13.0% probability. One concern is that there are a few outlying AD duties in the sample above 100%. When one excludes these six observations, the estimated marginal effect of a 10 percentage point increase in the AD duty rises about 25% to a one-percentage point increase in FDI probability — still a fairly small effect given the sample average FDI probability of 12.2% (Table 3).

To this point, the estimates have not controlled for macroeconomic changes, such as exchange rate movements, and/or industry characteristics that may be correlated with a higher incidence of US cases against foreign dumping and which also may independently lead to greater FDI activity into the US. Yearly dummies are included to control for macroeconomic changes, but were found to be jointly insignificant ( $\chi(10)=13.76$  with  $P$ -value=0.18). The typical way to control for unobserved industry characteristics is to include industry dummies. In this setting with a dependent variable that is a dummy variable as well, one has to be careful that any included dummy regressor is not perfectly collinear with the dependent variable. This limits the included industry dummy variables to only those industry categories that are substantial enough to avoid this problem. In the end, five major industry categories are included: (1) non-manufacturing industries, (2) chemicals (SIC 28), (3) iron and steel products (SIC 33), (4) fabricated metal products (SIC

Table 3  
Descriptive statistics of variables

Variables	Mean	Standard deviation	Median	Minimum	Maximum
Dependent variable					
FDI	0.122	0.328	0.000	0.000	1.000
Regressors					
AD duty (in decimal form)	0.187	0.335	0.015	0.000	2.592
Import value (in millions of dollars)	0.014	0.036	0.004	0.000	0.696
Less-developed country	0.529	0.499	1.000	0.000	1.000
Multinational firm	0.270	0.444	0.000	0.000	1.000
Plant-level scale economies (in thousands of employees)	0.162	0.173	0.128	0.007	0.681

FDI refers to FDI by firm in the product subject to the associated US AD investigation. See Appendix A for more details on data construction and sources.

34), and electrical/electronic machinery (SIC 36). Column 2 of Table 4 presents estimates when these industry dummies are included. A Wald statistic indicates these industry dummies are jointly significant ( $\chi(5)=24.42$  with  $P$ -value=0.00) and the individual  $t$ -statistics suggest that the non-manufacturing, chemical and fabricated metal products industries are less likely to engage in FDI, while the electrical/electronic machinery sector is more likely to engage in FDI, everything else equal. This latter industry effect suggests another reason why Belderbos (1997) found such high tariff jumping responses: his sample contained exclusively electronic machinery products. Importantly, the marginal effects of the other variables, including the AD duty, are not substantially affected when controlling for industry fixed effects.<sup>11</sup>

As mentioned above, there is considerable noise in the import value control regressor. In particular, for about 20% of the observations there are no public figures available and import value for an investigated product was estimated as the customs value of the publicly listed TSUSA or HTS product codes associated with the case. In a number of cases, it is clear that this is very inexact, as the subject

<sup>11</sup>An alternative is to include a wide variety of industry-related characteristics as controls. I experimented with inclusion of US data on R&D intensity, capital intensity, concentration ratios, advertising intensity, innovation rates and average plant size (in terms of employment) with the associated 4-digit SIC industry of the investigated product. One problem is that these data are generally available for just the manufacturing industries, which cuts the sample observations by almost 30%. Using this reduced sample, these industry controls were jointly statistically significant, but the marginal effects of the other variables, including the AD duty, are not substantially affected.

Table 4  
Marginal effects from probit estimation of FDI likelihood, 1980–1990

Explanatory variables	Full sample			Affirmative cases only		
	Base model (1)	Base model with industry dummies (2)	Elimination of poor import value data (3)	Column (3) model (4)	Including Japanese fixed effect (5)	Including use of BIA variable (6)
AD duty	0.074** (0.020)	0.073** (0.017)	0.057** (0.015)	0.098** (0.033)	0.094** (0.032)	0.115** (0.035)
Import value	-0.101 (0.159)	-0.286 (0.156)	0.038 (0.142)	-0.064 (0.613)	-0.274 (0.947)	-0.383 (0.916)
LDC firm	-0.074** (0.021)	-0.064** (0.015)	-0.054** (0.021)	-0.102** (0.042)	-0.075 (0.047)	-0.070 (0.045)
Multinational firm	0.257** (0.045)	0.203** (0.023)	0.196** (0.048)	0.337** (0.069)	0.325** (0.069)	0.312** (0.029)
Plant-level scale economies	-0.084* (0.040)	-0.068 (0.044)	-0.073 (0.038)	-0.111 (0.112)	-0.069 (0.115)	-0.068 (0.107)
Japanese firm					0.043 (0.048)	0.044 (0.046)
Use of BIA						-0.038 (0.023)
Industry dummies	No	Yes	Yes	Yes	Yes	Yes
Pseudo $R^2$	0.44	0.49	0.47	0.49	0.49	0.50
Chi-squared	189.04**	216.68**	170.89**	142.51**	143.04**	138.98**
Observations	792	792	707	341	341	341

Robust standard errors are in parentheses, with \*\* and \* denoting statistical significance (two-tailed test) at the 1 and 5% levels, respectively. Marginal effects for 'less-developed country firm', 'multinational firm', 'Japanese firm', and 'use of BIA' are for discrete changes in the variables from 0 to 1.

product comprises only parts of selected TSUSA or HTS codes. Column 3 of Table 4 presents estimates of the model from a sample where observations for which this estimation of import value was obviously inexact were eliminated. As one would expect, this change in sample leads to a positive marginal effect of import value on FDI probability, though it remains statistically insignificant. Importantly, the marginal effects of the other explanatory variables are largely unaffected, although the estimated tariff-jumping effect has decreased by about 22%.<sup>12</sup>

<sup>12</sup>An additional concern is inclusion of terminated cases in the sample. US AD cases can be terminated for a variety of reasons, including withdrawals of the petition by domestic petitioners. As Prusa (1992) notes, these terminated/withdrawn cases can lead to private settlements amongst the domestic and foreign firms with potential exemption from US antitrust laws and/or VER arrangements between governments. Thus, these cases may not be an appropriate control group if FDI probabilities are affected by these settlements. However, when these cases are excluded from the sample, there are no qualitative changes (and little quantitative changes) in the estimated coefficients.

#### 4.4. Empirical results with affirmative products only

The estimates above are from a sample that includes both product–firm combinations subject to AD duties and those combinations not subject to AD duties, allowing identification of the tariff-jumping FDI effect. However, it is informative to estimate the empirical model for only the affirmative subset, since it reveals which factors make tariff-jumping more likely once the firm receives the AD duty. Column 4 of Table 4 presents estimates when our specification with industry dummies and elimination of observations with poor import data is run with only the affirmative sample. Prior multinational experience and LDC status are quite important for firms' abilities to tariff-jump after they receive an AD duty. The probability that a multinational firm will tariff-jump, everything else equal at the means of the data, is 35.7 percentage points higher than for a firm with no multinational experience. This is a substantial effect, even with a higher average FDI probability of 18.6% in this sample. LDC status decreases the FDI probability by 10.2 percentage points. Thus, these characteristics are crucial for a firm's ability to tariff-jump. As one would guess, the size of the duty a firm faces matters, as a higher AD duty leads to a higher likelihood of tariff-jumping. The marginal effects of the AD duty are somewhat larger than for the full sample, but still fairly small. This suggests that the other characteristics (MNE and LDC status) determine to a large extent whether the firm tariff-jumps; e.g. regardless of the size of the AD duty, a non-MNE from an LDC is highly unlikely to tariff-jump.

Given the focus of previous studies on only Japanese firms and the descriptive analysis in this paper that showed higher tariff-jumping probabilities by Japanese firms, one important question is whether Japanese firms are different in their tariff-jumping FDI probabilities. Column 5 of Table 4 includes a Japanese fixed effect variable; i.e. an indicator variable of whether the firm is a Japanese firm or not. Though positive in sign, it is statistically insignificant at standard confidence levels. This is surprising at first glance, but the difference can be explained in large part from the fact that a much higher percentage of Japanese firms are multinational than the average firm in the sample (61% versus 27%) and that Japan is not a less-developed country. Once controlling for these factors, there is nothing inherently 'Japanese' that leads to greater tariff-jumping of US AD duties.

One possible explanation for the fairly low tariff-jumping responses found by this paper is the role of the US administrative review process that allows firms to receive lower duties and provides an alternative to tariff-jumping.<sup>13</sup> In fact, this process may be quite attractive to foreign and domestic firms because it achieves very similar outcomes to a VER in the sense that it allows foreign firms to raise

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<sup>13</sup>Belderbos' (1997) study of Japanese electronics products found that tariff-jumping probabilities were lower in the US than in Europe and he notes that one reason for this may be that the US administrative review process allows firms to receive lower duties much sooner than the European process.

US prices in exchange for lower (or eliminated) duties. To see whether this process affects tariff-jumping decisions, I include a measure of the USDOC's use of 'best information available' (BIA) at the time of the initial investigation as a proxy for higher costs of future administrative reviews. As mentioned earlier, BIA is often the data supplied by the domestic petitioners and is used when the foreign firm does not provide information to the USDOC or provides it in unusable form. This occurs when foreign firms find it too costly to provide the information, either because of technical constraints or confidentiality reasons. Thus, I take reliance on BIA by USDOC at the time of the initial case as a proxy for high costs of requesting and participating in an administrative review for a particular firm. The expected sign is positive, as BIA indicates costly administrative reviews, an alternative to tariff-jumping the AD duty. Column 6 of Table 4 presents estimates when I include an indicator variable for those cases where BIA was used. The coefficient on the BIA variable is negative and insignificant, suggesting that the US administrative review process does not substantially affect tariff-jumping probabilities. Inclusion of the BIA variable increases standard errors on the LDC variable, which is likely due to some collinearity — firms from LDCs often find it difficult to gather and report necessary data to the USDOC.

## **5. Conclusion**

By examining the comprehensive list of all US AD cases from 1980 through 1990, this paper finds different results with respect to tariff-jumping FDI than previous papers that have only focused on Japanese tariff-jumping of AD protection. For the overall sample, the paper's probit estimates show a statistically significant effect of AD duties on FDI probability, but the magnitude is quite modest. In fact, the results consistently support the hypothesis that tariff-jumping is a realistic option for only multinational firms from industrialized countries. Because many firms subject to US AD investigations and eventual duties do not have these characteristics, overall tariff-jumping of US AD protection is low. Furthermore, while the raw numbers show a high tariff-response rate for Japanese firms (which is consistent with previous studies finding relatively large tariff-jumping responses), the analysis suggests that this is due almost solely to the fact that many of these firms have substantial multinational experience, not any Japanese-specific response. Interestingly, there is no evidence that certain methods used by the USDOC (that make a favorable administrative review less likely) have much impact on tariff-jumping behavior. This is important because a priori these methods could substantially alter tariff-jumping FDI and subsequent outcomes for domestic firms.

These findings are particularly important in understanding distributional consequences of US AD actions. As the Kodak–Fuji case points out, tariff-jumping can be an important option for a foreign firm to maintain substantial presence in the

US market in the face of such investigations. However, this option is seemingly unrealistic for firms from LDCs and/or with little multinational production experience. Thus, it is not surprising that developing countries have become much more adamant about addressing AD protection within the context of WTO than industrialized countries. Since the conclusion of the Uruguay Round many countries around the world (including many less-developed countries) are implementing new WTO-consistent AD programs of their own, which are patterned after the AD programs in the US and the EU. With respect to the US, Gallaway et al. (1999) provide estimates that place the collective effect of AD duties in the US as one of its largest trade protection programs. These tariff-jumping effects and their welfare consequences become more important in face of this rising world AD protectionism.

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### **Appendix A**

Data for tariff-jumping FDI was gathered from a variety of sources including (1) *Foreign Direct Investment in the United States: Transactions*. Washington, D.C.: International Trade Administration, US Department of Commerce, various volumes, (2) Arpan, Jeffrey S., and Ricks, David A. *Directory of Foreign Manufacturers in the United States*. Atlanta: Georgia State University Business Press, various volumes, (3) *Directory of Foreign Firms Operating in the United States*. New York, NY: Uniworld Business Publications, various volumes, (4) various volumes of state industrial/manufacturer's directories published by Harris Publishing Co. (later Harris InfoSource). Twinsburg, OH: Harris Publishing Co.,

and (5) *Ward's Business Directory*. Detroit, MI:, Gale Research, various issues. I also supplemented these sources with *Japan's Expanding US Manufacturing Presence*. Washington, DC: Japan Economic Institute (JEL), various issues, for confirming tariff-jumping FDI by Japanese firms. I thank Keith Kead and John Ries for providing me with an electronic copy of the 1990 publication of this document. Finally, I was able to gather considerable detail and confirmations through searches of the Lexis–Nexis database and companies webpages.

Data on (1) whether the firm requests an administrative review, (2) the USDOC's use of BIA and (3) the initial AD duty (ad valorem rates) are publicly available from *Federal Register* notices connected with the case. However, I thank James DeVault for sharing a database that had much of this information already collected for my sample period.

Data for the value of the subject product in an AD case can be gathered from the USITC reports connected with each specific case, provided there are enough firms so that proprietary firm-level data are not revealed by the aggregate number. This is true for ~80% of the cases in my sample. Using this information, I assume equal market shares and define the firm's value of subject product as the case value of the subject import (in billions of US dollars) divided by the number of firms. In the other cases I do not have these data and therefore I construct estimates of the subject import by first gathering data on the tariff line item codes of the investigated product (which are reported in *Federal Register* notices by both the USITC and USDOC). Then, using the NBER Trade Database, Disk 1: US Imports, 1972–1994, produced by Robert Feenstra, I estimate the value of the subject product as the customs value of tariff line-item code from Japan the year before the filing of the case and divide by the number of firms in the case to get the regressor for each firm-level observation. This latter estimation of US sales is similar to Prusa (1997). There were a number of cases for which the subject product covered just portions of tariff-line item codes so that I was not confident this method would provide a reasonable estimate. In these cases, there are missing values for the observation.

Plant-level scale economies is calculated as the average number of employees (in hundreds) for a plant in the US 4-digit Standard Industrial Classification (SIC) industry of the investigated product. These data are gathered from the 1987 US *Census of Manufactures*.

The firm's multinational status was determined by by a number of directories that list multinational firms worldwide, including (1) *Moody's International Manual*. New York: Moody's Investor's Services, 1998, (2) Hoopes, David S. (Editor), *Worldwide Branch Locations of Multinational Companies*. Detroit, MI: Gale Research, Inc., 1994, and (3) Sanchez, James Joseph (Editor). *Asia Pacific Corporate Organization*. Tuscon, AZ: Aristarchus Group, 1990.

Finally, a firm was considered to be from a less-developed country unless it was based in Australia, Austria, Belgium, Canada, Finland, France, Germany, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Sweden, Switzerland, or the United Kingdom.

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