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Policy Externalities: How US Antidumping Affects Japanese Exports to the EU[†,‡]

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Abstract

This paper investigates the international externalities associated with US use of antidumping (AD) measures by examining the relationship between US AD duties (ADDs) and Japanese exports to the US and EU over the 1992-2001 period. We first examine the trade destruction and trade diversion associated with Japanese exports to the US market resulting from US AD duties. We then investigate whether US ADDs impose externalities on a non-targeted third country by examining the effect of these US policies on Japanese exports to the EU. We document sizable trade deflection and trade depression in the EU market resulting from US ADDs. Model estimates indicate that, on average, roughly one quarter to one third of the value of Japanese exports to the US thought to be *destroyed* by a US ADD is actually *deflected* to the EU in the form of a contemporaneous increase in exports. Finally, we present evidence that US ADDs impose terms-of-trade externalities on non-targeted markets. We find that US duties on Japanese exports are associated with substantially lower Japanese export prices in the EU market.

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1 Introduction

Does a large importing country's use of antidumping impose externalities on countries other than the target of the trade remedy action? Most research on antidumping has focused on its economic costs from the perspective of the countries directly involved in the antidumping action, i.e., the policy-imposing country and the home country of the targeted exporting firms. These costs of antidumping in either the policy-imposing or targeted country have been well documented[1], and we will not formally investigate them here. Instead, the goal of the current paper is to take the analysis one step further and examine the impact of one country's use of antidumping measures on the economic activity in a *third* country not directly involved in the antidumping procedure.

How might a country's use of antidumping impose an externality on a third country? The most direct path is for the imposition of a trade remedy to change trade patterns and thus export prices, i.e., affecting the third country's terms of trade. In a three-country model, Bown and Crowley (2004a) show how country A's imposition of a trade remedy against exporters from country B could lead to increased exports from B to a third country C. If the policy-imposing country is large enough to affect world prices, then a trade policy change would induce a terms-of-trade externality in the sense formulated by Johnson (1953-54) and highlighted by the recent theoretical work on trade agreements by Bagwell and Staiger (1999, 2002). The purpose of this paper is thus to take a first step in empirically investigating whether one country's use of antidumping generates systematic and sizable changes in both trade patterns and the terms of trade in the market of a third, non-targeted country.[2] In the empirical analysis, the US will be the AD-imposing country (A), and we will trace the impact that US ADDs have on Japanese (country B) exports to the EU (country C).

A broader goal for this paper is to contribute to the literature investigating international ramifications of the use of antidumping as a policy instrument. Our contention is that the international linkages of antidumping are important and still not adequately understood. While the frequent use of antidumping by the US and the EU has been the subject of extensive research,[3] and there is even

[1]Such costs include the losses to domestic consumers or downstream users through higher prices, which usually more than offset the combination of any gains to the protected industry in the policy-imposing country and its government's collection of tariff revenue. In the exporting country, firms targeted by the trade remedy face a reduction in exports to the now-protected market and in profitability. Furthermore, the use or existence of an antidumping law has been shown to impose other costs on these two countries, as by inducing socially inefficient "antidumping-jumping" foreign direct investment or collusive behavior among targeted firms.

[2]In this paper we do not intend to look for evidence that systematic changes in trade patterns or the terms-of-trade between B and C is valued or shunned by C's government, i.e. we will *not* attempt to differentiate between the cases in which C's government might consider this a positive versus a negative externality. We leave this follow-up question for future research that we discuss in section 4.

[3]For surveys on the literature focused primarily on the US and EU, see Blonigen and Prusa (forthcoming) and

an evolving literature examining its use in other countries, including some developing countries (e.g., Francois and Niels, 2004); understanding the international aspects of antidumping becomes increasingly important as its use rises and antidumping laws proliferate worldwide, as has been the recent trend (Miranda et al., 1998). Some of the worldwide proliferation is attributable to countries using antidumping in order to establish a credible retaliation device. Thus, proliferation may continue until all countries have adopted AD laws and the threat of AD use is a deterrent to countries using it in practice (Prusa and Skeath, 2002; Blonigen and Bown, 2003).[4] This paper seeks to extend our understanding of the international ramifications of antidumping use by first documenting the impact of such use on third countries' trade and prices. Given this evidence, we then provide a discussion of the potential importance of this policy externality as a factor contributing to the worldwide proliferation of antidumping as well as other related research.

This paper takes the US and the EU - two of the largest import markets globally (which also happen to be two of the most historically active users of antidumping) - and investigates in detail the cross-country implications of US antidumping use on trade patterns and the terms of trade. In our econometric investigation, we take elements from Prusa (1997, 2001) and Bown and Crowley (2004a) and track the exports of a sizable country (Japan) as one potential link through which the international externality of antidumping action may be transmitted. In terms of our formal empirical investigation, we first take an estimation framework similar to Prusa (1997, 2001), and use product-level data to estimate the impact that US ADDs on Japanese and third country exports have on US imports from Japan over the period 1992-2001.[5] We expect a US ADD on Japanese exports to be associated with a reduction in Japanese export growth to the US, which we term "trade destruction." Furthermore, a US ADD on third-country exporters but not on Japan would be expected to lead to the familiar "trade diversion" associated with Viner (1950), i.e., an increase in Japanese exports to the US market due to imposition of a discriminatory trade policy on a lower-cost foreign competitor. Then we use the methodology of Bown and Crowley (2004a) and match the US imposition of ADDs to Japanese exports to the EU, the sample third market in our application. We expect US ADDs on Japan to lead to surges in Japanese exports to the EU, an outcome we term "trade deflection." On the other hand, if the US had imposed ADDs on EU (as opposed to Japanese) exports, we would

Nelson (2004). Messerlin and Reed (1995) discuss the comparative political-economy aspects of its use across the US and EU.

[4] In this context, the eventual worldwide adoption of antidumping laws would lead each country to have access to the trigger strategy to sustain a self-enforcing, low (cooperative) tariff equilibrium, where antidumping is rarely used, in the spirit of the theory of Bagwell and Staiger (1990).

[5] Konings et al. (2001) provide similar estimates for EU imports affected by the EU's imposition of ADDs as well as the trade of firms not named in an AD investigation.

expect a reduction in Japanese exports of those same products to the EU market, an outcome we call "trade depression." A novel feature of our analysis is an additional investigation of changes in the *prices* of Japanese exports to the EU in relation to the imposition of US antidumping duties on the same products.

Table 1 illustrates why the US, EU and Japan in this configuration are a reasonable threesome to examine, given the context of the questions under consideration. Japan and the EU are both frequent and separate targets of US ADDs, and they are also frequently targeted over the same goods. An additional reason is that both the US and the EU are particularly important export markets for Japanese industries. According to the World Trade Data Base files in Feenstra (2000), the US and EU were Japan's largest and second largest export markets in 1996 - with the US receiving 27.5% of Japanese exports and the EU receiving 15.3% of Japanese exports.

Figure 1 provides a simple illustration of our empirical motivation for investigating the existence of trade destruction and trade deflection, as well as changes in a third country's terms of trade associated with the imposition of US ADDs on Japanese exports. The figure plots an index of Japanese country-specific export values and/or export prices using median rates of change for the Japanese commodities that the US has targeted with AD duties, for the year of the AD investigation (t) and the two years preceding and post-dating the investigation, normalizing the starting point of each index at 100 in $t-3$. The dramatic shrinkage in Japanese exports to the US market in the year of the AD investigation of Japanese exporters (trade destruction) is associated with a substantial increase in Japanese exports of those same commodities to the EU (trade deflection). Furthermore, the imposition of a US ADD on Japanese exports is associated with a fall in the price of those same Japanese product-level exports to the EU market, i.e., a *terms-of-trade improvement* from the EU's perspective.

Figure 2 illustrates the potential trade diversion and trade depression of Japanese exports associated with the imposition of US ADDs on *EU* products that compete in the US and EU markets with non-targeted Japanese exports. The slight increase in Japanese exports to the US market in the year of the US AD investigation of its EU competitors (trade diversion) is associated with a substantial decrease in Japanese exports of those same commodities to the EU (trade depression). Unlike figure 1, there is little change in Japanese export *prices* in the EU market, even though its exports to the EU are falling rapidly. This is consistent with a scenario in which any *increase* in prices associated with the withdrawal of Japanese exports from the EU market (trade depression) is simultaneously balanced by a *decrease* in prices as more EU production is retained domestically, due to the reduction of EU exports associated with the US ADD. In this paper we assess whether the suggestive evidence presented in figures 1 and 2 is statistically and economically significant when we control for other factors that may affect Japanese product-level export prices and growth.

As a preview of our empirical results, we find evidence consistent with the results of Prusa (1997, 2001) that US ADDs on Japan lead to the reduction of Japanese exports to the US, i.e., trade destruction. We also present results that the imposition of ADDs on non-Japanese exporters of products that Japan also exports to the US results in an increase in Japanese exports of those products to the US, i.e., trade diversion. Next, consistent with the pattern of results presented in Bown and Crowley (2004a), we find evidence that US ADDs on Japan lead to an increase in Japanese exports of the same products to the EU, i.e., trade deflection. We then use our simple econometric model to estimate the size of the impact of the ADDs, and we find that, on average, roughly one quarter to one third of the value of Japanese exports to the US that is "destroyed" by US ADDs is actually "deflected" to the EU. Furthermore, the result on trade deflection is particularly strong for Japanese *steel* exports, thus calling into question the effectiveness or even existence of a collusive ("East of Burma") arrangement between Japanese and EU steel producers where it has been alleged that each has restrained from exporting to the other's market. We also present evidence that Japanese exports to the EU fall when the EU is targeted with US ADDs, i.e., trade depression. Finally, we provide evidence that US ADDs on Japan lead to a decrease in the price of those same Japanese exports to the EU, an EU terms-of-trade improvement vis-à-vis Japan.

The rest of this paper proceeds as follows. Section 2 describes our empirical estimation exercise and data. Then, after illustrating the empirical results in section 3, in section 4 we comment further on the potential implications of trade deflection and terms-of-trade externalities for related areas of research on international trade policy. Section 5 concludes.

2 Empirical Models and Estimation

2.1 Empirical model: Japanese exports to the US

To investigate our questions of interest, we first estimate the following reduced-form equation for the growth in the value of Japanese exports to the US of product h at time t, where we define t as the year of the AD investigation

$$\Delta ln(x_{US,ht}) = \Delta\alpha_{Ht} + \alpha_1'\Delta\tau_{Japan,ht} + \alpha_2'\Delta\tau_{i,ht} + \alpha_3'\Delta ln(x_{US,ht-1}) + \Delta\epsilon_{US,ht}, \quad (1)$$

where $\Delta ln(x_{US,ht})$ is Japanese product-level export growth to the US, or the change in the natural logarithm of the value of Japanese exports of product h to the US between years $t-1$ and t. With respect to the explanatory variables, $\Delta\tau_{Japan,ht}$ and $\Delta\tau_{i,ht}$ are the change in the US trade policy against imports of h at time t from Japan and some other exporting country i, respectively, where

the change is equal to zero if no trade remedy is applied or removed. Furerthermore, $\Delta\alpha_{Ht}$ are a combination of industry-time fixed effects designed to control for industry H-specific covariates (e.g., productivity shocks) or US-specific covariates such as changes in aggregate demand or exchange rate movements that may affect Japanese export growth to the US. We define industry H as the 2-digit HS code associated with the 6-digit HS product h. Finally, following the procedures described in Anderson and Hsiao (1981, 1982) and Arellano and Bond (1991), we use an instrumental variables approach to instrumenting for the lagged growth rate, $\Delta ln(x_{US,ht-1})$, in equation (1) with the second lag of the log level of exports of h to the US, $ln(x_{US,ht-2})$.[6]

Our estimation of equation (1) is similar to the basic approaches in Prusa (1997, 2001), which study the effects on US imports of US antidumping measures. However, Prusa focuses on AD cases for the 1980-1994 period, his investigation examines US imports of all products targeted by US AD measures from all foreign sources, and he also uses a slightly different level of aggregation in his analysis.[7] Given our questions of interest, our investigation covers a different time period (1992-2001) and is also different in scope. We examine only Japanese, product-level bilateral exports, and we use trade data at the 6-digit HS level; i.e., the finest available level of disaggregation that is immediately comparable across countries. This comparability is necessary given our focus on linking changes in growth of Japanese exports to the US with changes in growth of Japanese exports to the EU, and the response of each to product-level imposition of US AD measures. Since we take the 6-digit HS product as the unit of observation, a final important difference from Prusa is that we also include in the estimation products that were *not* hit with ADDs (as well as those hit with ADDs); Prusa

[6] Equation (1) derives from an export equation specified in *levels*, given by

$$ln(x_{US,ht}) = \alpha_h + \alpha_{Ht} + \alpha_1'\tau_{Japan,ht} + \alpha_2'\tau_{i,ht} + \alpha_3' ln(x_{US,ht-1}) + \epsilon_{US,ht}. \quad (2)$$

There are two problems to address in estimating equation (2) directly. First, the autocorrelation of $ln(x_{US,ht})$ implies that least squares estimation of (2) yields biased estimates. Second, in a short panel, the number of parameters to be estimated (α_h, α_{Ht}) increases with the number of commodities, so that α_h and α_{Ht} cannot be consistently estimated. Furthermore, even taking the first lag of (2) and subtracting this from (2), direct estimation of the resulting equation would yield biased coefficients because the lagged difference in the log of exports $[ln(x_{US,ht-1}) - ln(x_{US,ht-2})]$ is correlated with the error term $(\epsilon_{US,ht} - \epsilon_{US,ht-1})$. To address both problems, we follow Arellano and Bond (1991) and estimate the first difference of (2) and instrument for the lagged change in Japanese exports to the US with the lagged level, i.e., by instrumenting for $\Delta ln(x_{US,ht-1})$ with $ln(x_{US,ht-2})$. While we do not report them here to conserve space, F-tests on this and the instruments discussed below confirm the quality of the second lag of the log level as a strong instrument.

[7] For the first half of the sample, Prusa uses the best available data at the 5 or 7-digit TSUSA import level, whereas for the period after 1988 he uses the slightly more disaggregated 10-digit HTS level of US imports. Note, however, that a unit of analysis for one of our observations is the 6-digit HS product, whereas Prusa takes the aggregated imports of all products subject to a given US AD measure as his unit of observation.

includes only products that were ultimately hit with ADDs.

2.2 Empirical model: Japanese exports to the EU

To investigate the impact of US AD measures on Japanese export growth to the EU, we extend the initial empirical exercise by using an approach similar to Bown and Crowley (2004a) and estimating the following equation for the growth in the value of Japanese exports to the EU of product h at time t:

$$\Delta ln(x_{EU,ht}) = \Delta\beta_{Ht} + \beta_1' \Delta\tau_{Japan,ht} + \beta_2' \Delta\tau_{EU,ht} + \beta_3' \Delta ln(x_{EU,ht-1}) + \beta_4' \Delta ln(x_{US,ht-1}) + \Delta\epsilon_{EU,ht}, \quad (3)$$

where $\Delta ln(x_{EU,ht})$ is Japanese product-level export growth to the EU, or the change in the natural logarithm of the value of Japanese exports of product h to the EU between time $t-1$ and t. Many of the explanatory variables are defined just as they were in equation (1). For example, $\Delta\tau_{Japan,ht}$ ($\Delta\tau_{EU,ht}$) is the change in the US trade policy against imports of h at time t from Japan (the EU), where the change is equal to zero if no trade remedy is applied or removed. Furthermore, $\Delta\beta_{Ht}$ are again industry-time combination fixed effects controlling for either industry H-specific covariates (e.g., productivity shocks), or EU-specific covariates such as changes in aggregate demand or exchange rate fluctuations that affect Japanese export growth to the EU. We again use an instrumental variables approach and instrument for the lagged growth rate, $\Delta ln(x_{EU,ht-1})$, in equation (3) with the second lag of the log level of exports of h to the EU, $ln(x_{EU,ht-2})$.

The other explanatory variable included in equation (3), $\Delta ln(x_{US,ht-1})$, is designed to control for the concern that any apparent trade deflection identified by our estimates is not really trade deflection in response to a US ADD, but a surge in Japanese exports to the EU in t that is one period behind the surge in Japanese exports to the US that set off the AD investigation in the first place (in $t-1$), e.g. perhaps both resulting from the same Japanese productivity shock. Just as was the case in equation (1), here we also instrument for $\Delta ln(x_{US,ht-1})$ with the second lag of the log value of Japanese exports to the US, i.e. $ln(x_{US,ht-2})$.[8]

2.3 Empirical model: Japanese export prices in the EU market

Finally, to investigate the impact of US AD measures on Japanese export prices in the EU, we estimate the following equation for the percent change in the unit value of Japanese exports to the

[8]Furthermore, we also note that our results presented below are robust to using the third lag of the log value of US exports as an instrument. As use of this instrument shortens an already short time dimension in our panel of data, we focus here on the estimates that use the second lag.

EU of product h at time t:

$$\Delta ln(p_{EU,ht}) = \Delta\gamma_{Ht} + \gamma_1'\Delta\tau_{Japan,ht} + \gamma_2'\Delta\tau_{EU,ht} + \gamma_3'\Delta ln(p_{EU,ht-1}) + \gamma_4'\Delta ln(x_{US,ht-1}) + \Delta\eta_{EU,ht}, \quad (4)$$

where $\Delta ln(p_{EU,ht})$ is the percent change in Japanese export prices in the EU market between $t-1$ and t, and $\Delta\gamma_{Ht}$ are again industry-time fixed effects. In a manner analogous to that described above, we instrument for $\Delta ln(p_{EU,ht-1})$ with $ln(p_{EU,ht-2})$ and $\Delta ln(x_{US,ht-1})$ with $ln(x_{US,ht-2})$.

2.4 Data

2.4.1 Trade data

To estimate the models, we use product-level data on Japanese exports to the US and EU at the 6-digit Harmonized Schedule (HS) level, available from the UNCTAD TRAINS (various issues) data set. For 1990-2001, we are able to use TRAINS to create a data set of the *value* of Japanese exports to the US and to the EU, in order to estimate equations (1) and (3). According to our available data for the 1990-2001 period, Japan exported products under roughly 4600 different 6-digit HS codes to the US, and roughly 4000 different 6-digit HS codes to the EU. Furthermore, for the 1990-1999 period, TRAINS also has available a series of the *quantity* of Japanese exports to the EU, which we use to create a series of Japanese export prices (unit values) associated with its exports to the EU market, which we use to estimate equation (4).

It should be noted that there are a number of shortcomings to using the TRAINS data set to derive the price measure used in the estimation of equation (4). For a number of products with a positive *value* of trade, the associated *quantity* measure may be missing or even zero (as the recording level may be in the thousands or millions of units), which serves to eliminate a substantial number of observations from the analysis. Thus, of the roughly 4000 different 6-digit HS products with *value* of Japanese export data to the EU, we are only able to generate price series for just under 3000 of those 6-digit HS codes. A second and more general concern is that our requirement for comparability of data across countries mandates our use of the 6-digit HS level of data, which is an aggregation of more disaggregated trade at the 8- or 10-digit level, while antidumping duties are typically applied at the 8- or 10-digit level. If the duties are not applied uniformly across subcategories within a 6-digit HS code, there could be trade diversion with implications for product quality *within* a 6-digit HS code that may also be affecting the price measure.[9] Finally, the TRAINS data is recorded as a c.i.f. (cost, insurance and freight) value - thus it is possible that changing trade costs over time would be

[9]Furthermore, given that antidumping duties are typically applied at the 8- or 10-digit HS level, and because we use 6-digit HS trade data, our results using the *value* of trade specifications may be estimated imprecisely to the extent

reflected as changes in our particular price measure. With these caveats in mind, we nevertheless use this measure in our first pass at the data for the initial terms-of-trade investigation.

2.4.2 US trade remedy policy variables

The main explanatory variables of interest in equations (1), (3) and (4) are the changes in US import policy facing a commodity h ($\Delta\tau_{Japan,ht}, \Delta\tau_{i,ht}$) exported by Japan or another country i to the US. We collected data on the US antidumping duties imposed against individual countries at the 6-digit HS level from 1992 through 2001 from a variety of US government publications, most notably the *Federal Register.*[10] From this data, we first construct a panel of indicator variables in which the indicator is equal to 1 if a US antidumping policy change is made, i.e., if an AD duty is imposed or removed against Japan or another exporting country i for HS commodity h in year t. We have also collected data on the *level* of applied AD duties, which we use as our key policy variable when the AD measure was applied to Japanese or EU exports. Where it is important to examine the impact of US AD measures against multiple and/or non-EU third countries' exports to the US, we use an indicator in lieu of the actual applied duty.[11]

3 Empirical Results

3.1 Japanese exports to the US: trade destruction and trade diversion

Table 2 illustrates our first set of results, presenting estimates for the impact of US AD measures on Japanese exports to the US over the 1992-2001 period and our evidence of trade destruction and trade diversion. The first three rows present evidence on the impact on Japanese export growth to the US in year t of a US AD investigation in year t, $t-1$ or $t-2$ that resulted in duties on exports from Japanese firms. The negative and statistically significant coefficient estimate in year t is

that variation in a given 6-digit product is driven by variation in 8- or 10-digit products that were not subject to the antidumping action.

[10] Following Bown and Crowley (2004a), we also constructed and employed indicators to control for whether Japanese exporters of product h faced the removal of an AD measure (e.g., after a Sunset Review) as well as the imposition or removal of a US safeguard measure. To conserve space, we do not report these estimates as our focus here is on the application of antidumping duties. These estimates are available from the authors upon request.

[11] One concern with using duties applied against third countries is how to average the measure when there are multiple third countries that face US ADDs, which happens frequently. Since the applied duty facing one country's exporters at the 6-digit level is already an average of the trade-weighted average duty applied at the 10-digit level as reported in the *Federal Register,* further averaging that duty across multiple countries (without the possibility of trade-weighting the average) would likely only serve to generate substantial noise in the data. The applied duty rates are from the Blonigen (2004) US antidumping database website and updates from the *Federal Register.*

indicative of *trade destruction*. Specifically, in column (1), imposition of a 1 % US AD duty on Japan at time t is associated with a 0.681 percentage point reduction in the growth of Japanese exports to the US between $t-1$ and t. Imposition of a US AD duty at time t had no additional statistically significant effect on the growth of Japanese exports to the US in the next period, though curiously it is associated with a *positive* growth of exports two periods later (0.547). However, this result is not robust to minor changes in the specification, for reasons that we will describe momentarily. Nevertheless, the year t effect is robust and is also economically significant, given that AD duties on Japanese exports are frequently over 40%. It is a sizable impact even though the trade-weighted average growth in product-level Japanese exports to the US is 28.3% per annum over our 1992-2001 sample of data.

Continuing to the bottom half of column (1), the next set of estimates provides evidence on the impact on Japanese export growth to the US in year t of a US ADD year t, $t-1$ or $t-2$ investigation that resulted in duties on exporters from a third country i (e.g., the EU, Korea). The positive coefficient estimate in year t is indicative of *trade diversion*: the US ADDs on a third country's exports lead to an increase in Japanese exports to the US of that same product. Recall that the policy variable here is not the size of the duty but simply an indicator that the US imposed an AD duty on a product h from a Japanese competitor country i. Thus, in terms of the economic significance of the estimate in specification (1), an AD duty on a third country in year t that is not also applied on Japanese exports leads to a 44.9 percentage point increase in the growth of Japanese exports to the US market between $t-1$ and t. Next, the interaction of the AD policy on country i with an indicator that country i is the EU finds *no* statistically significant *differential* trade diversion impact when the EU was the third country i that faced the US ADD versus another third country. Finally, some of the trade diversion gains experienced in t are eliminated in the next period $(t+1)$. One explanation is that the US later responded to the trade diversion surge from non-targeted producers by simply targeting them with an ADD of their own one period later.

The fundamental difference between specifications (1) and (2) is the definition of the dependent variable, i.e., the growth rate in Japanese exports of commodity h to the US between $t-1$ and t. In specification (1), we use standard log growth rate measures and thus an unbalanced panel of data where we lose any observations for Japanese exports to the US of a particular product being zero in either t or $t-1$. In specification (2), we address this particular issue by using the Davis and Haltiwanger (1992) approach for defining the growth rate, so that the estimation may capture the impact of entering and exiting Japanese exporters.[12] The results from specification (2) indicate that, when controlling for the presence of entering and exiting exporters, the *trade destruction* that

[12]The Davis and Haltiwanger application for our export growth rate measure would be

is introduced in t is not eliminated by increased trade two periods later. Furthermore, while the trade diversion of existing producers that occurs in t may be eliminated in $t+1$ (perhaps because of subsequent ADDs filed by the US), allowing the estimation to account for new entrants leads to an additional increase in export growth two periods later.

3.2 Japanese exports to the EU: trade deflection and trade depression

Columns (3) and (4) of table 3 present estimates from equation (3) examining the response of Japanese exports to the EU when the US imposes ADDs. Here the first three rows would present evidence of *trade deflection* - Japanese products subject to US ADDs experience an increase in export growth to the EU. This corresponds to the *trade destruction* results of columns (1) and (2) of table 2 for the same explanatory variables. When Japanese exports to the US market decline because of US ADDs, there is an associated increase in Japanese exports to third markets like the EU. The estimate suggests that imposition of 1% US ADD on Japanese exports in year t is associated with a 0.322 percentage point increase in Japanese exports to the EU in t and an additional 0.507 percentage point increase in Japanese exports to the EU two periods later. These are also sizable effects, as the trade-weighted average annual growth rate in product-level Japanese exports to the EU is 23.3% during our sample. In section 3.5 below we will compare the *size* of the implied trade deflection to the EU with the destroyed trade in the US market estimated earlier.

The estimates from the second set of variables in rows four through six of table 3 reveal some weak evidence of *trade depression.* When the US imposes an ADD on one of Japan's competitors (e.g., EU exporters) in the US market but *not* on Japanese exporters, we saw from specifications (1) and (2) of table 2 that Japanese exports to the US increase, i.e. trade diversion. From where does that increase in Japanese exports come? This result suggests one potential explanation - some of the increase in exports to the US comes through the reduction of Japanese exports to the EU; more EU production is now retained domestically as it cannot be exported to the US because of the AD measures in place. The estimates for these explanatory variables also use the size of the US AD duty, this time the duty imposed on EU exporters. A 1% US ADD on EU exporters in year t is associated with a 0.885 percentage point reduction in growth of Japanese exports to the EU market in year t in specification

$$\Delta x_{US,ht} \equiv \frac{x_{US,ht} - x_{US,ht-1}}{1/2(x_{US,ht} + x_{US,ht-1})},$$

where $x_{US,ht}$ ($x_{US,t-1}$) is the 6-digit exports of product h to the US in year t ($t-1$). This measure of export growth is symmetric around zero and lies in the closed interval [-2,2], with trade flows that end (start) at zero corresponding to the left (right) endpoint. Davis and Haltiwanger note that this measure of the growth rate is monotonically related to the conventional growth rate measure, with the two measures being approximately equal for small rates of growth.

(3), though this estimate is not statistically significant. The estimate is significant, however, when we redefine the dependent variable in specification (4) to allow for entering and exiting exporters using the Davis and Haltiwanger (1992) approach to defining growth rates, as we did in table 2. Finally, to determine the combined effect on Japanese exports to the EU of a US ADD imposed on *both* Japanese and EU exports of the same product, simply sum the coefficient estimates from the first and fourth rows for a given year t. Thus a 1% ADD imposed on both the EU and Japan is associated with a -0.563 (=0.322 - 0.885) percentage point reduction in growth of Japanese exports to the EU in t, or a net result of *trade depression*.

The signs of the estimates presented in table 3 are broadly consistent with the pattern of results found in Bown and Crowley (2004a). The only major difference is that the EU-specific estimates for trade deflection and trade depression presented here are generally two or even three times *larger* in magnitude. This result is not surprising given that Bown and Crowley (2004a) report estimates for the impact of trade deflection and trade depression that is averaged across 36 of Japan's export destination countries. As the current exercise focuses only on the EU, which is Japan's second largest trading partner, we would expect much of the trade deflection and trade depression to be concentrated in this market.

3.3 The impact of US ADDs on Japanese export prices in the EU

Column (5) of table 3 presents estimates from equation (4), which investigates a previously unexamined question concerning the impact of US ADDs on Japanese export *prices* in the EU market.[13] The imposition of a US ADD on Japanese exporters (top three rows) is associated with a substantial reduction in the price of Japanese exports of affected products to the *EU market*, i.e., a terms-of-trade improvement from the EU's perspective. A 1% US ADD on Japanese exports is associated with 0.616 percentage point reduction in Japanese export prices in the EU in year t, and this is further reduced by 0.924 percentage points one period later. These are significant effects given the size of many US ADDs and that both the median (1.5%) and mean (0.4%) annual growth rate of the price of Japanese exports to the EU are fairly close to zero in the data set used for our estimation.

On the other hand, the US imposition of ADDs on EU exporters has little impact on the price of those same Japanese exported products to the EU market - in $t+1$ there is a significant positive effect, but this is almost entirely eliminated the next year. What would account for no net price-impact of US ADDs on EU exporters even with the existence of *trade depression*? One explanation is that while

[13] Before estimating the model, we do drop outlier observation for which it is likely that there is mismeasurement in the quantity import data, our rule being to drop observations with quantity level growth of more than 500% or less than -500% over a given year.

a reduction in Japanese exports to the EU would, ceteris paribus, lead to an *increase* in the price of Japanese exports to the EU, simultaneously there is likely to be an offsetting *decrease* in prices for these same goods as more EU production is retained domestically, due to the US ADD.[14]

3.4 The impact of US ADDs on steel versus non-steel exports

Given that so much of the US antidumping caseload involves *steel* products, a natural exercise is to investigate the impact that steel products have on the estimation. Separating out the impact of ADDs on steel versus non-steel products also allows us to investigate the effectiveness of an alleged cartel in existence between EU and Japanese steel producers that has been referred to as the "East of Burma Agreement."[15]

Consider then the estimates presented in table 4, where we essentially re-estimate specifications (2) (of table 2) and (4) (of table 3) but now also interact each of the policy variables with an indicator variable that takes on a value of 1 whenever the 6-digit product h was in chapter 72 or 73 of the HS code, where most steel imports are classified. Thus the estimate for the steel indicator reflects whether there is a *differential* impact that the AD policy has on the export of steel products, relative to the average impact on non-steel products. As indicated by specification (6) which again examines the impact on Japanese exports to the US, a US ADD generates period t trade destruction and trade diversion that is even stronger for steel than non-steel products.

With respect to the impact of US ADDs on Japanese exports to the EU, the results from specification (7) of table 4 also indicate that, if anything, AD policies on steel have an even greater impact than they do on non-steel products.[16] In fact, these estimates indicate that the *trade deflection* that

[14] We do not use the Davis and Haltiwanger approach for defining the percentage change in import prices, as no data for the unit value in either t or $t-1$ is not likely to imply a zero *price.*

[15] Frederic Jenny, Vice President of the French Competition Authority and Chairman of the WTO Working Group on Competition, has described the cartel as the following,

> "The most famous [cartel], because its a current one, is the East of Burma Agreement in steel, which divides the world between the European mills and the Asian mills along the line, which is East of Burma. Each side cannot export more than four hundred thousand (400000) tons to the other side. If any violators are found out then the manufacturers of the other side have the right, according to the cartel rule, to dump steel in their country up to twice the amount that the violator has exported above and beyond his quota. (Jenny, 2001).

[16] This result differs from Bown and Crowley (2004a). There the authors examined Japanese exports to 36 trading partners and found that, with respect to all of its trading partners, *non-steel* products on average experienced more trade deflection than steel products. One explanation for the sizable deflection associated with Japan-EU steel trade identified here is the nature of their bilateral trading relationship, i.e., that most of the Japanese exports to the EU in categories that are hit by US ADDs are in fact steel products.

associates a US ADD with increased Japanese exports to the EU in t is entirely due to steel products (0.833), and furthermore, *non-steel* products facing a US ADD in t do not experience trade deflection until two periods later (0.168).

This result on steel versus non-steel trade deflection from Japan to the EU could be due to the fact that a fair amount of steel trade occurs in fairly homogenous products that can respond quickly to changing (i.e., opening and closing) market conditions. Thus, there could be a longer lag for the deflection response for some of the more differentiated, non-steel products. An additional likely explanation is simply that the year t impact of a US ADD on *non-steel* products is imprecisely estimated, given that only a handful of the Japanese products in the data set that are hit with a US ADD and exported to the EU are not categorized in chapter 72 or 73 of the HS code.

Nevertheless, these results on steel product deflection and increased Japanese steel exports to the EU call into question either the existence of the "East of Burma Agreement" or the trade-restraining effectiveness of any cartel between Japanese and EU steel exporters during this time period.

3.5 How much of the destroyed Japanese exports to the US gets deflected to the EU?

As a final exercise we use our baseline models to provide "back-of-the-envelope" estimates to calculate how much of the Japanese exports to the US that are thought to be destroyed because of antidumping are actually deflected to the EU market. To derive these estimates we work through three steps. First, for each model, we use the model's parameter estimates to generate predicted values for the dependent variable (the growth rate of Japanese product-level exports), which are then used along with the actual value of Japanese exports in $t-1$ to generate model predictions for the value of Japanese exports in t.[17] Second, we use the model's parameter estimates to calculate predicted values for the dependent variable under the *counterfactual* assumption that the imposed US antidumping duties on Japanese exports had *not* been imposed. As a final step, we then compute the *difference* between the model's predicted value of trade in t and this counterfactual value of trade in t. For the model estimated on Japanese exports to the US, this difference is our measure of *destroyed* trade for each observation in which the US imposed an ADD on Japanese exports. For the model estimated on Japanese exports to the EU, the (absolute value of this) difference is our measure of *deflected* trade for each observation in which the US imposed an ADD on Japanese exports.

Suppose we compare the estimates of *destroyed* and *deflected* trade by AD action across the two

[17] An alternative approach would be to simply use the value of exports in t as revealed by the data. Unfortunately, under our assumptions about counterfactual growth, this method generates some estimated *negative* values for deflected trade and *positive* values for destroyed trade.

models. If we use the standard, log growth rate measures for the models estimated in specifications (1) and (3), the mean level of destroyed trade at the 6-digit HS level for a product hit with a US ADD was $12.4 million, the mean level of deflected trade to the EU was $3.2 million, and the mean ratio of deflected trade to destroyed trade in year t across 6-digit HS products that were hit with a US ADD was 31.3%. On the other hand, comparing the predictions that use the growth rate measures that allow for entering and exiting exporters of specifications (2) and (4), the mean level of destroyed trade was $11.9 million, the mean level of deflected trade was $2.4 million, and the mean ratio of deflected trade to destroyed trade across products hit with a US ADD was 25.1%. Thus, the models predict that, on average, roughly one quarter to one third of the value of Japanese exports in year t *destroyed* by a US ADD is actually *deflected* to the EU in the form of increased exports.

4 Implications for Other Trade Policy Research

Given evidence that US antidumping policy with respect to Japan has a third-country impact on both the EU's imports and its terms of trade, what are the implications of this result? First, to think about the expected *sign* of the international externality identified by our analysis, it is illustrative to use the framework developed in the political economy literature (Grossman and Helpman 1994; Goldberg and Maggi, 1999). These types of models allow for governments' objective functions to place differing weights on the welfare of various sectors in the economy. In the context of our results, if the EU government valued the increased imports from Japan, e.g., because of weight given to lower consumer prices or an expanded set of varieties, then the US use of antidumping against Japan in this context would generate a *positive* externality from the perspective of the EU. On the other hand, if policy makers in the EU considered increased trade from Japan to be a source of concern, e.g., because the exports placed unwelcome adjustment pressure on or led to lower profits in a politically important domestic industry that competed locally with Japanese exports, then US use of antidumping against Japan would generate a *negative* externality from the EU perspective.

4.1 Research on the worldwide proliferation of trade remedies

The empirical evidence of trade deflection presented above suggests a new and unexamined explanation for the proliferation of AD laws and the use of AD and other trade remedies worldwide that has been documented by Miranda et al. (1998). Retaliatory explanations for the proliferation have been proposed and examined by many researchers, including Prusa and Skeath (2002) and Blonigen and Bown (2003), but the retaliatory explanation is quite different from the explanation suggested by the analysis undertaken here. A logical extension of our investigation is to examine whether, when a

large importing country like the US imposes ADDs on a large exporter like Japan, so that Japan's exports are deflected to a third market like the EU, the EU responds to the deflected Japanese exports by imposing ADDs of its own. Put a different way, to what extent does the EU consider the US use of ADDs as generating *negative* externalities to which it must react with a policy response of its own trade remedy?[18]

4.2 Research on WTO dispute settlement

Finally, the existence of trade deflection has important implications for two related areas of research in dispute settlement under the World Trade Organization: 1) the conditions under which aggrieved countries resort to use of the dispute resolution system, and 2) the implications for auctioning retaliation rights to compensate complainant countries when a respondent country that loses a dispute refuses to bring a WTO-inconsistent policy into conformity with its obligations.

The ability of some exporting countries to deflect trade is likely to affect the use of the WTO's dispute settlement system for addressing Members' concern over any WTO-inconsistent application of trade remedies. If a country is able to deflect trade substantially in response to the imposition of an ADD in one market, even if the ADD is imposed in a WTO-inconsistent manner, the affected exporters may be less likely to spend the resources necessary to challenge and litigate the issue at the WTO.[19] Bown and Crowley (2004b) are examining the ability of developing countries in particular to deflect trade. The goal of this ongoing research is to examine country, industry, product, or market characteristics that may affect an exporter's capacity to deflect trade so as to provide information that may be useful for other research questions in trade policy.

The existence of deflected trade is also an important theoretical assumption necessary for the recent theoretical work on auctioning retaliation rights for dispute settlement at the WTO, as proposed by

[18]While it is not an example of antidumping use, an anecdotal case in the spirit of this explanation is the worldwide steel "safeguard" trade remedy use in 2002. Shortly after the US announcement of the impending safeguard tariff and quotas on imported steel in March 2002, the European Union and a number of other steel-importing countries responded by imposing steel safeguard protection of their own. As an explanation, the EU partially justified its trade policy change with the following 25 March 2002 press release,

> "[w]hilst US imports of steel have fallen by 33% since 1998, EU imports have risen by 18%. Given that worldwide there are 2 major steel markets (EU with 26.6m tonnes of imports in 2001 and US with 27.6m tonnes), this additional protection of the US steel market will inevitably result in gravitation of steel from the rest of the world to the EU. This diversion ["deflection"] is estimated to be as much as 15m tonnes per year (56% of current import levels) " (EU, 2002).

[19]Bown et al. (2003) discuss other potential determinants of which US trade remedies get challenged at the WTO.

Bagwell et al. (2003).[20] In their model, differences in the values that third-country governments would place on the deflected trade (i.e., whether they consider it a positive or a negative externality) affect the actions of potential bidders for retaliation rights and thus both the likelihood of an equilibrium where the right to retaliate is auctioned to a country that will follow through and actually retaliate, as well as the size of the equilibrium bid and the extent of compensation to the complainant country.

5 Conclusion

This paper investigates some of the potential international ramifications of antidumping use by a large importing country. We document evidence from the 1992-2001 period that the US use of AD duties on Japanese exports is associated with surges of Japanese exports to the EU market (trade deflection) as well as a simultaneous reduction in the price of Japanese exports to the EU market (an EU terms-of-trade improvement). Finally, our models predict that, on average, between one quarter and one third of the value of Japanese exports to the US thought to be *destroyed* by an antidumping duty is actually *deflected* to the EU market as a contemporaneous increase in exports.

The international externalities of US antidumping are not only important from the perspective of policy, but they also have implications for a body of related economic research that takes the existence and importance of terms-of-trade externalities in particular as a possible motivation for trade agreements like the WTO. Our hope is that this will be just one of many papers that analyzes in detail the international externalities associated with antidumping. Continued research is necessary if we are to understand the global nature of the costs associated with the use of this trade policy instrument, as well as the causes of its proliferating use worldwide.

[20] For a non-technical version of the arguments made in their theoretical paper, see Bagwell et al. (2004). They note that a motivation for their theoretical investigation was a Mexican (WTO, 2002b) policy proposal highlighting the ineffectiveness of WTO retaliation rules from the perspective of small countries. Mexico's argument was that imports of developing countries are too small to allow them to make credible retaliatory threats, even if sanctioned to do so by panel ruling in a formal WTO trade dispute. This argument is consistent with the empirical results of Bown (2004a,b).

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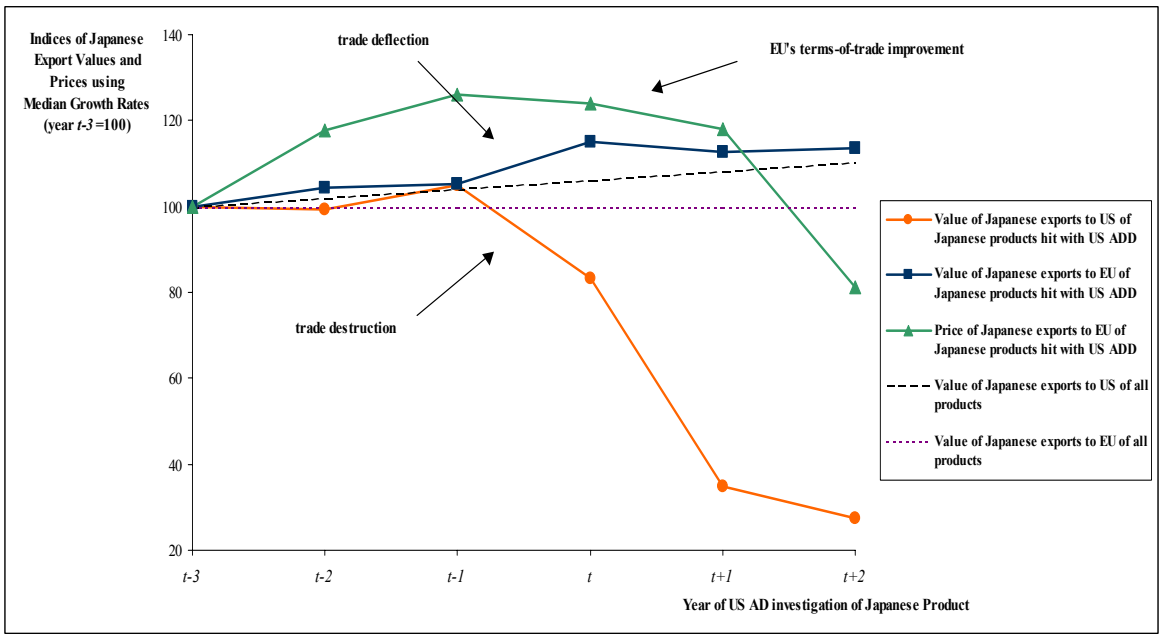
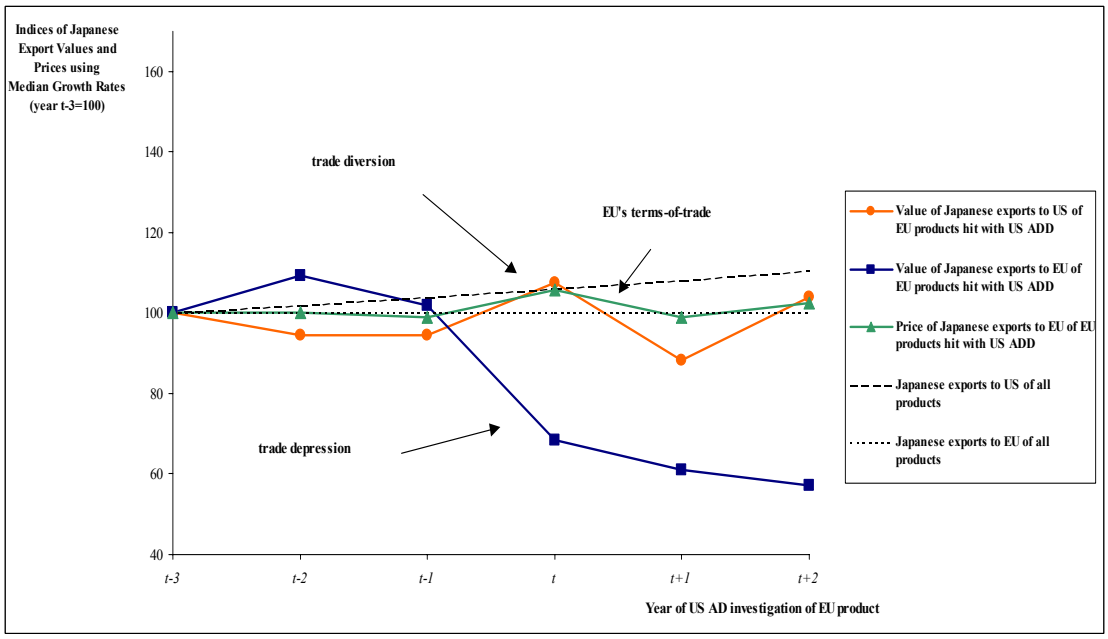
Figure 1: Japanese Export Values and Prices when Japanese Products are Hit by US ADDs



Note: 6-digit HS products in which Japanese exporters alone were hit with US antidumping duties. Median growth rate based on a consistent series of 26 observations for the value of trade measures and 17 obervations for the export price measure.

Figure 2: Japanese Export Values and Prices when EU Products are Hit by US ADDs



Note: 6-digit HS products in which EU exporters alone were hit with US antidumping duties. Median growth rate based on a consistent series of 28 [trade diversion] and 41 [trade depression] observations for the value of trade measures and 19 obervations for the export price measure.

Table 1: Products Exported by Japan that were subject to a US ADD, 1992-2001

Description	Number of six-digit HS products
US ADDs on Japanese exported products	88
…Where Japan exported the same product to the EU	67
…and the EU also faced US ADDs on the same product	41
…and the EU did not face US ADDs on the same product	26
…Where Japan did not export the same product to the EU	21
US ADDs on EU exported products*	73
…Where Japan also faced US ADDs on the same product	41
…Where Japan did not face US ADDs on the same product	32

Source: data compiled by the authors.
* Conditional on Japan exporting that product to the US.

Table 2: The Estimated Impact of US ADDs on Japanese Export Values to the US, 1992-2001

Explanatory Variables	Dependent Variable: % Change in the **value** of Japanese exports to the US in *t*	
	Standard log growth rate measure	Zeros-corrected growth rate measure
	(1)	(2)
Policy Variables		
Trade Destruction:		
US AD duty imposed on Japan exports of *h* in year *t*	-0.681***	-1.013***
	(0.202)	(0.321)
US AD duty imposed on Japan exports of *h* in year *t-1*	-0.389	0.079
	(0.501)	(0.193)
US AD duty imposed on Japan exports of *h* in year *t-2*	0.547***	-0.148
	(0.181)	(0.189)
Trade Diversion:		
US AD policy imposed on country *i* exports of *h* in year *t*	0.449*	0.977***
	(0.257)	(0.112)
…interacted with indicator that country *i = EU*	-0.284	-0.045
	(0.268)	(0.140)
US AD policy imposed on country *i* exports of *h* in year *t-1*	-0.356**	-1.017***
	(0.179)	(0.116)
…interacted with indicator that country *i = EU*	-0.249	-0.114
	(0.230)	(0.152)
US AD policy imposed on country *i* exports of *h* in year *t-2*	0.076	0.280**
	(0.149)	(0.120)
…interacted with indicator that country *i = EU*	0.224	0.078
	(0.211)	(0.158)
Other Control Variables		
Instruments† for % change in the value of Japanese exports to the US in *t-1*	0.745***	0.213***
	(0.028)	(0.017)
Two-digit HS and year combination fixed effects [number of fixed effects]	Yes [850]	Yes [960]
US AD policy removal variables, SG policy application and removal variables†	Yes	Yes
Observations	26482	44089
R^2	0.11	0.04

Notes: In parentheses are White's heteroskedasticity-consistent standard errors corrected for clusters defined on the a variable defined as the HS6 product and year combination. Finally, ***, ** and * denote variables statistically different from zero at the 1, 5 and 10 percent levels, respectively. † Estimates available from the authors upon request.

Table 3: The Estimated Impact of US ADDs on Japanese Export Values and Prices in the EU, 1992-2001

Explanatory Variables	**Dependent Variable:** % Change in the **value** of Japanese exports to the EU in *t*		**Dependent Variable:** % Change in the **price**[±] of Japanese exports to the EU in *t*
	Standard log growth rate measure	Zeros-corrected growth rate measure	Standard log growth rate measure
	(3)	(4)	(5)
Policy Variables			
Trade Deflection:			
US AD duty imposed on Japan exports of *h* in year *t*	0.322* (0.179)	0.304*** (0.111)	-0.616*** (0.233)
US AD duty imposed on Japan exports of *h* in year *t-1*	-0.113 (0.189)	-0.201 (0.134)	-0.924* (0.524)
US AD duty imposed on Japan exports of *h* in year *t-2*	0.507** (0.228)	0.309*** (0.119)	0.349 (0.232)
Trade Depression:			
US AD duty imposed on EU exports of *h* in year *t*	-0.885 (0.718)	-0.805*** (0.308)	0.049 (0.328)
US AD duty imposed on EU exports of *h* in year *t-1*	0.249 (0.591)	0.532 (0.317)	0.516* (0.280)
US AD duty imposed on EU exports of *h* in year *t-2*	0.767 (0.772)	0.003 (0.379)	-0.354** (0.173)
Other Control Variables			
Instruments[†] for % change in the value of Japanese exports to the EU in *t-1*	0.505*** (0.024)	0.577*** (0.020)	---
Instruments[†] for % change in the price of Japanese exports to the EU in *t-1*	---	---	0.235*** (0.057)
Instruments[†] for % change in the value of Japanese exports to the US in *t-1*	0.161** (0.023)	0.094*** (0.011)	-0.029 (0.028)
Two-digit HS and year combination fixed effects [number of fixed effects]	Yes [839]	Yes [939]	Yes [621]
US AD removal variables, SG application and removal variables[†]	Yes	Yes	Yes
Observations	30231	36579	16326
R^2	0.06	0.09	0.41

Notes: [±] In the price regression (5), the price variable is defined as the unit value of exports (=value/quantity), whose data series runs from 1990-1999 only. In parentheses are White's heteroskedasticity-consistent standard errors corrected for clusters defined on the a variable defined as the HS6 product and year combination. Finally, ***, ** and * denote variables statistically different from zero at the 1, 5 and 10 percent levels, respectively. [†] Estimates available from the authors upon request.

Table 4: The Estimated Impact of US ADDs on Japanese Export Values to the US and EU for Steel versus Non-Steel Products, 1992-2001

	Dependent Variable: % Change in the **value** of Japanese exports…	
Explanatory Variables	…to the US in *t* (6)	…to the EU in *t* (7)
Policy Variables	**Trade Destruction:**	**Trade Deflection:**
US AD duty imposed on Japan exports of *h* in year *t*	-0.446*** (0.126)	0.079 (0.085)
…interacted with indicator that *h* = *steel product*	-1.955*** (0.359)	0.833*** (0.270)
US AD duty imposed on Japan exports of *h* in year *t-1*	-0.153 (0.312)	-0.059 (0.151)
…interacted with indicator that *h* = *steel product*	0.357 (0.514)	-0.532* (0.321)
US AD duty imposed on Japan exports of *h* in year *t-2*	0.166 (0.129)	0.168*** (0.039)
…interacted with indicator that *h* = *steel product*	-0.727* (0.420)	0.537 (0.344)
	Trade Diversion:	**Trade Depression:**
US AD policy imposed on country *i* exports of *h* in year *t*	0.489*** (0.144)	-0.813*** (0.322)
…interacted with indicator that *h* = *steel product*	0.664*** (0.177)	-0.258 (0.582)
US AD policy imposed on country *i* exports of *h* in year *t-1*	-0.502*** (0.151)	0.347 (0.586)
…interacted with indicator that *h* = *steel product*	-0.745*** (0.183)	0.625 (0.790)
US AD policy imposed on country *i* exports of *h* in year *t-2*	-0.166 (0.191)	0.326 (0.252)
…interacted with indicator that *h* = *steel product*	0.631*** (0.213)	-0.630 (0.575)
Other Control Variables		
Instruments† for % change in the value of Japanese exports to the US in *t-1*	0.212*** (0.017)	0.095*** (0.011)
Instruments† for % change in the value of Japanese exports to the EU in *t-1*	---	0.577*** (0.020)
Two-digit HS and year combination fixed effects [number of fixed effects]	Yes [960]	Yes [939]
US AD policy removal variables, SG policy application and removal variables†	Yes	Yes
Observations	44089	36579
R^2	0.04	0.09

Notes: In parentheses are White's heteroskedasticity-consistent standard errors corrected for clusters defined on the a variable defined as the HS6 product and year combination. Finally, ***, ** and * denote variables statistically different from zero at the 1, 5 and 10 percent levels, respectively. † Estimates available from the authors upon request.