Tariff-jumping FDI and domestic firms' profits

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Abstract. Studies of trade policy welfare effects often ignore the potential for tariff-jumping foreign direct investment (FDI) to mitigate positive gains to domestic producers. Using event study methodology we find that affirmative U.S. antidumping decisions are associated with average abnormal gains of over 3% to a firm in the petitioning industry in the absence of tariff-jumping FDI, but much smaller and statistically insignificant abnormal gains if there is tariff-jumping FDI. We also find evidence that tariff jumping in the form of new plants or plant expansion has significantly larger negative effects on U.S. domestic firms' profits than other types of tariff-jumping FDI. JEL Classification: F13, F23, L11

Investissements directs de l'étranger pour éviter les barrières tarifaires et profits des entreprises nationales. Les études des effets de bien-être des politiques commerciales ignorent souvent la possibilité que l'investissement direct de l'étranger (IDE), en permettant d'éviter les barrières tarifaires en vigueur, en arrive à atténuer les gains de la politique commerciale protectionniste pour les producteurs nationaux. En utilisant une méthodologie axée sur l'étude d'événements, on découvre que les décisions d'imposer des mesures anti-dumping aux Etats-Unis sont associées à des gains moyens anormaux de plus de 3% pour l'industrie qui en fait la demande, en l'absence d'investissement direct de l'étranger fait pour éviter les barrières tarifaires. Ces gains sont beaucoup plus petits et statistiquement insignifiants quand cette manœuvre d'évitement est adoptée. Il appert que cette stratégie pour éviter les barrières tarifaires a des effets négatifs plus importants, et ce de manière significative, sur les profits des entreprises américaines

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quand elle prend la forme de nouvelles installations ou d'agrandissements d'installations existantes que quand elle prend d'autres formes.

1. Introduction

Tariff-jumping foreign direct investment (FDI) allows a foreign firm to avoid a trade barrier by locating production within the destination market. Such activities have the potential to substantially mitigate the welfare consequences of the original trade protection policy.[1] Despite the potential importance of tariff-jumping on welfare, there are only a few, primarily theoretical, papers in which tariff-jumping and the occurrence of foreign direct investment (FDI) rather than the effects on welfare are examined (see, e.g., Belderbos 1997; Blonigen and Feenstra 1997; Barrell and Pain 1999; and Blonigen 2002). In this study, we use event study methodology to estimate the effects of tariff-jumping FDI on the welfare consequences of trade policy. We find U.S. antidumping decisions yield an average abnormal gain of over 3% to domestic firms producing the investigated product when no tariff-jumping is involved in the case. However, when tariff-jumping FDI does occur, such gains fall by more than 50% and are statistically insignificant. We also find that announcements of plant expansions have significantly larger negative effects on domestic firms' profits than other types of FDI.

Theoretically, the likelihood of tariff-jumping FDI for a given trade barrier and the magnitude of its effect on welfare of various agents depends on a number of factors, including differential production costs, relocation costs, other entry barriers, demand conditions, and the pattern of rivalry present in the market. For example, as Smith (1987) shows for simple monopoly and Cournot duopoly markets, 'tariffs may or may not induce foreign direct investment, they may or may not change market structure, and they may have pro- or anti-competitive effects'(96).[2] While trade economists find none of the above controversial, it is surprising how often tariff-jumping is ignored in the academic literature, particularly in the case of strategic trade policy.[3] An exception is a theoretical literature that examines the consequences of tariff-jumping FDI where governments understand the connection between trade policy and FDI and act strategically. Ellingsen and Warneryd (1999) find that the optimal tariff for a government concerned about domestic producers is one that is just low enough so that FDI does not occur. In contrast, Brander and Spencer (1987) show

1 There are only rare exceptions where countries apply tariffs to foreign firms, regardless of whether they export to the country or have production in the country.

2 Motta (1992) extends Smith's (1987) analysis by allowing for potential entry by domestic producers and finding an even wider array of possible outcomes and welfare effects.

3 For example, Levinsohn (1989) shows how the literature on the non-equivalence of tariffs and quotas in the presence of imperfect competition often hinges on the assumption that a quota leads to no foreign supply response, which is false if tariff-jumping FDI is possible. A second example is the sparse mention in the literature of the large FDI response by Japanese automakers when assessing the market and welfare effects of the U.S. automobile VER, though Berry, Levinsohn, and Pakes (1999) is an important exception to this.

conditions under which a country with unemployment may wish to induce FDI by setting differential taxes on imports and local production. Flam (1994) and Haaland and Wooton (1998) examine the ambiguity of trade policy determination with potential FDI for a government with agglomerated production or in the presence of antidumping policies, respectively.

Given this wide range of theoretical market outcomes and welfare consequences, the empirical evidence on tariff-jumping FDI and its welfare consequences in the context of trade policies remains an important issue. In particular, there has been little effort to estimate tariff-jumping responses or its welfare consequences. Indeed, only a few authors have systematically examined tariff-jumping FDI occurrences, and none has tried to estimate its welfare implications in any dimension. Recent papers in which tariff-jumping FDI has been empirically examined include Belderbos (1997), Blonigen and Feenstra (1997), and Barrell and Pain (1999), in which the focus has been on Japanese firms' responses to antidumping (AD) trade protection in the United States and the European Union. For various levels of data aggregation, these studies consistently find substantial tariff-jumping responses. In contrast, Blonigen (2002) uses a more comprehensive dataset of all firms subject to U.S. AD duties and finds much smaller average tariff-jumping responses.

A number of authors have estimated the welfare consequences of trade policies, particularly AD protection, but do not address the effects of tariff-jumping FDI. Murray and Rousslang (1989), DeVault (1996), and Kelly and Morkre (1998) use computable partial equilibrium models to examine the welfare consequences of dumping (and AD) for separate U.S. cases. Gallaway et al. (1999) estimate the collective welfare effects of all U.S. AD duties as of 1993 and find a substantial $2–$4 billion annual loss from these trade policies. In the estimates of none of these studies is tariff-jumping FDI considered.

Most closely related to our study, Hartigan, Kamma, and Perry (1989), Mahdavi and Bhagwati (1994), and Hughes, Lenway, and Rayburn (1997) use event study methodology to examine the consequences of AD investigation events and announced duties on domestic firms' profits.[4] Hartigan, Kamma, and Perry (1989) examine non-steel U.S. AD petitions in the early 1980s. They find statistically significant effects on domestic firms' profits, but only when the U.S. International Trade Commission (USITC) ruled that there was a *threat* of injury to the domestic industry, not when it ruled that actual injury had occurred. Mahdavi and Bhagwati (1994) and Hughes, Lenway, and Rayburn (1997) examine events surrounding the trade protection actions

4 Other examples of studies using event methodology to examine the impact of trade policies on domestic firm profitability include Hartigan, Perry, and Kamma (1986) that examined U.S. escape clause petitions, Lenway, Rehbein, and Starks (1990) that examined various trade policies connected with the steel industry in the late 1970s and 1980s. Ries (1993) examines the market effects for Japanese automakers and their suppliers from the 1981 U.S. VER on Japanese autos.

related to the U.S. semiconductor industry in the mid-1980s, which began with a series of AD investigations on various types of semiconductor chips. Mahdavi and Bhagwati find a negative stock market reaction to the AD investigation, but positive effects of the concluding Semiconductor Agreement of 1986 that supplanted any AD duties. Hughes et al. find positive effects of the Semiconductor Agreement for both the U.S. producers and the downstream consumers of semiconductors. They attribute positive impacts to downstream consumers from the benefits of a strong, innovative domestic supplier. In neither of these studies is tariff-jumping FDI responses that occurred with substantial magnitude in the semiconductor industry considered.

In this paper, we take the next step of addressing the impact of tariff-jumping FDI on welfare consequences of trade policies. Our focus is on the welfare of domestic firms that apply for import relief under U.S. AD laws. Unique firm-specific data from U.S. AD cases allow us to focus on tariff-jumping FDI consequences for domestic firms' profits and compare that with the initial domestic profit effects from the imposition of the AD duty. For many U.S. AD cases, both the set of AD investigation events (from petition to imposition of the duty) and the foreign firm's decision to locate production to the United States are publicly announced events in prominent media outlets. We use these announcements and stock market returns data to apply an event study methodology that allows estimation of profit consequences for publicly-traded domestic firms involved in these AD cases.[5]

The rest of the paper proceeds as follows. In the next section we describe the AD investigation process in the United States. Our empirical results from estimating stock market reactions to AD and related tariff-jumping announcements using event study methodology are detailed in section 3. Our second-stage analysis of the factors that affect the magnitude of these market reactions, including our hypothesis that tariff-jumping FDI mitigates the gains domestic petitioners experience from AD protection, is described in section 4. Section 5 concludes and our main findings are highlighted.

2. A brief overview of U.S. AD investigations

The U.S. AD laws are administered by the U.S. Department of Commerce (USDOC) and the USITC, each with distinct roles in the process. An investigation begins when a petition is filed with both agencies by an 'interested party'

5 An alternative methodology is use of firm-level accounting to examine how AD events affect a firm's market power, as in Konings and Vandenbussche (2002). We choose to use event study methodology, since AD actions are often targeted to particular products, whereas accounting data cumulate across all the firm's activities. Accounting data are also subject to changes in reporting procedures. A commonly cited disadvantage of event studies is the leakage of information prior to the 'event' and the effects of confounding events that occur very near in time to the event of interest. Both would tend to make estimates less precise, not necessarily bias the coefficient estimates. We address both of these issues in our analysis below.

that represents the domestic industry connected with the product named in the investigation. Interested parties may be domestic firms, labour unions, a trade association, or the USDOC itself, but it is typically one or more domestic firms in the industry.

When a petition is filed, the USDOC's role is to determine whether the subject product is being sold at 'less than fair value' in the United States. Specifically, they calculate whether firms exporting to the United States are selling the product in the United States at less than 'normal' or 'fair' value, which is generally defined as the foreign firm's own home market price for the same good. For each case, the USDOC calculates an ad valorem dumping margin equal to the percentage difference between the U.S. transaction prices they observe and 'fair value'. The USITC concurrently determines whether the relevant U.S. domestic industry has been materially injured, or is threatened with material injury, by reason of the imports subject to its investigation.

The USDOC and USITC each makes preliminary and final determinations for each case. 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 the 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 U.S., the importer must pay U.S. Customs a cash deposit equal to the margin times the value of the subject product.

In all cases, the USDOC finds a non-negative dumping margin by virtue of the methodologies they use to calculate the dumping margins (see Murray 1991). Thus, the main information received from the USDOC decision is the magnitude of the dumping duty should the case be ruled affirmative. The most important hurdle for a final affirmative decision in the case, leading to imposition of AD duties, is the USITC final determination. The USITC ruled affirmative in their final decision in 40% of the cases from 1980 to 1993 (USITC, 1995, 3–1).[6]

3. First-stage analysis: cumulative abnormal returns

Our empirical analysis consists of two stages. In the first stage, reported in this section, we use an event study methodology to estimate abnormal stock returns for publicly traded firms from announcements of our focus events: AD

6 AD cases can be terminated or suspended before a final decision is made by the USDOC and USITC. Terminations may occur for a variety of reasons, from insufficient grounds for an AD petition to a decision by the domestic petitioners to no longer pursue the case, possibly because of a private settlement with the foreign firms (see Prusa 1992). Suspensions occur when the domestic and foreign parties agree to a suspension agreement to resolve their dispute. For clarity of our hypotheses and analysis, we focus solely on affirmative AD cases.

investigations and tariff-jumping FDI. In the second-stage, reported in section 4, we estimate determinants of these first-stage abnormal returns obtained from our event study methodology.

The hypotheses we explore in this section are that (1) AD duties will lead to gains in domestic firms' profits, and (2) tariff-jumping FDI by the foreign rival will mitigate these gains (i.e., lead to loss in domestic profits). There are a number of issues that may complicate the testing of these hypotheses. The first hypothesis is quite straightforward, particularly for AD cases that are initiated by domestic firms themselves and presumably would not petition for AD duties unless they expected positive profit gains from the action. Although government agencies make the ultimate determination of the case, AD actions allow little or no voice for consumer groups or other agents in the economy in the investigation. Thus, it is clear that the trade action is intended solely to benefit the domestic producers.

The second hypothesis is that tariff-jumping FDI by the foreign firm will lead to negative returns to domestic firms involved in AD actions, thus counteracting the positive effects of the initial AD events, since it will allow the foreign firm to avoid the AD duty. However, two issues suggest that tariff-jumping FDI effects may not fully counteract the gains from the AD duty. First, foreign firms' competitive advantages may be largely connected with location advantages in their own country. If so, a tariff-jumping foreign firm may not diminish the domestic firm's profits much more than if the foreign firm were to continue exporting in the face of an AD duty. Consistent with this possibility, there are a number of examples where tariff-jumping foreign firms ultimately are not successful in their relocation of production.[7] In this case, such tariff-jumping FDI may not lead to any mitigation of the gains to the domestic firms from a successful AD action. The second issue is one of sample selection. One might suspect that domestic firms would not petition for relief if they believe harmful tariff-jumping FDI will occur. Therefore, to the extent that tariff-jumping exists, it may be in cases where the domestic industry calculated that the AD actions will not be substantially mitigated. This obviously assigns substantial information and rationality on the part of the domestic firms. In addition, government agencies, not domestic firms, determine the level of the import barrier in AD cases and may set it 'too high', leading to tariff-jumping FDI that is harmful to the domestic firms. To the extent that our results find negative effects of

7 For example, Dofasco and Co-Steel, Canadian steel firms, started a joint-venture steel mill in Kentucky in 1995 in response to the 1992–93 U.S. steel cases against imported steel from Canada and other import sources. By 1998 the joint venture had never turned a profit and Co-Steel was trying to sell its $600 million share (Canadian Press Newswire, 24 April 1998). In a similar vein, U.S. Department of Commerce (1993, 47) reports that U.S.-owned ball-bearings plants were approximately three times more profitable from 1987 to 1991 than foreign-owned ball-bearings plants in the U.S. (9.0% return on assets versus 2.3%), many of which had recently located in the United States because of AD duty cases.

tariff-jumping FDI on domestic firms' profits, it is despite this sample-selection bias.

3.1. Methodology and data

To test these hypotheses, we employ an event study methodology that estimates abnormal stock returns for firms from public announcements of our focus events after controlling for general market movements. Thus, assuming the stock market is efficient, we estimate the market model:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}, \tag{1}$$

where R_{it} is the return on security i on day t, R_{mt} is the market return on day t, and ϵ_{it} is the zero mean disturbance term. R_{mt} is the broad-based stock index for the market portfolio, the S&P 500 index.

We estimate equation (1) for each firm using daily returns 300 days before the event through 100 days before the event. We then estimate abnormal returns ($AR_{i\tau}$) in our event window for firm i. Abnormal returns will be indexed in event time using τ. Using the market model parameter estimates from equation (1), we define $AR_{i\tau}$ for firm i as

$$AR_{i\tau} = R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m\tau}, \tag{2}$$

where τ measures time relative to the event date, $\tau = 0$. Thus, assuming efficient markets, the abnormal return represents the market's valuation of the change in the firm's current and future expected profitability due to the announced event. An event window typically includes the event day and the day after the event to allow the information to be fully incorporated into the firms' return. In addition, the window may include days before the event to allow for possible leakage of the event's outcome to some investors. The cost of extending the window is the possibility of other unrelated events confounding the estimated abnormal returns for the focus event (e.g., a firm's quarterly earnings announcement). We use a three-day event window for the majority of our analysis, which includes the day before, the event day, and the day after, but we also consider the sensitivity of our results by examining event windows of greater length.

In order to draw inferences for the focus events, we aggregate the abnormal return observations. Using the estimated abnormal return for each day of the event window, the cumulative abnormal return (CAR) for each firm i and event j is

$$CAR_{ij} = \sum_{\tau=1}^{L} AR_{ij\tau}, \tag{3}$$

where l is the first day in the event window and L is the last day in the event window.

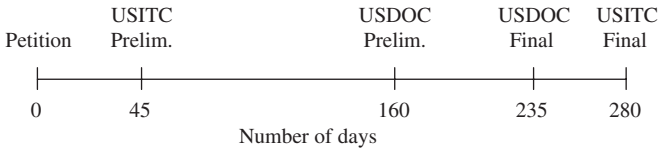

FIGURE 1 Standard timeline for U.S. AD investigations

We run this first-stage estimation procedure for two types of events. The first type is the AD investigation events which are comprised of five events (in the chronological order they follow in U.S. AD cases): (1) the initial petition by the domestic firms, (2) the preliminary decision by the USITC, (3) the preliminary decision by the USDOC, (4) the final decision by the USDOC, and (5) the final decision by the USITC. Figure 1 presents the timeline of AD case events for a standard case.

The magnitude of the effect of these AD announcements on the market depends on how much additional information they reveal. The petition is the first event that begins the investigation and likely has a surprise element for the market. However, the gains are realized by the domestic firms only if the petition will be successful. Thus, uncertainty of the final outcome may mitigate the size of gains from a petition. The USITC preliminary injury decision is almost always affirmative for any AD case, since it must occur within 45 days of the petition and has time to incorporate only information presented by the domestic industry in their petition. Thus, this event may not convey much new information to the market. The preliminary USDOC decision is virtually always affirmative as well for any AD case. However, this USDOC decision includes preliminary dumping margins, which provides information to the market of the eventual size of AD duties should the final case decision be ruled affirmative. The USDOC final dumping margin determination comes out 75 days later in a standard case. Changes in the final dumping margin from the preliminary margin likely represent new information to market and will be controlled for in our empirical analysis below. The final AD case event is the USITC final decision, which, if affirmative, leads to imposition of AD duties. This event likely has the potential to elicit market reactions because it resolves any uncertainty about the final outcome of the case. On the other hand, as the last event of the case, the market may have reasonably certain information about how the case will be determined. In our results below, we report CARs for all of the five separate investigation events, as well as a cumulated CAR that combines the effects of all five AD events.

To construct a sample of AD events, we began by collecting data on all publicly traded U.S. firms that were petitioners in U.S. affirmative AD cases between 1980 and 1995. For those affirmative cases with at least one publicly traded firm we gathered information on the dates of the AD events. In about half of the relevant AD events standard media announcements were found

using Lexis-Nexis search engines. For these observations, the event date corresponds to the date of these media announcements. For the others, typically in lower-profile AD cases, we rely on the date of the *Federal Register* notice of the AD event.[8]

Final published reports by the USITC list all U.S. firms producing the investigated product, not only the petitioners. These related non-petitioning firms may be substantially affected by the AD events in similar fashion to the petitioning firms, though their non-participation suggests that the expected gains from the AD case may be smaller. We include these related non-petitioning firms in our sample because it nearly doubles our sample size (increasing efficiency of our estimates) and statistical tests find that these firms are similarly affected by AD events as the petitioning firms.[9]

In summary, our sample is observations of stock price returns for five AD event dates for all publicly traded U.S. firms producing a product subject to an affirmative AD investigation during the period from 1980 through 1995. This yields almost 200 publicly traded firms over 63 affirmative U.S. AD cases. Data on firms' stock returns, as well as the market return, come from the Center for Research on Stock Prices (CRSP). FDI announcements by investigated foreign firms, which we discuss further below, occurred in 17 of these 63 cases, covering 34% of our firm-level observations.[10]

The second type of event for which we estimate CARs is tariff-jumping FDI announcements. Blonigen (2002) identifies all instances of FDI connected with U.S. AD investigations from 1980 through 1995, and these data also indicate the type of FDI that occurred (i.e., acquisition, new plant, joint venture, etc.).[11] Using this list, we compile a database of public media announcements of these FDI incidents using Lexis-Nexis search engines.

3.2. Empirical results

In stage-one regressions, we estimate three-day CARs for all five types of AD investigation event decision dates: (1) petition, (2) preliminary USITC, (3) preliminary USDOC, (4) final USDOC, and (5) final USITC decision. The top half of table 1, column 1 gives the average CARs of these five

8 For those cases with media announcements, we notice a fairly consistent lag between the media announcement and the publication date of the *Federal Register* notice. We experimented with assigning non-media events a date that was equivalent to the *Federal Register* notice date minus this observed lag. Our results are weakened when this method is used to assign the event date to non-media events, suggesting that the *Federal Register* date corresponds more closely to the time the stock market receives the relevant information for these lower-profile cases.

9 Free-riding behaviour is one explanation for why these firms may experience significant positive abnormal returns from the AD cases, but choose not to be a petitioner in the case. Another possibility is that some firms, such as multinational firms with an array of product lines and significant foreign sales, may have greater exposure to retaliation and choose not to participate as a petitioner despite the potential for abnormal gains.

10 A list of the cases and involved firms is available from the authors upon request.

11 These data can be accessed at http://darkwing.uoregon.edu/~bruceb/adpage.html or http://www.nber.org/antidump/.

TABLE 1
Summary of first-stage regressions for AD investigations and tariff-jumping events

Event	Mean CARs	Z-statistic	Number of CARs
AD Events			
Petition	0.0083	3.08**	190
Preliminary USITC decision	−0.0004	−0.38	187
Preliminary USDOC decision	0.0093	2.85*	182
Final USDOC decision	0.0041	1.25	176
Final USITC decision	0.0048	1.43	181
Cumulated total	0.0277	4.09**	186
Effects of tariff-jumping FDI on AD event CARs			
Cumulated Total – With Tariff-jumping FDI	0.0153	1.44	64
Cumulated Total – Without Tariff-jumping FDI	0.0341	4.01**	122
Tariff-jumping Events			
All tariff-jumping FDI announcements	−0.0042	−0.64	215
New plant FDI	−0.0070	−1.01	141
Acquisition FDI	0.0053	0.49	16
Plant expansion FDI	0.0040	0.80	17
Joint venture FDI	−0.0019	−0.40	41

events and a cumulated total CAR for all five events. Following Borenstein and Zimmerman (1988), we construct a Z-statistic to analyse the statistical significance of these average CARs. Assuming independent events, a Z-statistic can be constructed that is the sum of the t-statistics connected with each event divided by the square of the number of events. This Z-statistic is distributed as a normal variable with a variance equal to the number of observations and has the following formula:

$$Z = \sum_{n=1}^{N} \frac{(CAR_n / \sqrt{\text{var}(CAR_n)})}{\sqrt{N}}, \tag{4}$$

where CAR_n is the cumulative abnormal return for event (n), var indicates 'variance,' and N is the number of events. This method of determining statistical significance has the advantage of controlling for observations with high standard errors, which get less weight in the Z-statistic. We report this Z-statistic in the second column of table 1.[12]

The results presented in table 1 suggest that the AD petition announcement and the preliminary USDOC decision are the individual AD events that clearly lead to positive gains for U.S. firms. However, four of the five AD events display a positive average CAR, and the average CAR cumulated over all five AD events is positive and statistically significant at the 1% significance level,

12 In our case of *cumulated* totals of CARs from the five AD events, we first construct Z-statistics over the five AD events for each firm-case observation and then construct a Z-statistic over all case observations.

with an average gain of 2.77%. This provides strong support for the hypothesis that these AD events provide positive abnormal returns for the U.S. firms. One issue we cannot address here is the heterogeneity in abnormal returns across firms. For example, some affirmative decisions yield much smaller dumping margins than others. Our second-stage regression analysis below allows us to examine this heterogeneity further.

While this 2.77% average cumulated abnormal return is statistically significant, our hypothesis is that this would be larger if not for consideration of tariff-jumping by the foreign firms. To examine this possibility, the next two rows of table 1 report the average cumulated CARs for observations of U.S. firms involved in affirmative cases where no tariff-jumping FDI occurred and for affirmative cases where tariff-jumping FDI did occur. We find a substantial difference in average CARs between these two samples. The U.S. firms experiencing affirmative AD decisions and no tariff-jumping FDI by their foreign rivals average about a 3.4% gain. In contrast, those for which tariff-jumping FDI occurs experience an average gain of only 1.5% with a Z-statistic that suggests the effect is not statistically different from zero. These results provide evidence of our hypothesis that tariff-jumping FDI can mitigate the positive abnormal gains that U.S. domestic firms experience from AD trade protection. In fact, it suggests that tariff-jumping FDI by foreign rivals may completely eliminate such gains on average. While we do not report these results in table 1 for the sake of space, this difference in gains between tariff-jumping and non-tariff-jumping cases is slightly larger when the sample is restricted to only petitioning U.S. firms. In this case, petitioning firms in affirmative AD cases with no tariff-jumping experience 4.7% gains, while petitioning firms in cases with tariff-jumping experience an average CAR of −0.5%, which is not statistically different from zero.

The above comparison of means does not control for other relevant factors that may systematically affect CARs across our focus groups. In section 4 below, we examine this issue by estimating a second-stage regression of the estimated CARs to examine the effect of tariff-jumping FDI on firms' gains from AD investigations, controlling for other factors.

We also estimate CARs for tariff-jumping announcements in similar fashion, and the last rows of table 1 show the summary statistics for the average firm CARs from all tariff-jumping FDI announcements as well as a breakdown by the type of FDI indicated in the announcement (i.e., new plant, plant expansion, acquisition, or joint venture). Our hypothesis is that tariff-jumping FDI announcements should lead to losses for the domestic petitioning firms. The mean CARs, presented in table 1, for all tariff-jumping announcements is −0.42%, though not statistically significant. The breakdown of mean CARs by FDI type provides some additional information. Nearly two-thirds of the tariff-jumping announcements involve new plants, and announcements of this type lead to an average CAR of −0.70%. Joint ventures also lead to negative CARs on average, while acquisitions and plant expansion announcements average positive CARs. In general, these average tariff-jumping CARs

are fairly small and not statistically significant, but also they do not control for other factors; a possibility we address in the next section with our second-stage estimation.

4. Second-stage regressions: explaining the CARs

The above analysis provides simple comparisons of means. To more formally examine our hypotheses, we regress CARs on various factors that may explain differences in the CARs across events. In particular, we run second-stage regressions of the form:

$$CAR_{ij} = \phi + \lambda' X_{ij} + \mu_{ij}, \tag{5}$$

where ϕ is an intercept, X_{ij} is a matrix of explanatory variables, λ is a vector of estimated parameters, and μ_{ij} is an assumed normally distributed error term. Because our dependent variable is generated from our first-stage event study regressions, we use a White correction to adjust our standard errors for heteroscedasticity.[13]

4.1. Explaining CARs from AD announcements

With respect to the second-stage regressions for the AD investigation announcements, we focus on the hypothesis that tariff-jumping FDI mitigates the gains domestic petitioners may experience from the AD case. Thus, we first include a dummy variable that takes the value of '1' when one or more investigated foreign firms announce their intention to FDI in the investigated product and expect a negative coefficient. To construct this variable, we include FDI announcements that occur before, during, or after the AD investigation and decisions.

Certainly, there may be differences in the FDI announcement impacts depending on their timing in relation to the AD case. FDI announcements that occur before (or during) the AD case are known with certainty when the AD events occur. However, this may lead to a sample selection problem in that U.S. firms that know FDI will occur, and thereby mitigate an AD duty, do not file an AD case in the first place. This means that we will only observe AD cases where FDI announcements have occurred when it is clear that the FDI will not (substantially) mitigate the AD duty. As such, we expect there to be no observable effect of FDI announcements that occur before the case ends. FDI announcements that occur after the case could not be known with certainty during the case, but they may be a good proxy for the industry's susceptibility to tariff-jumping FDI subsequent to the case. After our base specifications using a simple dummy variable for whether or not the AD-investigated product

13 We get qualitatively identical results when we control for heteroscedasticity, as suggested by Saxonhouse (1976). Results using the Saxonhouse corrections are available from the authors upon request.

experiences an FDI announcement at some point, we explore for differences in the FDI effects depending on its timing in relation to the case.

We include other explanatory variables as controls. First, positive abnormal gains are expected to be higher for AD investigation events the greater the amount of trade volume involved in the cases, particularly relative to the size of the U.S. firm(s). In particular, for each firm-level observation, we control for the size of the investigated product's imports relative to the firm's total sales, which we call the product's import share of revenue. The numerator of this variable is constructed as the total value of the investigated product's import value divided by the number of U.S. firms. We divide this by the firm's total sales to derive the product's import share of firm revenue.[14]

Additionally, a couple AD events yield unique quantifiable information that should affect the magnitude of the CARs for a firm. In the second-stage regression that explains CARS at the preliminary USDOC decision, we include the preliminary AD duty (in decimal form), expecting a larger duty to be associated with higher CARs. At the final USDOC decision, an increase in the final dumping margin from the preliminary margin should also increase the CAR for this AD event, so we include the difference between the final and preliminary dumping margin (in decimal form) as an explanatory variable for second-stage regression of the CARs for the final USDOC decision.[15] Finally, a substantial portion of our sample comprises observations on steel and semiconductor cases. These industries have been consistent high-profile users of U.S. AD laws, and there may be a systematic difference in AD CARs for these two sectors. Thus, we include a dummy variable for each of these two sectors. We also include year dummies and dummies for SIC industries 28, 33, 34, and 35, as unobserved macroeconomic conditions or industry characteristics may affect market investor's reactions in a systematic way. These particular industry dummies are included, since they encompass the bulk of U.S. AD cases, in conjunction with the steel (SIC 331) and semiconductor industry (SIC 3674).[16] The top half of table 2 reports descriptive statistics for our explanatory variables in the second-stage regressions for the sample of CARs cumulated over all five AD events.

Table 3 presents the results from running separate regressions to explain CARs for the five AD events, as well as regression results for the cumulated total CAR. F-tests for the petition and preliminary USDOC regressions, as

14 Regressions that specified investigated import value and firm total revenue as separate regressors yielded virtually identical results for our focus variables.

15 Data for the subject import volume, case decision, and final AD duties can be accessed at *http://darkwing.uoregon.edu/~bruceb/adpage.html*. Preliminary AD duties were collected from relevant *Federal Register* notices, and data on petitioning firms' sales volume come from the Compustat database. Data on the number of U.S. firms involved in each AD case come from USITC reports connected with each case.

16 F-tests of the joint significance of the industry and year dummies were often, but not always, statistically significant for the regressions reported in tables 3 and 4.

TABLE 2
Descriptive statistics for second-stage regressions

Variable	Mean	Standard Deviation	Minimum	Maximum
AD cumulated total events (186 observations)				
Log of import share of revenue	−5.23	2.32	−11.04	1.54
Preliminary duty (in decimals)	0.43	0.46	0.00	4.44
Final duty – Preliminary duty (in decimals)	−0.03	0.32	−2.83	1.63
FDI case	0.34	0.48	0.00	1.00
Semiconductor case	0.08	0.27	0.00	1.00
Steel case	0.24	0.43	0.00	1.00
Tariff-jumping events (215 observations)				
Log of import share of revenue	−3.95	2.62	−9.51	1.54
FDI after investigation	0.64	0.48	0.00	1.00
New plant or plant expansion FDI	0.73	0.44	0.00	1.00
Semiconductor case	0.28	0.45	0.00	1.00
Steel case	0.31	0.46	0.00	1.00

well as for the cumulated total CAR, are statistically significant. The R^2s range from 0.10 to 0.23 for these six cross-sectional regressions.

While coefficient signs on regressors are typically of expected sign in the regressions of the specific AD events, the regression using the CAR cumulated over all five events clearly gives the strongest and most precise results (last column of table 3).[17] In fact, all coefficient estimates follow expected signs and all but one are statistically significant in this cumulated total CAR regression. Focusing on these cumulated total CAR results, we find that tariff-jumping FDI announcements are generally estimated to have a negative effect on a domestic firm's gains from AD events of about 3.3%. This estimate is quite consistent, though larger in magnitude, with the comparison of mean CARs in table 1. The other control variables are clearly important determinants as well. The larger the import share of the firm's total revenue, the greater positive CAR the firm receives from the AD events. In addition, higher preliminary dumping margins and increases in the dumping margin from the USDOC's final decision lead to higher CARs as expected. Finally, there is evidence that affirmative semiconductor cases led to higher than normal CARs for affected U.S. firms, but no such evidence exists for U.S. steel AD cases.

There are a number of issues that may be affecting the precision of our estimates. One issue is the timing of FDI. As mentioned earlier, our FDI variable in table 3 is not distinguishing between FDI announcements that happen before or during the case from those that occur afterwards. In column 2 of table 4 we present estimates for our cumulated total CAR regression when we split our FDI

17 As suggested by one referee, we also tried seemingly unrelated regression (SUR) analysis on our five AD event regressions, but found this led to virtually no change in our coefficient estimates or precision.

TABLE 3
Second-stage regressions for AD investigation events – White-corrected standard errors

		Dependent variable: CARs with 3-day event window					
Regressors	Expected sign	Petition	Preliminary USITC	Preliminary USDOC	Final USDOC	Final USITC	Cumulated total
Log of import share of revenue	+	0.001 (0.003)	0.001 (0.001)	0.008* (0.004)	0.001 (0.002)	0.001 (0.002)	0.012** (0.005)
Preliminary duty	+			0.018 (0.012)			0.045* (0.023)
Final duty – preliminary duty	+				0.004 (0.008)		0.057* (0.033)
FDI case	–	−0.025* (0.012)	0.011* (0.007)	0.002 (0.013)	−0.015 (0.015)	0.004 (0.010)	−0.033* (0.019)
Semiconductor case	?	0.013 (0.020)	0.036** (0.012)	0.013 (0.021)	0.004 (0.024)	−0.007 (0.018)	0.079** (0.035)
Steel case	?	0.025** (0.012)	−0.021* (0.011)	−0.003 (0.014)	0.015 (0.016)	0.015 (0.015)	0.023 (0.031)
Industry dummies		YES	YES	YES	YES	YES	YES
Year dummies		YES	YES	YES	YES	YES	YES
R^2		0.11	0.23	0.10	0.11	0.11	0.22
F-statistic		1.52*	2.71**	1.24	1.29	1.08	2.42**
Number of observations		190	187	182	176	181	186

NOTES: Robust (White-corrected) standard errors in parentheses. Industry dummies are for SIC 28, 33, 34, and 35. *denotes statistical significance at the 10% level and **denotes statistical significance at the 5% level.

variable into one that indicates FDI announcements before the end of the case and one that indicates FDI announcements after the case. The first column of results in table 4 provides the same estimates from the last column of table 3 for comparison purposes. As the estimates show, our estimated effect is almost completely captured in the FDI announcements after the case. This suggests that FDI announcements before the case may stop U.S. firms from starting (or continuing) AD cases where AD duties will not be effective, owing to the FDI. We observe only the cases where such FDI will not mitigate the AD duty effects in a substantial way.[18]

In any event study there is always the possibility of other 'confounding' announcements in the event window, which may bias the estimated CARs and/or the precision of the estimates. To examine this possibility we employed the

18 In other specifications we tried, both those reported in table 4 and those not reported, we find that the effects of FDI after the event is significant and negative, while the effect of FDI announcements before the AD case ends are insignificant.

TABLE 4
Evaluating alternative specifications of second-stage regressions for AD investigation events

		Dependent variable: cumulated CARs over five AD events					
		Three-day event window			Eight-day Event Window		
	Expected sign	Results from last column of table 3	Timing of FDI	Elimination of outliers	Petitioners only	Base specification	Elimination of outliers
Log of import share of revenue	+	0.012** (0.005)	0.012** (0.005)	0.004 (0.004)	0.010** (0.005)	0.005 (0.007)	−0.001 (0.007)
Preliminary duty	+	0.045* (0.023)	0.043* (0.022)	0.012 (0.040)	0.053** (0.024)	0.044 (0.033)	−0.004 (0.007)
Final duty – preliminary duty	+	0.057* (0.033)	0.056* (0.031)	0.112* (0.066)	0.087** (0.038)	0.027 (0.041)	0.008 (0.009)
FDI case	–	−0.033* (0.019)		−0.056** (0.021)	−0.053** (0.028)	−0.047 (0.031)	−0.075** (0.037)
FDI *before* AD Decision			0.018 (0.029)				
FDI *after* AD decision			−0.038* (0.022)				
Semiconductor cases	?	0.079** (0.035)	0.082** (0.036)	0.114** (0.044)	0.040 (0.056)	0.194** (0.065)	0.167** (0.076)

(*continued*)

TABLE 4 *concluded*

		Dependent variable: cumulated CARs over five AD events					
		Three-day event window			Eight-day Event Window		
	Expected sign	Results from last column of table 3	Timing of FDI	Elimination of outliers	Petitioners only	Base specification	Elimination of outliers
Steel cases	?	0.023 (0.031)	0.022 (0.032)	0.020 (0.039)	0.013 (0.040)	0.045 (0.047)	0.048 (0.056)
Industry Dummies		YES	YES	YES	YES	YES	YES
Year Dummies		YES	YES	YES	YES	YES	YES
R^2		0.22	0.22	0.27	0.36	0.22	0.24
F-statistic		2.42**	2.33**	4.37**	1.39	1.70**	14.38**
Number of observations		186	186	162	89	186	162

NOTES: Robust (White-corrected) standard errors in parentheses. Year and industry dummies included, where industry dummies are for SIC 28, 33, 34 and 35. *denotes statistical significance at the 10% level and **denotes statistical significance at the 5% level. The three-day event window includes the trading day before the event through the trading day after the event. The eight-day event window runs from five trading days before the event to two trading days after the event.

following procedure to eliminate potential outlying observations that may be contaminated by confounding events. For each AD case event, we eliminated firm-level CAR observations that were greater than two standard deviations from the average U.S. firm CAR in the same AD case and event. The third column of table 4 displays our results when we eliminate such observations. While our sample size is reduced by 24 observations, the R^2 and F-test improve significantly. Of particular note, the effects of FDI announcements increase over 50% in magnitude to a negative impact on the cumulated total CAR of −5.6%.

Another issue that may affect our estimates is our pooling of both petitioning and non-petitioning U.S. firms. Non-participation in the AD petition may suggest that a firm has less to gain from the AD duty and, hence, less to lose if the foreign firm decides to FDI. In the fourth column of results in table 4, we present estimates when we sample only petitioning firms. Results are very similar to those of the full sample, though this change in sample leads to a larger estimated negative effect of FDI on the cumulated total CAR from −3.3% to −5.3%. While the main control variables are statistically significant in this regression, the much lower number of observations leads to a statistically insignificant F-test.

A final issue we address is the size of the event window. To this point, we have shown results for only a three-day window. As an alternative, we provide results in the final two columns of table 4 when we use an eight-day window that spans from five trading days before the event to two days after the event. The first of these columns shows our base specification that is identical to the last column in table 3, while the last column shows results when we eliminate outliers using the same procedure as described above. The base specification of the eight-day window CARS shows very similar results to the three-day window results, but they are less precisely estimated. The likely explanation is the greater chance for confounding events in an eight-day window. The last column's results are consistent with this conjecture as the precision of the specification (e.g., the F-test) is substantially improved by eliminating outliers. Of note, the FDI variable is sizeable (−7.5%) and statistically significant once outliers are eliminated in the eight-day event window specification.[19]

4.2. Explaining CARs from tariff-jumping FDI announcements

We next turn to second-stage regressions connected with the CARs from tariff-jumping FDI announcements. In particular, such a regression can indicate whether certain forms of FDI are more damaging to the domestic petitioning firms than others, controlling for other factors. To examine this issue, we include a dummy variable indicating whether the announced FDI will be a new plant or plant expansion. These forms of FDI create new capacity in the

19 We get qualitatively similar results using a 16-day event window that includes ten trading days before the event to five trading days after the event.

TABLE 5
Second-stage regressions for tariff-jumping events

		Dependent variable: CARs with three-day event window	
Regressors	Expected sign	Base specification	Elimination of outliers
Log of import share of revenue	–	−0.002 (0.001)	−0.004** (0.001)
FDI after AD investigation	–	−0.002 (0.007)	−0.004 (0.005)
New plant or plant expansion FDI	–	−0.011 (0.007)	−0.013* (0.005)
Semiconductor case	?	−0.000 (0.008)	0.003 (0.006)
Steel case	?	−0.007 (0.010)	0.007 (0.007)
R^2		0.04	0.10
F-statistic		1.66	4.32**
Number of Observations		215	203

NOTES: Robust standard errors in parentheses. *denotes statistical significance at the 10% level, and **denotes statistical significance at the 5% level.

U.S. industry and are investments done independently of U.S. firm considerations, unlike joint ventures or acquisition FDI. Thus, we expect that new plant and plant expansion FDI lead to greater losses for U.S. firms. Given our results in table 4, we also include a dummy variable for FDI after the investigation, expecting that such announcements will lead to greater negative CARs for U.S. firms as well.

Finally, as with our second-stage regression analysis of the AD announcements, we include the log of the import share of revenue and dummy variables for observations that are connected with semiconductor and steel cases as controls. We do not include year and industry dummies in these regressions, since F-tests reject their inclusion, though we get qualitatively identical results to those reported here when they are included. The bottom half of table 2 reports descriptive statistics for our explanatory variables in the second-stage regressions of the tariff-jumping FDI sample.

Table 5 presents our results for the tariff-jumping FDI announcements. The first column of results gives estimates when we use the entire sample of observations for all publicly-traded U.S. firms producing products involved in affirmative FDI cases that experienced tariff-jumping FDI. All three main regressors have the correct negative sign. However, the R^2 is low and the F-test fails to reject the null of jointly zero slopes. The second column of results in table 5 is from a sample where we eliminate outliers using the same procedure described above. While this leads to the loss of only twelve observations, the

equation fits the data much better with an F-test significant at the 1% level. The three main regressors continue to be the expected sign, though now two of them are statistically significant. As in the second-stage regressions of AD events, the log of import share of revenue is an important determinant of the size of the CARs, with larger losses to firms where imports are a greater share of the firm's revenues.

Turning to our FDI variable, there is significant evidence that new plant or plant expansion FDI leads to more negative CARs than other types of FDI, with a 1.3% lower CAR, everything else equal. This makes sense because new plants and plant expansions add domestic capacity in the industry, unlike acquisitions, and are independent of U.S. firm involvement, such as joint ventures. The fact that we find generally small negative CARs of tariff-jumping events and only a 1.3% loss for the most damaging forms of FDI in our second-stage regressions is informative. It suggests that the effects of tariff-jumping FDI are mainly incorporated into lower returns to the AD events through anticipation of such tariff-jumping by the market, not at the time that the tariff-jumping is finally announced after the case.

5. Conclusion

This paper began with the idea of examining changes in domestic firms' profits from AD investigations and from the subsequent tariff-jumping FDI that may result from such actions. The initial hypotheses were that AD investigations, particularly those that are ruled affirmative and lead to AD duties, result in positive abnormal returns to domestic firms, while tariff-jumping FDI may partially or completely mitigate these effects. We find evidence for both of these hypotheses. On average, affirmative U.S. AD decisions are associated with over a 3% abnormal gain to a domestic firm when there is no tariff-jumping FDI (almost 5% for the domestic firms filing the AD petition), but no statistically significant abnormal gains if there is tariff-jumping FDI. In a related vein, we find evidence that the announcements of plant expansions or new plants have significantly larger negative effects on domestic firms' profits than other types of FDI, including acquisitions and joint ventures.

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