

Evidence on the Upstream and Downstream Impacts of Antidumping Cases

Corinne M. Krupp
Sanford Institute of Public Policy
Duke University
Durham, NC 27708

Susan Skeath
Department of Economics
Wellesley College
Wellesley, MA 02481

March 2002

Krupp: (919) 613-7395 (phone), (919) 684-2861 (fax), krupp@pps.duke.edu
Skeath: (781) 283-2180 (phone), (781) 283-2177 (fax), sskeath@wellesley.edu

The authors wish to thank Craig Shulman, Jim Hartigan, Tom Prusa, Jeff Wooldridge, participants at the Midwest International Economics meetings, and two anonymous referees for helpful comments. We also acknowledge the Michigan State University Center for International Business for its generous support of this research.

ABSTRACT

“Evidence on the Upstream and Downstream Impacts of Antidumping Cases”

Anecdotal and theoretical evidence suggests that antidumping cases filed on behalf of domestic upstream intermediate products affect not only the upstream competitors, but also the downstream users. We empirically examine these claims using a panel of upstream/downstream product pairs over the 1977-1992 period. The results show that the imposition of antidumping duties in an upstream industry positively affects the quantity and value of domestic upstream production and negatively affects the quantity of downstream production. In addition, we find evidence that duties negatively affect the quantity value of dumped upstream imports (the harassment effect), positively affect non-dumped upstream imports in quantity terms (the diversion effect), and positively affect the value share of upstream domestic production (market-share shifting).

JEL Classification: F13.

1. Introduction

Antidumping laws are a form of “fair” trade protection in which a beleaguered domestic industry may prompt the government to investigate its allegation that a foreign firm has caused it injury by selling at prices below “fair value.” Most industrialized countries have and use these laws, as permitted under the GATT Code Article VI.¹ Since 1980, the number of antidumping investigations filed in the United States and in other countries has risen dramatically.²

This paper empirically examines the market impact of antidumping case filings and duty impositions in upstream (intermediate product) industries under the presumption that effects will be felt by both domestic and foreign competitors in the upstream industry as well as by domestic downstream users of the allegedly dumped good. We focus on a sample of ten US antidumping cases filed between 1978 and 1992 in industries whose products have a well-defined downstream industry customer base. Current U.S. antidumping law does not require the investigating agencies to consider how antidumping duties affect downstream users, but a thorough understanding of the welfare implications of the antidumping laws would be incomplete without an analysis of their impact on the industries upon which duties are imposed and on any downstream buyers.³

Our analysis extends the current empirical literature on the effects of antidumping actions in several ways. First, we add to the fairly small number of papers that use disaggregated and

¹ “Agreement on the Implementation of Article VI of the General Agreement on Tariffs and Trade 1994,” initially negotiated in the 1970 Tokyo Round and recently amended slightly in the 1986-1994 Uruguay Round. The antidumping code is operationalized by the “WTO Antidumping Agreement” under the jurisdiction of the WTO.

² According to the USITC *Antidumping and Countervailing Duty Handbook*, the number of U.S. antidumping cases filed rose from 34 in 1980 to a high of 89 in 1992. An average 45.6 cases per year were filed in the U.S. alone from 1980 to 1996. Worldwide, AD case filings increased from 69 in 1980 to a high of 320 in 1992 and 246 in 1998. (See Prusa and Skeath (2002).)

³ Few countries require consideration of the impact of potential antidumping duties on the customers of the “dumped” good; Canada has a public interest provision, but it has rarely been used and is considered to have been a failure. See Warner (1992) for more information on the Canadian experience.

industry-specific microeconomic data.⁴ Much of the existing research uses aggregate data, as in Finger, Hall and Nelson (1982), although there are a few notable exceptions. Krupp and Pollard (1996) use data disaggregated to the same level that we do here but they collect it for only one industry. Staiger and Wolak (1994) use more aggregate data but try to mitigate the effects of aggregation by incorporating some disaggregated measures. Prusa (1997), who voices concern about the level of aggregation in most studies, uses fairly disaggregated data at the 5-digit Foreign Trade Statistics (TSUSA) level, but addresses a different issue. In this paper, we use 7-digit TSUSA and 8-digit SIC data for our entire sample of industries.

Second, we are able to examine the effects of antidumping case filing and imposed duties on upstream quantities as well as the effects on market shares of imports and of domestic import-competing industries. Our data also allow us to analyze how the downstream users of these upstream inputs are affected by considering changes in downstream production quantities after the antidumping orders are in place.

In addition, we consider some interesting questions raised by the anecdotal evidence. These questions include:

- Is there evidence of market-share shifting towards dumped imports and away from domestic producers and non-dumped imports *prior* to an antidumping investigation?

⁴ Disaggregated data is preferable in analyzing these cases as they are filed on behalf of a specific, narrowly-defined product; domestic production data is not widely available in this form, unlike import data. We also needed cases that had clearly defined downstream users for which production and value data could be collected. Thus, an antidumping case against steel wire nails was out of the question for our purposes (downstream users too numerous and diffuse), although we could analyze a perchloroethylene case because demand for this chemical is driven by drycleaning sales.

- Are there any differences in responses for these firms' behavior after the final antidumping order is handed down? Specifically, is there evidence of diversion away from dumped imports and towards domestic producers and non-dumped imports?⁵
- What are the impacts of the investigation and the imposition of antidumping duties on the value of upstream domestic production and the value of dumped imports? What can we infer about price movement in upstream markets?

While the construction of a richly detailed strategic model of upstream and downstream competition that generates all of the aforementioned testable predictions might have been possible, we contend that the data analysis we conduct is illuminating and useful in its own right. Here, we are not bound by market structure assumptions that such a model would have required; thus, we can examine the above questions irrespective of the types of upstream and downstream market structures relevant to our data. In addition, our inclusion of disaggregated domestic production data allows us to go further than any of the earlier work in this area. We look for, and find to some degree, evidence of the diversion effect as well as of market-share shifting specifically toward domestic production and non-dumped imports.

Finally, to our knowledge, there have been only two other empirical studies of the relationship between upstream and downstream firms and their bids for antidumping protection. Feinberg and Kaplan (1993) examine the tendency of protection to spread downstream and they find some evidence for the two industries they examine that rent-seeking does tend to flow downstream following an upstream bid for administered protection.⁶ Hughes, Lenway, and Rayburn (1997) use stock price data for upstream firms in the U.S. semiconductor industry and

⁵ Staiger-Wolak, Krupp-Pollard, and Prusa all find evidence of a “diversion effect” of market share from dumped to non-dumped imports in the presence of antidumping actions.

⁶ Both antidumping and countervailing duty cases were covered in their analysis.

downstream users in the electronics and computer industries to gauge the effects not only of an antidumping case filing, but also of the ongoing negotiations and industry responses prior to and during the drafting of the 1986 Semiconductor Agreement between the U.S. and Japan. They find positive effects of several key events during this period on both upstream and downstream firm stock prices.

Again, our approach differs from these papers in that we use industry-specific micro-economic data for a larger range of upstream-downstream industry pairs. Further, we investigate the antidumping case impact on the pure quantities and values of upstream imports (both dumped and non-dumped) *and* domestic production, as well as the impact on the quantity produced by downstream users of the upstream inputs. While such a focus necessarily implies a much smaller data set than one in which stock prices are analyzed, we assert that the true impact of the antidumping investigation shines through more clearly in our case. Stock prices can reflect a huge range of factors and, for many companies filing antidumping complaints, the like product over which the case is filed is but one of many products produced.

The broader purpose of this research is to begin to quantify upstream and downstream effects of antidumping investigations on all of the relevant market participants. We know that many firms use substantial amounts of imported inputs in their production processes and maintain supply relationships with both domestic and foreign firms. The literature on economies of scale and trade has taught us that no country can make all varieties of goods efficiently, and that specialization and trade lead to gains for all of the countries involved. The current antidumping law focuses solely on the question of material injury to the domestic industry by the allegedly-dumped imports and the extent of the dumping. Thus, it fails to take into account the pro-competitive effects of trade, and it may lead to additional negative welfare impacts in both

the domestic and importing countries. It is crucial, in this context, to consider the broader implications of antidumping case filings and antidumping duties as we begin to do in this study.⁷

The paper is organized as follows. In Section 2, we discuss our predictions for firm behavior in industries affected by antidumping case filings as well as our data and empirical methodology. In Section 3, we present the results of our quantity and value estimations for the upstream industries, and in Section 4, we analyze the impact of the upstream antidumping cases on the downstream firms using quantity data. Section 5 provides a summary of our findings and some concluding remarks.

2. Predicted Outcomes and Data

A. Predictions for Firm Behavior

Antidumping law requires that a domestic industry show the existence of dumping as well as evidence of injury from that dumping in order to receive protection in the form of antidumping duties. Any legitimate filing of an antidumping case must, therefore, be preceded by import and domestic behavior consistent with such injury.⁸ Then, if injury can be shown, any imposed duties will have an impact on equilibrium market behavior of all players in the industry as well as of any downstream users of the industry's product(s).

Previous work (e.g. Feinberg and Kaplan) suggests that the market impact of upstream AD duties is indeed felt by both upstream competitors and downstream users. In general, following

⁷ The preceding focus on the negative impact of antidumping cases on downstream users has in mind the neoclassical model of trade. In a strategic trade model with positive externalities and technological spillovers between upstream and downstream firms, governments may be able to tax away excess rents earned due to market power and thereby improve welfare. See Brander (1986) and Brander and Spencer (1985). In such a world, downstream firms may favor upstream trade protection since it would improve the global competitiveness of the domestic industry due to the presence of spillovers and external economies associated with having a larger critical mass of industry participants (upstream and downstream) in one country.

⁸ The USITC can dismiss an antidumping case after 20 days if it is found to be completely without merit.

the imposition of AD duties on upstream imports, we would expect to see reductions in the foreign dumping firm's production and market share concurrent with increases in domestic production and market share in the upstream market. If other foreign (non-dumping) firms produce for the upstream market, some of the reduction in dumped imports may also be diverted to these firms. Price increases in the upstream market could lead to an overall decrease in production when domestic and non-dumped import production does not completely offset reductions in dumped imports. An upstream price increase will also alter downstream production decisions, reducing output in that market in the wake of the upstream AD duties.⁹

Additional evidence suggests that there are changes in firm behavior in advance of AD case filings.¹⁰ In particular, we expect that dumped imports will rise prior to a case filing (especially in pure quantity or quantity share terms). Such behavior would be consistent with the alleged material injury to the domestic industry that comes as a result of the dumped imports and that plays a direct role in the initial filing itself. We might also expect the quantity of upstream domestic production and non-dumped imports to fall prior to the antidumping filing if, in fact, the dumped imports squeeze the other competitors out of the market.

B. *Data*

In order to test whether actual outcomes match these predictions, we investigate the impact of AD duties imposed in the U.S. on a set of upstream industries with well-defined downstream users. Our data set consists of thirteen upstream-downstream industry pairs in which antidumping cases were filed during the 1978-1992 period; there are ten upstream and thirteen

⁹ Note that the intuition for these effects can be verified in a simple Cournot model of strategic trade augmented to incorporate explicitly the upstream-downstream aspects inherent to the markets we consider.

¹⁰ See Boltuck and Litan (1991), Hufbauer, Berliner, and Elliott (1986), Pollak (1991), Rushford (1995), and in particular, Bovard (1991).

downstream industries.¹¹ Quantity and value data on the domestic industries were collected at the eight-digit SIC level from the *Annual Survey of Manufactures* and the *Census of Manufactures* (collected every 5 years), both published by the Census Bureau in the U.S. Department of Commerce. We also collected import and export data in quantity and value terms for both upstream and downstream industries using the Department of Commerce Foreign Trade Statistics series FT246 and FT247 (7-digit TSUSA annual import volume and value) and FT446 and FT447 (7-digit Schedule B annual export volume and value). Additional domestic production data at the disaggregated product-specific level for most of the industries came from both the *Survey of Current Business* and the USITC annual publication *Synthetic Organic Chemicals*. We were able to ascertain the downstream customers of the upstream filing industries through the descriptions in the USITC staff reports from the published preliminary and final material injury decisions.

We have one data panel with 10 upstream industries over 16 years and another panel with 13 downstream industries over the same 16 years.¹² We have a subset of nine upstream industries for which data is available in value terms (ethyl alcohol is the only industry in our sample for which production data is not available in value terms); there is also value data for the 12 downstream industries that pair with these nine upstream industries. In addition, we also have a different subset of four upstream industries, including ethyl alcohol, for which data is available in quantity terms; again, there is also quantity data for the four downstream industries that pair with these upstream industries. The upstream industries for which we have a full set of quantity data are methanol, titanium dioxide, ethanol, and nitrile rubber.

¹¹ We have more downstream than upstream industries because some of the upstream products serve as important inputs in more than one downstream industry. All of the upstream-downstream pairings are listed in the appendix.

¹² Although most of the import data is available monthly, we are constrained to use annual data because of our inclusion of domestic production figures that are available only on an annual basis.

While we would have preferred a much larger and broader set of antidumping cases, we faced significant data limitations. Domestic production data for both downstream and upstream industries were not available for many industries involved in antidumping cases during this period. In addition, our work focuses on examining specific impacts of upstream antidumping investigations on downstream behavior, so we chose cases where the upstream product represented a significant input for a rather narrowly-defined set of downstream users. Of the antidumping cases that concern intermediate products, many of these have thousands of downstream uses and often represent a very small share of the downstream users' total costs.¹³ Including such industries would likely have resulted in the finding of considerable spurious correlation in our results, so we chose to focus on those that provided a clear match between upstream input and downstream users and those that had complete trade and production data series for each pair.

We use the upstream and downstream panels separately to determine the answers to the following questions. First, in the upstream market, does the antidumping investigation and/or the imposition of dumping duties have a specific, discernable impact on the behavior of the market participants? Second, do U.S. antidumping investigations and the imposition of duties in upstream industries affect production behavior in the downstream market?

¹³ Examples include the various steel cases, steel wire nails, PET film, sugars and syrups, asphalt shingles, etc. In some cases where the downstream user was well-defined (e.g., motorcycle batteries (motorcycles) and pads for woodwind instruments (woodwind instruments)), domestic production data was not available on an annual basis for the 1978-1992 period.

3. Evidence for the Upstream Market

A. *Quantity Results*

In the upstream market, we first analyze the quantity behavior of domestic production and dumped imports in response to the imposition of AD duties. We then examine the effect of duties on the quantity behavior of non-dumped imports as well. Finally, we consider whether market behavior of the dumping firm(s), or the upstream competitors, changes markedly in the year immediately preceding an AD case filing. In each case, we test the predictions described in Section 2.A. using the 2SLS estimation technique on our four upstream industries with available quantity-based data.

In the first stage of our estimation, we use ordinary least squares to regress the log of downstream demand ($\ln DDEM$) on a set of instruments that includes industry and year dummy variables, an antidumping filing dummy variable,¹⁴ a dumping margin variable, and one-period lagged values of the log of DDEM.¹⁵ In the second stage, we take the fitted values of $\ln DDEM$ and use them to conduct OLS estimation, in pure quantities as well as in quantity shares of apparent consumption,¹⁶ on the following pooled 2SLS regressions:

$$(1) \quad \ln DIMP_{it} = \alpha + \beta \ln DDEM_{it} + \gamma DM_{it} + \sum_{i=2}^4 \delta_i INDUS_i + \varepsilon_{it}$$

$$(2) \quad \ln PR_{it} = \alpha + \beta \ln DDEM_{it} + \gamma DM_{it} + \sum_{i=2}^4 \delta_i INDUS_i + \varepsilon_{it}$$

¹⁴ AD = 1 in the year preceding the filing, 0 otherwise.

¹⁵ We estimate this 2SLS specification to avoid a simultaneity problem associated with including $\ln DDEM$ on the right-hand side of equations 1 and 2 (above). In cases in which there was more than one downstream user, we estimated each of the downstream users separately. We did not use the seemingly-unrelated regressions (SUR) estimation technique given the small size of our data panel. To account for possible serial correlation of the errors across time, we included a lagged value of the dependent variable on the right-hand side; the coefficients on DM remained unchanged. Note that the inclusion of industry and year dummy variables accounts for heterogeneity across industries and over time in all of our estimations.

¹⁶ Apparent consumption is the sum of domestic production (less exports) and imports.

where DIMP = dumped imports, in pure quantities (or shares of apparent consumption (DIMPN)); PR = domestic production, in pure quantities (or shares of apparent consumption (PRN)); DDEM = fitted values of derived demand for the upstream input from its downstream users, in quantity terms; INDUS = set of industry dummy variables to capture industry-specific effects unrelated to the antidumping case; DM = dumping margin variable set to zero in the absence of duties and set to the percentage dumping margin, determined by the Department of Commerce, from the time a dumping margin is announced in Commerce's preliminary finding until the time it is altered or removed.¹⁷

The dumping margin variable (DM) is of primary interest in our first set of estimates. It captures the effect of the relative size and duration of any imposed duties and is hypothesized to have a significant effect on production quantities in the affected industries. Our predictions above suggest that the imposition of antidumping duties will result in a decrease in dumped imports, both in pure quantities and in quantity share of apparent consumption, and an increase in domestic upstream production, both in pure quantities and as a share of apparent consumption. The empirical validation of these predictions for the upstream firms is presented in Table 1.¹⁸

¹⁷ Dumping margins are determined in a preliminary and final DOC investigation, but there is a suspension of liquidation of imports following the preliminary margin announcement. We use the final margins listed in the USITC final determination staff report for consistency, unless the final determination is negative. In those cases, we use the preliminary dumping margin determination made by the Department of Commerce and apply it to the intervening period (fraction of the year) in which these duties are in effect (prior to the negative USITC final ruling). In all cases in which there is more than one "dumping" country, we use an average of the weighted-average country dumping margins as our DM variable.

¹⁸ We estimated many versions of these equations, both explicitly including year and industry dummy variables in the OLS regressions and as instrumental variables in 2SLS regressions. The joint F tests indicated non-significance of the year dummy variables when included in both stages of 2SLS while the industry dummy variables were significant. Thus, we only included the industry dummy variables explicitly in the second stage of the estimation, while both sets of dummy variables are used as instrumental variables in the first stage of the estimation.

Table 1: Upstream 2SLS Regressions – Pure Quantities

Dependent variable	Independent Variables			<u>F</u>	<u>R</u> ²	<u>N</u>
	<u>α</u>	<u>DM</u>	<u>lnDDEM</u>			
(1a) lnDIMP (I)	12.71 (15.9)	-.670** (.370)	-.050 (1.02)	37.11	.78	57
(1b) lnPR (I)	-13.45* (6.65)	.222** (.121)	1.77* (.425)	108.9	.91	60

*(**) = Significant at the 5% (10%) level. Standard errors are in (). (I) indicates presence of industry dummy variables. lnDIMP = log of dumped imports and lnPR = log of domestic production (in pure quantity terms).

In regression (1a), we see that the coefficient on DM is negative and significant at the 10% level, implying that the quantity of dumped imports fell in response to the dumping margin for this subset of industries, all else equal. Because the dependent variable is in logs, this coefficient may be interpreted as implying that, on average, the quantity of dumped imports falls 0.67% for every one-percentage point increase in the dumping margin.

In regression (1b) we observe a positive, significant coefficient on DM, indicating that domestic production rises, on average, 0.22% for every one-percentage point increase in the dumping margin imposed on the import competitors. Note that the DM coefficient in this domestic production regression is smaller than that in the dumped imports regression.

We find somewhat similar results for our regressions using the upstream producers' share of apparent consumption, as shown in Table 2. For dumped imports, the coefficient on DM is negative and significant, as predicted, and it is larger than in the pure quantity regression. It may be interpreted as indicating that, on average, the dumped import share of apparent consumption falls 0.82% for every one-percentage point increase in the dumping margin, ceteris paribus. In the domestic production shares regression, the coefficient on DM is smaller than in the pure

quantity regression, and it is not significant. We note that the average domestic share of apparent consumption for these industries is over 90% for this 16-year period, with the largest standard deviation being 10.93 percentage points (methanol). This may explain why we find no effect on the domestic producers' quantity shares in response to the antidumping duties imposed.

Table 2: Upstream 2SLS Regressions – Quantity Shares of Apparent Consumption

Dependent variable	Independent Variables			<u>F</u>	<u>R</u> ²	<u>N</u>
	<u>α</u>	<u>DM</u>	<u>lnDDEM</u>			
(2a) lnDIMPN (I)	20.77 (14.9)	-.816* (.351)	-1.18 (.953)	10.56	.51	56
(2b) lnPRN (I)	4.68* (.060)	.004 (.025)	-.0106 (.004)	3.12	.09	60

*(**) = Significant at the 5% (10%) level. Standard errors are in (.). (I) indicates presence of industry dummy variables. lnDIMPN = log of dumped imports and lnPRN = log of domestic production (all in quantity shares of apparent consumption).

If we expand our definition of the “domestic” firm to include purely domestic firms *and* non-dumped import competitors, we can address questions of diversion in the presence of antidumping duties. For instance, do both domestic producers and non-dumped imports gain at the expense of dumped imports once dumping margins are imposed? It is possible that other import competitors increase their market presence in response to the “handicapping” of the dumped imports by the imposition of antidumping duties, and we can explore the possibility of this “diversion effect” by considering the response of non-dumped imports to the imposition of antidumping duties.

To answer this question, we use quantity data to estimate the following regression for non-dumped imports:

$$(3) \quad \ln NDIMP_{it} = \alpha + \beta \ln DDEM_{it} + \gamma DM_{it} + \sum_{i=2}^9 \delta_i INDUS_i + \varepsilon_{it}$$

where NDIMP is the quantity of non-dumped imports in the U.S. market (or share of apparent consumption (NDIMPN)), and all other variables are as specified before. The estimation results appear in Table 3.

Table 3: Upstream Non-dumped Imports 2SLS Regressions – Pure Quantities and Shares of Apparent Consumption

Dependent variable	Independent Variables			<u>F</u>	<u>R</u> ²	<u>N</u>
	<u>α</u>	<u>DM</u>	<u>lnDDEM</u>			
(3a) lnNDIMP (I)	-42.47* (19.9)	.746* (.356)	3.39* (1.27)	3.80	.11	61
(3b) lnNDIMPN (I)	-22.39 (16.21)	.547** (.296)	1.48 (.103)	9.08	.42	60

*(**) indicates significant at the 5% (10%) level. Standard errors in (. (I) indicates presence of industry dummy variables.

These results show some evidence of a diversion effect from dumped to non-dumped imports, in quantity terms. The coefficient on DM in regression (3a), the pure quantity regression, may be interpreted as indicating, on average, a 0.75% increase in non-dumped imports for every one-percentage point increase in the dumping margin imposed on dumped imports, ceteris paribus. In regression (3b), in quantity shares of apparent consumption, the coefficient on DM implies that for every one-percentage point increase in the dumping margin, the non-dumped share of apparent consumption increases by 0.55%, on average, ceteris paribus. Thus, while we do not find evidence of market-share shifting towards domestic production, we do find some evidence indicating that non-dumped imports gain market share relative to dumped imports in response to the imposition of antidumping duties.

Finally, with respect to the quantity regressions, we look for changes in the quantity behavior of dumped imports, domestic production, and non-dumped imports in advance of the antidumping filing. Here we incorporate a dummy variable, AD, to capture upstream import behavior that occurs during the year prior to the filing of an antidumping investigation. Given our predictions, we would expect the coefficient on AD to be positive if importers do indeed bring in larger quantities of their goods prior to an investigation (therefore actually providing cause for the investigation).

To analyze pre-filing behavior, we use AD, which equals 1 in the year preceding a filing and 0 otherwise, instead of DM in the previously-specified regressions for dumped imports, domestic production, and non-dumped import quantity (equations 1, 2, and 3, respectively). The results for the three revised regressions, described below, are presented in Table 4.

$$(4a) \quad \ln DIMP_{it} = \alpha + \beta \ln DDEM_{it} + \gamma AD_{it} + \sum_{i=2}^4 \delta_i INDUS_i + \varepsilon_{it}$$

$$(4b) \quad \ln PR_{it} = \alpha + \beta \ln DDEM_{it} + \gamma AD_{it} + \sum_{i=2}^4 \delta_i INDUS_i + \varepsilon_{it}$$

$$(4c) \quad \ln NDIMP_{it} = \alpha + \beta \ln DDEM_{it} + \gamma AD_{it} + \sum_{i=2}^9 \delta_i INDUS_i + \varepsilon_{it}$$

Table 4: Upstream 2SLS Regressions – Pure Quantities

Dependent variable	Independent Variables			F	R ²	N
	α	AD	lnDDEM			
(4a) lnDIMP (I)	-3.30 (16.0)	1.04* (.478)	.948 (1.02)	39.14	.79	57
(4b) lnNDIMP(I)	-32.38 (21.04)	.042 (.483)	2.77* (1.35)	2.86	.09	61
(4c) lnPR (I)	-10.64 (7.00)	.035 (.162)	1.60* (.448)	106.36	.91	60

*(**) = Significant at the 5% (10%) level. Standard errors are in (.). (I) indicates the presence of industry dummy variables. lnDIMP = log of dumped imports, lnNDIMP = log of non-dumped imports, lnPR = log of domestic production (all in quantity terms).

We find that, for this small sample, dumped imports *do* rise prior to the antidumping filing. There is no significant response from either non-dumped or domestic competitors, at least not in quantity terms. These results suggest that it is only the dumping firms that change their quantity behavior in advance of (and therefore leading to) an antidumping filing.

B. Value Results

We now explore what happens to the *value* of upstream production in response to the antidumping investigation and the dumping margin imposition. Using value data allows us to more than double our sample size because domestic production data is much more widely available in value terms than in quantities. Thus, we can expand the number and types of industries we examine in this section.

Given the predictions for firm behavior detailed in Section 2.A., we expect that our analysis here would show the value of production for dumped imports rising prior to an antidumping case filing if their sales and market share were rising relative to the price during this period. Similarly, we would expect the value of dumped imports to fall once duties are imposed

if these firms cut their production and lose market share. Finally, we would expect the value of domestic upstream production to rise after duties are imposed if output and price are both increasing for these firms. These predictions presume that the imposition of antidumping duties leads to a net decrease in output to the domestic market, as discussed above.

To analyze each of these issues, we use the 2SLS methodology described above on modified forms of regressions 1 and 2 from Tables 1 and 2. We use value data to run first-stage regressions for downstream domestic demand and second-stage regressions for dumped and non-dumped imports, and domestic production. The second-stage regression equations are:

$$(5) \quad \ln DIMP_{it} = \alpha + \beta \ln DDEM_{it} + \lambda AD_{it} + \gamma DM_{it} + \sum_{i=2}^9 \delta_i INDUS_i + \varepsilon_{it}$$

$$(6) \quad \ln NDIMP_{it} = \alpha + \beta \ln DDEM_{it} + \gamma DM_{it} + \sum_{i=2}^9 \delta_i INDUS_i + \varepsilon_{it}$$

$$(7) \quad \ln PR_{it} = \alpha + \beta \ln DDEM_{it} + \gamma DM_{it} + \sum_{i=2}^4 \delta_i INDUS_i + \varepsilon_{it}$$

Note that we include the dumping margin variable (DM) in all three second-stage regressions and the antidumping investigation dummy variable (AD) in the regression for dumped imports.

In Table 5, we present the results of estimating regressions (5), (6), and (7) using the data in pure value terms.

Table 5: Upstream 2SLS Regressions – Pure Values

Dependent Variables	Independent Variables				F	R ²	N
	α	AD	DM	lnDDEM			
(5a) lnDIMPV (I)	-3.81 (5.08)	-.045 (.301)	-1.10* (.394)	.587 (.440)	25.17	.70	132
(6a) lnNDIMPV (I)	-25.83* (8.50)		-.168 (.332)	1.92* (.458)	42.64	.76	140
(7a) lnPRV (I)	5.91* (661)		.144* (040)	-.133* (.057)	5.38	.28	135

*(**) = Significant at the 5% (10%) level. Standard errors are in (. (I) indicates the presence of industry dummy variables. lnDIMPV = log of dumped imports; lnNDIMPV = log of non-dumped imports; and lnPRV = log of domestic production (all in value terms).

For dumped imports and domestic production, the results here are essentially the same as the quantity results: dumped import values fall in response to the imposition of antidumping duties, and domestic production values rise. This is consistent with our expectations. Following the imposition of antidumping duties (or, perhaps, even in their absence), the market prices tend to rise for the product involved in the antidumping case filing, and it appears that the domestic firms gain from this price effect while the allegedly-dumped imports lose. There is no significant apparent change in the value of imports prior to the antidumping filing, and non-dumped import values do not appear to respond to the size of the dumping margin.

In Table 6, we present results for the same three regressions with the data in value shares of apparent consumption. Here, we find evidence that domestic production values as a share of apparent consumption also increase in response to the size of the dumping margin. This is especially interesting since our previous market share regression with domestic production quantities (Table 2, equation 2b) indicates no market-share shifting in favor of domestic producers in response to the DM variable. In this regression (7b), however, our data set is larger

than that used in regression 2b (9 industries rather than 4). We believe that these results support our contention that both market-share shifting and rising upstream prices favor domestic producers once antidumping duties are imposed on dumped imports. For these industries, we do not find similar increases in the value of the non-dumped import share in response to DM. Thus, while domestic production values as a share of apparent consumption *rise* in response to DM and dumped import values *fall*, we see no response by non-dumped imports in value terms.

Table 6: Upstream Value 2SLS Regressions, Shares of Apparent Consumption

Dependent variable	Independent Variables				F	R ²	N
	α	<u>AD</u>	<u>DM</u>	<u>lnDDEM</u>			
(5b) lnDIMPVN (I)	-4.41 (4.76)	.634* (.244)	-.999* (.294)	.626 (.409)	27.21	.69	132
(6b) lnNDIMPVN (I)	-15.85 (5.12)		-.266 (.311)	1.52* (.440)	50.20	.80	134
(7b) lnPRVN (I)	5.96* (.661)		.145* (.040)	-.136* (.057)	5.40	.28	135

*(**) = Significant at the 5% (10%) level. Standard errors are in (.). (I) indicates the presence of industry dummy variables. lnDIMPVN = log of dumped import share; lnNDIMPVN = log of non-dumped import share; and lnPRVN = log of domestic production share of apparent consumption (all in value terms).

In the following section, we focus on the impact of the upstream antidumping case on downstream consumers of the affected inputs. We specifically examine the effects of the imposition of antidumping duties on the quantity of downstream production.

4. Evidence for the Downstream Market

To investigate the effect of the imposition of an upstream antidumping duty on the quantity of downstream production, we estimate the following regression:

$$(8) \quad \ln DDEM_{it} = \alpha + \gamma DM_{it} + \sum_{t=2}^{16} \varphi_t YEAR_t + \sum_{i=2}^4 \delta_i INDUS_i + \ln DDEM_{i(t-1)} + \varepsilon_{it}$$

We include the one-period lagged values of lnDDEM to remove any serial correlation that may be picked up by the dumping margin variable, DM, in order to isolate the effects of DM on downstream production. Our quantity sub-sample represents the following downstream industries: formaldehyde; paints, varnishes, and lacquers; gasoline; and, automobiles. The results from these downstream regressions are presented in Table 7.

Table 7: Downstream Regressions – Quantity Results

Dependent variable	Independent Variables			F	R ²	N
	α	DM	lnDDEM(-1)			
(8) lnDDEM (I,T)	14.77* (.562)	-.137* (.055)	.039 (.031)	1096	.99	61

* (**)= Significant at the 5% (10%) level. Standard errors are in (.). (I) and (T) indicate the presence of industry and year dummy variables, respectively.

Our results indicate that the imposition of antidumping duties on upstream dumped imports has a significant negative effect on the quantity of downstream production for these industries. This effect is evident even when the one-period lagged dependent variable is included on the right-hand side and when we account for industry- and year-specific effects. Specifically, the coefficient on DM indicates that, on average, for every one-percentage point increase in the upstream input antidumping margin, downstream domestic production falls about 0.14%, ceteris paribus. This result supports our theoretical prediction that upstream antidumping cases can cause production declines in the downstream industries that use these inputs.

When we regressed the *value* of downstream production on its lagged values, DM, and both industry and year dummy variables, we did not find evidence of a significant effect of the antidumping duty imposition. There appears to be no value effect downstream.¹⁹

5. Concluding Remarks

Recent empirical work, including Krupp and Pollard (1996), Prusa (1997), and Staiger and Wolak (1994), suggests that antidumping investigations have a depressing effect on import penetration by the dumping countries (the so-called “harassment effect”) as well as a “diversion effect” of market share toward non-dumped imports and domestic import-competing producers. In addition, there is anecdotal evidence suggesting that the downstream users of products that are the subject of antidumping cases are harmed by higher prices, a less competitive upstream market, and, in some cases, supply shortages of the inputs due to the investigation itself and the antidumping duties imposed. This paper provides some evidence, for a range of upstream-downstream industry pairs, that these allegations may be true. Further, we find additional evidence that domestic competitors gain market share, in value terms, as a result of the imposition of antidumping penalties.

Specifically, direct testing of our basic predictions indicates that dumped import quantities fall in response to the imposition of antidumping duties, while domestic upstream production rises. Dumped imports also fall in terms of their quantity share of consumption, though we do not find market-share gains by domestic producers in quantity terms. When non-dumped imports are included in the analysis, we find that they are positively affected by the dumping margins in both pure quantity and market-share terms. Thus, we see evidence of both harassment

¹⁹ We have not reported the results for the downstream value regression due to the lack of significant effects.

(reductions in dumped imports) and diversion (increases in non-dumped and domestic production) effects of antidumping actions in our quantity data. We do not, however, find in that data evidence of market-share shifting toward domestic production.

We also investigated the behavior of firms in advance of the antidumping case filings. Our results there show that only dumped import quantities change significantly in advance of a filing. This is consistent with the eventual initiation of a case filing and suggests that neither non-dumping firms nor domestic producers alter their production patterns in anticipation of a filing.

When testing our predictions on the effects of imposed duties using value data, we find dumped import values and value shares negatively affected by the dumping margins. In addition, domestic production values and value shares are both positively affected by imposed duties. The value regressions show little impact of antidumping duties on non-dumped imports, however. Thus, in value terms, we again see evidence of the harassment effect as well as evidence of a market-share shifting effect in favor of domestic producers. These results suggest that the argument made by some supporters of the antidumping law regarding its ability to help domestic producers reclaim the domestic market may have some basis in fact.

Finally, our downstream analysis provides some evidence for the hypothesis that negative consequences of upstream antidumping actions might be felt downstream. We find that the final dumping margins have significant negative effects on the quantity of downstream production. Thus, the concerns of downstream users about upstream antidumping cases seem at least partially justified.

It would be useful to analyze other aspects of the upstream/downstream responses to antidumping case filings and dumping margins. These include the impact of upstream antidumping cases on both upstream and downstream price-cost margins (as a proxy for

profitability), industry concentration, total employment and the share of production workers in total employment, and the cost of production as a share of the value of shipments. Such analysis would provide further insight into the specific effects of these cases on the affected industries. Unfortunately, data constraints make addressing these issues difficult and they also limit our ability to extend our work here to a larger number of industries. Future research may include a more industry-specific case approach where these analyses could be conducted.

Appendix 1: Listing of Upstream/Downstream Industries

<u>Upstream Industry</u>	<u>Downstream Industry(ies)</u>
Methanol (Q,V)	Formaldehyde (used in melamine-formaldehyde resins; widely used in the housing industry)
Perchloroethylene (V)	Drycleaning
Electric Motors (AC poly-phase; > 150hp but < 500hp) (V)	Industrial pumps; Air compressors; Metal-forming machine tools
Titanium Dioxide (Q,V)	Paints, varnishes, and lacquers
Tubes for Tires (V) (not bicycle)	All tires (auto, truck, bus)
Titanium Sponge (Q, V)	Titanium mill products; aircraft, aerospace applications (largest end use)
Radial Ply Tires (V)	Automobiles, trucks, buses
Ethyl Alcohol (Q) (non-beverage grade)	Gasoline
Color Picture Tubes (V)	Color televisions
Nitrile Rubber (Q, V)	Automobiles (used in gaskets, belts, seals, etc.)

Note: Q = all data available in quantity terms, V = all data available in value terms.

Appendix 2: Case Histories

<u>Product</u>	<u>Country(ies)</u>	<u>Date of Filing</u>	<u>Final ITC Decision</u>	<u>Dumping Margin</u>
Methanol	Canada	6/78	10/77 (-)	0
Perchloro-ethylene	Belgium, France, Italy	7/78	4/79 (+)	76.2% ²⁰
Electric Motors	Japan	10/79	12/80 (+)	6.7%
Titanium Dioxide	Belgium, France, UK, W. Germany	10/78	11/79 (-)	25.85% ²¹
Tubes for Tires (not bicycle)	Korea	7/83	6/84 (-)	0 ²²
Titanium Sponge	Japan, UK	11/83	11/84 (+)	72.41%
Radial Ply Tires	Korea	8/84	12/88 (-)	0 ²³
Ethanol	Brazil	3/85	3/86 (-)	78.5%
Color Picture Tubes	Canada, Japan, Korea, Singapore	11/86	11/87 (+)	31.625%
Nitrile Rubber	Japan	9/87	6/88 (+)	146.5%

²⁰ Order revoked in 6/84; DM = 0 thereafter.

²¹ DM imposed between preliminary ITC ruling and the final one year later. DM = 0 thereafter.

²² Negative DOC prelim implied DM = 0 throughout the investigation.

²³ Negative ITC prelim in 9/84, but affirmative remand in 12/85. Case dismissed 12/88.

References

- Boltuck, Richard and Robert E. Litan. 1991. *Down in the Dumps: Administration of the Unfair Trade Laws*. Washington, DC: Brookings Institution.
- Bovard, James. 1991. *The Fair Trade Fraud*. New York: St. Martin's Press.
- Brander, James A. 1986. "Rationales for Strategic Trade and Industrial Policy." In *Strategic Trade Policy and the New International Economics*, ed. Paul Krugman. Cambridge, MA: MIT Press.
- Brander, James A. and Barbara Spencer. 1985. "Export Subsidies and Market Share Rivalry." *Journal of International Economics* 18, pp. 83-100.
- Bureau of Economic Analysis. *Survey of Current Business*. Bureau of the Census: Washington, DC. Various issues.
- Carpenter, Robert, 1997. *Antidumping and Countervailing Duty Handbook*. United States International Trade Commission: Washington, DC.
- Feinberg, Robert and Seth Kaplan. 1993. "Fishing Downstream: The Political Economy of Effective Administered Protection." *Canadian Journal of Economics*, February, pp. 150-158.
- Finger, J. M., H. Keith Hall, and Douglas R. Nelson. 1982. "Political Economy of Administered Protection." *American Economic Review*, 72(3), pp. 452-466.
- Hufbauer, Gary C., Diane T. Berliner, and Kimberley A. Elliott. 1986. "Trade Protection in the United States." *Aussenwirtschaft*, 41(2/3), 225-258.
- Hughes, John S., Stefanie Lenway, and Judy Rayburn. 1997. "Stock Price Effects of U.S. Trade Policy Responses to Japanese Trading Practices in Semi-Conductors." *Canadian Journal of Economics* 30 (4a), pp. 922-942.
- Krupp, Corinne and Patricia Pollard. 1996. "Market Responses to Antidumping Laws: Some Evidence from the US Chemical Industry." *Canadian Journal of Economics* 29(1), pp. 199-227.
- Pollak, A. 1991. "Duties on Japanese Screens for Laptops Cleared by US." *New York Times*, August 16, p. D1.
- Prusa, Thomas. 1997. "The Trade Effects of U.S. Antidumping Actions." In *Effects of U.S. Trade Protection and Promotion Policies*, ed. R. C. Feenstra. Chicago: University of Chicago Press.

- Prusa, Thomas and Susan Skeath. 2002. "The Economic and Strategic Motives for Antidumping Filings." *Weltwirtschaftliches Archiv*, forthcoming.
- Rushford, Greg. 1995. "Don't Bother to Compete: Hire a Lawyer." *Wall Street Journal* September 21, p. A18.
- Staiger, Robert and Frank Wolak. 1994. "Measuring Industry-Specific Protection: Antidumping in the United States." *Brookings Papers on Microeconomics*, pp. 51-118.
- U.S. Bureau of the Census. *Annual Survey of Manufactures*. Washington, DC: U.S. Government Printing Office. Various issues.
- U.S. Bureau of the Census. *Census of Manufactures*. Washington, DC: U.S. Government Printing Office. 1977, 1982, 1987, 1992 issues.
- U.S. Bureau of the Census, "U.S. Imports for Consumption and General Imports." Report FT 246 & FT 247/Annual 1977-1992. Washington, DC: U.S. Government Printing Office.
- U.S. Bureau of the Census, "U.S. Exports/Schedule B Commodity by Country," Report FT 446 & FT 447/Annual 1977-1992. Washington, DC: U.S. Government Printing Office.
- U.S. International Trade Commission. Staff reports and Commission opinions on various antidumping cases, preliminary and final decisions, 1976-1993. Washington, DC: U.S. International Trade Commission.
- U.S. International Trade Commission. *Synthetic Organic Chemicals, 1976-1992*. Washington, DC: U.S. International Trade Commission.
- Warner, Presley. 1992. "Canada-US Free Trade: The Case for Replacing Antidumping with Antitrust." *Law and Policy in International Business* 23(4), pp. 791-890.