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ABSTRACT

This paper studies the differences in the uses and effects of U.S. antidumping law on imports and domestic output across the major regions exporting to the United States. Building on previous work (Staiger and Wolak, 1994), we extend our attempt to characterize the implications of the use of antidumping law for the behavior of U.S. imports and domestic output, and to distinguish between "outcome filers" (firms for which the prospect of an antidumping duty is an important ingredient in the decision to file) and "process filers" (firms for which filing is driven largely by a desire to secure the trade-restricting effects of the investigation process itself). In our earlier work we allowed for the coexistence of outcome- and process-filing industries, and found evidence consistent with the presence of process filers in some industries. However, we restricted the filing strategy of firms in a given domestic industry to be the same across all imports in that industry regardless of their country of origin. In this paper we abstract from cross-industry heterogeneity in antidumping filing strategies and explore instead the heterogeneity of filing strategies against different import-source countries, allowing for the possibility that domestic firms may pursue independent filing strategies with respect to imports from different countries. We argue that the most likely target countries for process filers are those whose export production is primarily destined for the U.S. market and accounts for a relatively large and stable U.S. market share. These characteristics point to Canada and Mexico as countries against which process filing by U.S. firms is likely to occur. Analyzing the filing behavior against Canada and Mexico as well as four other regions, we find evidence in the filing behavior and in the nature of the trade impacts which accompany filing to suggest that Mexico and Canada are indeed the most likely targets of antidumping petitions filed by process filers in the United States.

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1. Introduction

Given the success with which tariff reductions have been negotiated during the post-war period, it is not surprising that the rules which govern the exceptions from the negotiated tariff bindings have replaced the tariff bindings themselves as the central focus of international cooperation in trade policy. In 1947, the principal task confronting the contracting parties of the General Agreement on Tariffs and Trade (GATT) was the reciprocal lowering of high statutory trade barriers in place at that time. Today, in contrast, the heart of international trade policy negotiation consists of such issues as the conditions under which countries can reimpose temporary "safeguard" protection, the rules under which one country can impose a countervailing duty on another's subsidized exports, and procedures for settling disputes concerning the interpretation of these and other trade rules as they arise.

Nowhere is this change in emphasis more apparent than in the rising friction associated with antidumping law. Accusations that foreign firms are "dumping" products on to the domestic market and the belief that dumping is injurious to the domestic industry, are by no means new.[1] Almost 80 years ago, such accusations and beliefs led the United States to adopt its first antidumping legislation, as contained in Sections 800-801 of the Revenue Act of 1916. But while the original intent of the law was to protect U.S. firms from the "unfair competition" implied by the alleged dumping practices of the highly cartelized and heavily protected German industries

[1]Dumping is defined as exporting products to the domestic market at export prices "below fair value," i.e., either below the prices of comparable products for sale in the domestic market of the exporting country or below costs of production.

of the period (see Viner, 1966, p.242), antidumping law today seems to elicit a much broader usage.[2]

With the use and abuse of antidumping law now regularly a central concern of both multilateral and bilateral trade negotiations, it is especially important to have as full an understanding as possible of the impact of existing antidumping laws on the free flow of trade, and of the uses to which antidumping law is put in practice. In this regard, several researchers have challenged the view that antidumping law restricts trade only when antidumping duties are actually imposed, arguing that the threat or even the mere possibility of duties can also affect import flows. We explore in this paper the differences across import sources of the uses and effects of antidumping law, accounting for both direct as well as possible indirect effects on imports and domestic import-competing output.

In an earlier paper (Staiger and Wolak, 1994) we studied three possible channels through which these indirect effects might arise, which when combined with the direct effects of duties, capture most of the trade effects of antidumping law. We referred to these three non-duty effects as the "investigation effect," the "suspension effect," and the "withdrawal effect." The first refers to the trade distortions associated with on-going antidumping investigations, the second to the effects of "suspension agreements" (under which investigations are suspended in exchange for a promise by foreign firms to stop dumping), and the third to the effects of petitions that are withdrawn prior to a final determination. Our empirical findings, which reflected data on the timing and outcome of every antidumping investigation that covered a manufacturing industry

[2] This broadening usage was in part facilitated by explicit changes in U.S. antidumping law. For example, under the original U.S. law, predatory intent had to be shown to establish a finding of dumping. However, the Revenue Act of 1921 dropped the intent requirement.

product in the United States during the 1980-85 period, indicated that the investigation and suspension effects are substantial. Specifically, we found that suspension agreements lead to trade restrictions similar in magnitude to what would have been expected if antidumping duties were imposed instead. The effect of a typical antidumping investigation is to reduce imports during the period of investigation by roughly half the reduction that could be expected if antidumping duties had been imposed from the beginning of the investigation. We found little evidence to support a significant withdrawal effect.

Our focus on the broader trade effects of antidumping law also allowed us to consider the possibility that different firms might file antidumping petitions for different reasons. In particular, we found evidence of two distinct filing strategies that appeared to coexist in the data, and we referred to firms as "outcome filers" or "process filers" depending on which strategy they appeared to be using. Outcome filers are firms that file antidumping petitions in anticipation of obtaining a finding of dumping and the relief that comes with it (either antidumping duties or a settlement agreement). Process filers are firms that file antidumping petitions not to obtain a dumping finding, but rather to obtain the effects that arise solely from the investigation process itself. Our estimates suggested that while outcome filers are by far the dominant users of antidumping law, process filing was the likely strategy used by between 3 and 4 percent of the industries in our sample.

In the present paper we continue this line of research by looking for evidence of differences in the use and impacts of U.S. antidumping law as it is applied to imports from different trading partners. As we discuss in the next section, whether an antidumping petition is initiated for process or outcome filing reasons should depend not only on the characteristics

of the domestic industry, but also on the characteristics of the exporting country or countries against which the petition is filed. In our earlier work we allowed for the possibility that filing strategies might differ across U.S. industries, but we required firms in a given industry to pursue a common filing strategy against foreign imports, regardless of the country of origin. In this paper we allow the filing strategies of firms to be different for different import sources, but we impose the restriction that firms in all U.S. industries pursue the same overall filing strategy. Thus, we consider the possibility that U.S. firms may be outcome filers against imports from some countries and process filers against others.

Using this method of analysis we are able to quantify significant differences in filing strategies used by U.S. industries against five sets of trading partner countries. We are also able to quantify the extent of import and domestic output distortions due to the various stages of the suit resolution process for each of these five sets of trading partners. Finally, we are able to distinguish between regions exporting to the United States that are primarily targets of process filings by U.S. industries, as well as those regions that are primarily targets of outcome filings by U.S. industries.

We argue that the countries most likely to be the targets of process filings in the United States during our 1980-85 sample period are those whose export production over this period is predominantly destined for the U.S. market and accounts for a relatively large and stable U.S. market share. These characteristics point to Canada and Mexico as countries against which process filing by U.S. firms is likely to occur. Analyzing the filing behavior against imports from Canada and Mexico as well as against imports from four other regional groupings, we find evidence in the filing behavior and in the nature of the trade impacts which accompany filing to

suggest that Canada and Mexico were indeed the most likely targets of antidumping petitions filed under the process filing strategy during our sample period. The regions against which the filing strategy of U.S. firms and the nature of the associated trade impacts seems most consistent with our outcome filing view of antidumping suit activity are the countries of Western Europe and the region composed of Japan and the Newly Industrialized Countries of East Asia.

The rest of the paper proceeds as follows. The next section briefly describes our motivation for including investigation, suspension, and withdrawal effects with the duty effects when quantifying the impact of antidumping law on imports and domestic output. It then describes the different investigation effects expected under outcome and process filing strategies. We also discuss in this section why some countries are more likely to be the target of process filing by U.S. firms than others. This discussion motivates the regional grouping of U.S. imports that we employ to carry out our empirical analysis. Section 3 then describes our data and model for estimation, and presents the results. Section 4 concludes with an interpretation of our findings.

II. U.S. Antidumping Law

In this section we motivate why we believe it is important to consider the effects of suspension agreements, withdrawn petitions, and the investigation process itself, in addition to the effects of duty imposition, when quantifying the impacts of antidumping law on imports and domestic output. We also describe the different investigation effects on imports and domestic output that would be expected to arise under outcome and process filing. We then describe

domestic filing behavior under these two filing strategies.[3] Finally, we discuss why some countries are more likely to be the target of process filing by U.S. firms than others.

We begin by making several observations concerning the practice of antidumping law in the United States which may be helpful to keep in mind. First, there are two findings necessary for a determination of dumping: (i) sales of imports at less-than-fair-value (LTFV); and (ii) material injury to the domestic industry due to these imports. One government agency is assigned to each of these determinations--the International Trade Commission (ITC) determines injury to the domestic industry and the Commerce Department's International Trade Administration (ITA) makes the LTFV determination. A second point to bear in mind is that for each of these decisions there is a preliminary and final decision made by each agency. The statutory time allotted for the entire investigation ranges from ten months to fourteen months under special circumstances. Finally, except in "critical circumstances" (a condition described more fully below but in practice rarely met), a final determination of dumping will bring the retroactive imposition of antidumping duties on all imports of the relevant products which entered the United States on or after the date of the preliminary LTFV finding, provided that the preliminary LTFV finding was affirmative (as it was for 93 percent of the products whose investigations made it to this stage of the investigation process during the 1980-85 period). With these general points in mind we now turn to a discussion of the various potential trade distorting effects of antidumping law.

[3]A more detailed discussion of these points is contained in Staiger and Wolak (1994).

II.1 The Trade Effects of Antidumping Law

A simple view of the trade effects of antidumping law would hold that trade flows are only affected by antidumping law when a petition is filed, dumping is found, and antidumping duties are imposed. Were this indeed the case, one could get a fairly complete understanding of the trade effects of antidumping law by examining those instances where antidumping duties were actually imposed. However, there are a number of reasons to believe that this simple view is inadequate, that many of the effects of antidumping law are indirect and subtle, and that a narrow focus on antidumping duties alone would overlook important non-duty channels through which antidumping law could act. We now describe three non-duty effects which, we believe, when combined with the effects of duties, capture a major component of the possible trade effects of antidumping law.[4]

II.1.a The Investigation Effect

First, it is often claimed (see, for example, Dale, 1980, pp. 85-86, and U.S. Congress, 1978, p. 12 and p. 278) that imports are restricted during the period over which an antidumping investigation is ongoing. As described more fully in Staiger and Wolak (1994), there are two broad hypotheses concerning the reasons for and nature of this investigation effect. We refer to

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[4] There is a growing empirical literature concerned with the determinants and the duty and non-duty effects of antidumping law. See, for example, Finger (1981), Hernander and Schwartz (1986), Salvatore (1987), Hartigan, Kamma and Perry (1989), Messerlin (1989, 1990), Lichtenberg and Tan (1990), Harrison (1991), Prusa (1991) and Staiger and Wolak (1994). The two papers closest in spirit to our work here and in Staiger and Wolak (1994) are Lichtenberg and Tan (1990) and Harrison (1991). However, unlike the present paper, neither Lichtenberg and Tan nor Harrison attempts to distinguish among the phases of the investigation process, nor does either paper attempt to account exhaustively for the various post-investigation outcomes. Also, neither paper attempts to explore the possibility that the use and effects of antidumping law are source-country specific. See Staiger and Wolak (1994) for a more detailed comparison of our work with these papers.

these two hypotheses as the "outcome-filer" hypothesis and the "process-filer" hypothesis.

According to the outcome-filer hypothesis, the investigation effect reflects actions taken by domestic importers and/or foreign exporters in anticipation of the duties that would be imposed in the event of a final affirmative dumping determination, and which would be assessed retroactively back to the date of an affirmative preliminary LTFV determination. That is, as noted above, an affirmative preliminary LTFV determination carries with it the liability of duty assessment for all imports entering thereafter if a final affirmative dumping determination is made subsequently. Consequently, a preliminary finding of LTFV sales would be expected under this hypothesis to lead to a sharp drop in imports, with these trade-restricting effects lasting for the remainder of the investigation period, as long as the petition was perceived as having a reasonable chance of ending in a final dumping determination. In fact, this kind of investigation effect figures prominently in many press accounts of ongoing antidumping actions. For example, in reference to a U.S. antidumping petition brought by the National Knitwear & Sportswear Association against sweater producers in Hong Kong, South Korea, and Taiwan, **The New York Times** observes:

> The [preliminary dumping] margins were announced as retailers are about to place orders for delivery next fall. Some industry officials said prospects of higher prices, or just the uncertainty over what the new price levels would be, could cause some retailers to switch to domestic suppliers (**The New York Times**, April 24, 1990, p. C1).

In addition to a drop in imports coming with an affirmative preliminary LTFV determination, the outcome-filer hypothesis carries with it two additional implications. First, in light of the possibility of an affirmative preliminary LTFV determination and subsequent fall-off in import flows, imports might, if anything, be expected to rise somewhat during the first months of the investigation in anticipation of this effect. In fact, evidently anticipating this possibility,

U.S. law provides for an assessment of "critical circumstances" under which duties can be imposed retroactively back to the date of filing if the filing of a petition brings with it a significant import surge. For this reason, we would expect any import increase associated with the early stages of an investigation under the outcome-filer hypothesis to be small. Second, under the outcome-filer hypothesis, any petitions filed without regard to measures important for the final dumping determination would be unlikely to exhibit strong investigation effects, since this hypothesis presumes a significant probability of a final dumping determination and consequent duty imposition. It is for this reason that we refer to this hypothesis as the outcome-filer hypothesis: The strength of the investigation effect under this hypothesis reflects the fear of retroactive duty imposition in the event of an affirmative final determination at the end of the investigation process, and therefore ought to reflect the likelihood that the final outcome will be a finding of dumping.

It is also possible that there are investigation effects that do *not* reflect a significant probability of retroactive duty imposition at the end of the investigation process, but reflect rather the effects of the investigation process itself. This embodies the process-filer hypothesis. In an earlier paper (Staiger and Wolak, 1991), we presented a model in which domestic firms make strategic use of the on-going antidumping investigation of the pricing and sales practices of foreign firms to prevent the occurrence of price wars which might otherwise be triggered by periods of slack demand and low capacity utilization. Our theory suggests that domestic firms may value the competition-dampening effects of an on-going antidumping investigation for its own sake, and may file such petitions when capacity utilization is low with no expectation that they would actually result in duties or other remedies.

Specifically, we showed in Staiger and Wolak (1991) how access to antidumping law in the domestic country can lead to the filing of antidumping petitions by the domestic industry when capacity utilization is sufficiently low, and to less aggressive pricing by foreign firms and greater market share for domestic firms--and in fact to a fall in imports and a rise in domestic output--during the period of investigation as a result. This occurs despite the fact that antidumping duties are never actually imposed, and were never expected to be imposed. That is, the entire investigation effect of antidumping law under this interpretation comes in the form of a threat to "punish" foreign firms with a duty if they should "misbehave" and price too aggressively. Such a threat is made credible by filing the petition; because it is credible, the threatened duties need never materialize. In Staiger and Wolak (1994), we referred to such filers as process-filers, and noted that (i) the act of filing ought to have an immediate trade-dampening effect which lasts for the duration of the investigation, distinguishing the investigation effects under process filers from those under outcome filers, and (ii) process-filers ought to file antidumping petitions on the basis of low capacity utilization and little else, and in particular should not be concerned with measures important for the final determination of dumping, thus distinguishing the filing behavior under process filers from that of outcome filers.

II.1.b The Suspension Effect

Turning to the suspension effect, a second way in which antidumping law may restrict trade through non-duty channels is through the effects of so-called "suspension agreements," under which antidumping investigations are suspended by the Commerce Department in exchange for an explicit agreement by foreign firms named in the antidumping petition to eliminate sales in the U.S. market at less than "fair value." Since the intent of a suspension agreement is to

provide a non-duty alternative by which previous dumping activities can be halted, it would be surprising if there were not a suspension effect in the data. A prominent example involving such a suspension agreement (though not falling in our sample period) was the 1986 U.S.-Japan Semiconductor Trade Arrangement.

II.1.c The Withdrawal Effect

Finally, a third way in which antidumping law may restrict trade through non-duty channels concerns the withdrawal effect.[5] That is, the imposition of antidumping duties or the negotiation of a suspension agreement need not be the only outcomes of an antidumping petition for which post-investigation relief from imports is secured. In this regard, Prusa (1992) has argued that petitions which are withdrawn by the domestic industry before a final determination can have as restrictive an impact on subsequent trade flows as would be the case if a final determination of dumping had been made and duties imposed. Essentially, Prusa argues that domestic firms can use the threat of antidumping duties, together with the protection from domestic antitrust laws afforded when an antidumping proceeding is in progress, to bargain with foreign firms over domestic market share, and that the antidumping petition is withdrawn by the domestic industry if and when a sufficiently attractive bargain is struck.[6]

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[5] In addition, a number of papers, e.g., Anderson (1992), Staiger and Wolak (1992a), and Prusa (1988) have suggested that the mere existence of antidumping law can have trade effects even in periods when no petition is filed.

[6] Agreements between foreign firms and domestic petitioners are permitted under the Noerr-Pennington doctrine which provides exemption from prosecution under U.S. antitrust law. Direct conversations between domestic and foreign firms concerning prices or quantities would not be protected, so settlements are typically negotiated through the Commerce Department (Horlick, 1989). See Prusa (1992) for a detailed analysis of this exemption and its implications for the effects of antidumping law.

II.2 The Targets of Process Filers

Focussing on the three non-duty effects described above, together with the duty effect of antidumping law, in Staiger and Wolak (1994) we found evidence of substantial investigation effects, and of the trade-restrictiveness of suspension agreements, but found no evidence that withdrawn petitions had lasting trade-restricting effects. We also found some evidence for the coexistence of outcome and process filers in our data. However, we did not allow the filing strategy pursued by a domestic industry to differ by the identity of the country whose firms were named in the petition. Nor did we allow the trade effects of these petitions to vary systematically with the identity of the country against whose firms the petition was filed. In the next section we will present an extended framework which allows us to detect differences in filing strategies and in the impacts of antidumping law across the target countries named in the petition. However, before doing this we discuss why certain countries may be more likely targets of the process filing strategy than others.

The logic of our process filer strategy is that domestic firms use the antidumping investigation process to reduce the temptation of foreign firms to cut prices during periods of low capacity utilization. For this strategy to be sensible for domestic firms to pursue over our sample period, several conditions must be met in the country (countries) against which this filing strategy is being used. First, the firms exporting from each country named in the antidumping petition should comprise a significant share of the relevant U.S. market, since otherwise the threat posed by these firms to the profitability of U.S. firms in the event of a breakdown in price discipline is likely to be small. Second, the U.S. market share captured by the firms exporting from these countries should be relatively stable over the sample period, since otherwise the premise of an

orderly pricing arrangement, whose breakdown during periods of falling capacity utilization can be avoided through the competition-dampening effects of antidumping investigations, would be in doubt. Third, exporters from these countries should be relatively dependent on the U.S. market for their sales, since otherwise demand shifts in the U.S. market which lead to falling capacity utilization of U.S. firms might not lead to a significant fall in capacity utilization rates for the foreign exporters (and therefore would not give rise to a significant temptation on the part of foreign exporters to cut prices in the U.S. market).

With these three criteria in mind, we note first that the five largest non-oil-exporting trading partners of the United States in 1980 by import values were Canada (16 percent of total U.S. imports), Japan (13 percent of total U.S. imports), Mexico (5 percent of total U.S. imports), Germany (5 percent of total U.S. imports), and the United Kingdom (4 percent of total U.S. imports), with a number of countries then clustered, each at just under 2 percent of total U.S. imports (Direction of Trade Statistics Yearbook, 1987). Of these five biggest import-source countries for the United States, the growth in U.S. imports from Japan over the 1980-85 period was three times the growth in total U.S. imports over this period, and nearly twice as fast as the growth in U.S. imports over this period from the country with the next fastest import growth (Germany). Of the remaining four countries with high and relatively stable shares of the U.S. market over this period, 65 percent of Mexico's worldwide exports went to the U.S. market in 1980 and 61 percent of Canada's exports did, while the United Kingdom and Germany exported 10 percent and 6 percent of their worldwide exports, respectively, to the U.S. market (Japan exported 24 percent of its worldwide exports to the U.S. market). On this basis, we expect that Canada and Mexico would be the most likely targets of process filings from U.S. firms over our

sample period, because they represent two countries whose export production over this period is predominantly destined for the U.S. market and accounts for a relatively large and stable U.S. market share.

III. The Uses and Impacts of Antidumping Law

To investigate whether the filing strategies pursued by domestic firms and the impacts of the ensuing investigation process on the flow of imports and domestic output vary systematically with the identity of the country whose firms are named in the petition, we must first describe our choice of regional groupings and the data sources used for all of the empirical work presented in this paper. We then describe our econometric framework, which extends that of Staiger and Wolak (1994). Finally, we estimate a model of industry-level antidumping suit filings and of the import- and output-effects associated with the various phases and potential outcomes of the investigation process. We assess the degree to which our findings differ systematically as a function of the identity of the countries whose firms are targeted by the investigation.

Regional Groupings

To select the different exporting regions used in our analysis we attempted to balance several concerns. On the one hand, we had to keep the number of regions from getting too large, lest the estimation of the model became unmanageable. But at the same time, we also felt that similar economies should be grouped together. We settled on five regions: Canada and Mexico, as the region representing the most likely target of process filings, and four other regions. Our desire to group similar economies together led us to put all of the planned economies of Eastern Europe along with the Former Soviet Union together as a single exporting region. We call this region the planned economy region. This desire also led us to group together all of the countries

of Western Europe. In those cases in which we did not have a sufficient number of filings from a single country we grouped countries according to their location. This led us to group Japan in with the Newly Industrialized Countries (NICs) of South Korea, Taiwan, Singapore, and Hong Kong. Our fifth region is a residual of all of the other countries. Further disaggregation of this region into smaller regions along geographic lines did not lead to statistically significantly different results for these subregions, so we retained this level of aggregation.

Data Sources

The source of data for the industry-level economic magnitudes is the National Bureau of Economic Research Trade Date File (see Abowd, 1990 for a detailed description of this data set). This data set contains annual data for the period 1958 through 1985 on the value of domestic shipments, imports and exports for 450 U.S. manufacturing industries by 4-digit 1972 Standard Industry Code (SIC). It also contains information on such industry-level economic aggregates as the level of employment and the size of the capital stock, as well as an industry-level output price deflator. The source for the filing dates for all antidumping petitions and the dates and outcomes of all the subsequent stages of the investigation process, as well as the identity of the countries whose firms are named in the investigation, is the National Technical Information Service's Trade Action Monitoring System (TAMS), Pending Investigation Report. This publication is produced by the Commerce Department on a monthly basis and tracks all petitions having to do with the 1974 Trade Act, such as petitions for escape clause relief, antidumping duties, countervailing duties and remedies for unfair practices in import trade. Each month it lists the current disposition of each petition until its final determination. When an antidumping petition is filed, the petition must allege dumping of specific imported products. For purposes of the investigation, the ITC must then link the products under investigation to product codes of

the Tariff Schedules of the United States (TSUS). Consequently, the TAMS dataset records for each petition the TSUS codes for the products which are allegedly being dumped, the country or countries from which these imports came, and the petition's disposition in the current month.

We explicitly account for filing at the TSUS product code level in our econometric model of the suit filing process and in our model of the impacts of antidumping suits on imports and domestic output flows. However, since our economic data is available at the 4-digit 1972 SIC industry level, we must have a concordance between the TSUS codes and the 4-digit 1972 SICs to assign antidumping suits to SIC industries. We obtain a year-by-year concordance between TSUS product codes and the 4-digit 1972 SIC codes from the Commerce Department's Foreign Trade Division Imports Extract Master Concordance. This concordance allows us to assign each TSUS product covered by an antidumping petition to a 4-digit SIC industry. Because TSUS codes are based on traded products and SIC code assignments are based on a firm's principal productive activities, several SIC industries do not have any TSUS code associated with them over our sample. Consequently, a necessary requirement for an SIC-industry to appear in our dataset is that it contains at least one TSUS code product for each year during our sample. Only four industries were deleted from the sample because they had no TSUS code in them for only a portion of the sample time period. Most of the industries omitted had no TSUS codes in them for all years. This concordance procedure left a total of 338 industries for our time period of 1980-1985.

Our empirical work focuses on 1980 to 1985, because significant changes in the structure of U.S. antidumping law were made in The Trade Agreement Act of 1979. Modifications of this act were made by The Trade and Tariff Act of 1984, but none of these are directly relevant to the issues we consider in our research.

Econometric Model

There are several aspects of the economic environment we are modeling that our econometric model should capture. These involve the joint determination of the decision to file a petition with the level of imports and domestic output in an industry, as well as a number of specific characteristics of the petition filing process and of the impacts of filings on the level of imports and domestic output. We begin with a brief discussion of these modeling issues, and then present the econometric model which we estimate.

First, the decision to file an antidumping petition is likely to be determined jointly with the level of imports and domestic output in the industry. As such, filing, import, and output equations should be estimated jointly, allowing for the possibility of various correlations across equations. We allow for contemporaneous correlation between the level of imports and domestic output and the decision to file an antidumping suit against any of our five importing regions by the presence of an unobservable industry characteristic which affects the conditional mean of each of these variables. Our econometric model also allows for the existence of contemporaneous correlations among imports, domestic output and the filing rates as well as correlations over time among these seven variables.

Second, in attempting to understand the filing strategies used by firms, and to ask whether these strategies differ systematically with the identity of the countries whose firms are targeted by the petitions, there are several characteristics which we need to capture in our econometric model. Of primary importance is the fact, as mentioned above, that antidumping suits are filed at the TSUS code level although all of our economic data is at the 4-digit SIC level. Consequently, we must construct a model which allows us to recover information about the TSUS code-level filing process using SIC industry-level economic data as regressors for the filing rate

process. The number of filings in a given TSUS code is a non-negative discrete-valued random variable which is zero for most time periods, but in the periods in which it is nonzero, it can take on large values. We select a discrete distribution for the TSUS code-level number of antidumping suit filings which allows for this "contagion" property. In addition, to match the industry-level aggregation of our import and domestic output data, we need a distribution for TSUS level filings which can be aggregated to the 4-digit SIC level in a straightforward manner.

Third, to measure the impacts of various stages of the antidumping investigation process on the flow of imports and domestic output, and to ask whether these impacts differ systematically with the identity of the countries involved, several characteristics of the investigation process must be accounted for. First, a single antidumping investigation can straddle more than a single year, while each of the various stages of the process last only a fraction of a year. In addition, at the level of multilateral imports several antidumping investigations or outcomes can be simultaneously active in a single TSUS code because of filings against the same product imported from different countries. These characteristics present a problem because, as mentioned above, our data on imports and domestic output are only available on an annual basis at the 4-digit SIC level and our import data is not broken down by source country. Consequently, we must specify a model which will allow us to recover the TSUS code-level impacts on the flows of imports and on domestic output from stages of the investigation process which may run over adjacent years or for a fraction of a year, accounting for the possibility of multiple filings from the same TSUS code, using data which is time-aggregated to annual magnitudes and cross-sectionally aggregated to the 4-digit SIC industry level, and with import data which is only available at a multilateral level. Our TSUS code-level, within-year flow model provides a framework for us to recover

within-year country-specific effects from annual multilateral import and domestic output levels using indexes of country-specific suit activity in that year.

Our SIC industry-level model of the filing rate process and the impacts of the investigation process can be interpreted without reference to the underlying TSUS code-level processes. However, our bottom-up approach, starting with a TSUS code-level model which has not been time-aggregated to the annual magnitudes nor aggregated across country to multilateral magnitudes, specifies an econometric model at the level of time-, country-, and product-aggregation at which the true underlying processes are occurring. It is then aggregated across time, product, and country to an industry-level model. This modeling strategy allows the recovery of both TSUS code and industry level impacts because the industry-level model is obtained from the explicit aggregation of the TSUS code-level model. In addition, the strategy makes explicit the restrictions imposed on the TSUS code-level and import region-level models which are implied by estimating an industry-level model.

We now describe the details of our econometric model of dumping suit filing behavior and its impacts on the level of imports and domestic output. Let f_{grit} be the number of antidumping suits filed in industry i against good g from region r in period t, where g=1,...,G_{it}, t=1,...,T, r=1,...,R, and i=1,...,N. In the present case R = 5, T = 6, and N = 338. Because antidumping suits are filed at the TSUS code level, for the purposes of this paper a good is defined to be a TSUS product code.

Let λ_{grit} denote the rate at which suits are filed in industry i against good g from region r in period t. We assume that the distribution of f_{grit} given λ_{grit} is Poisson ($P(\lambda)$) with parameter $\lambda=\lambda_{grit}$. We denote this fact using the notation

$$f_{grit} \mid \lambda_{grit} \sim P(\lambda_{grit}). \tag{1}$$

These assumptions are consistent with f_{grit} being a Poisson point process for the time interval t to t + 1.

We further assume that λ_{grit} possesses a gamma distribution $\Gamma(\mu_{rit}, \sigma_r)$, where $\mu_{rit} = \exp(X_{it}'\gamma_r + \delta_r\theta_i)$. The vector X_{it} contains the observable characteristics of industry i as of the beginning time of t which affect its filing rate; the vector γ_r and the scalars σ_r and δ_r are parameters to be estimated.[7] The variable θ_i is the unobservable characteristic of industry i which affects the mean filing rate for that industry and δ_r is the parameter which denotes the impact θ_i has on the filing rate against region r. We assume that θ_i is independently and identically distributed across industries and remains constant over time. Using our above notation we have:

$$\lambda_{grit} \mid X_{it},\theta_i \sim \Gamma(\exp(X_{it}'\gamma_r + \delta_r\theta_i),\sigma_r). \tag{2}$$

Assumption (2) implies that each product class from region r within industry i and in time period t has a different mean rate of filing (λ_{grit}), although all of these filing rates are drawn from the same gamma distribution.

Combining assumptions (1) and (2), we have

$$f_{grit} \mid X_{it},\theta_i \sim P(\lambda_{grit}) \circ_{\lambda_{grit}} \Gamma(\exp(X_{it}'\gamma_r + \delta_r\theta_i),\sigma_r). \tag{3}$$

where $\circ_{\lambda_{grit}}$ denotes compounding or mixing the parameter λ_{grit} of the Poisson distribution with a gamma distribution $\Gamma(\exp(X_{it}'\gamma_r + \delta_r\theta_i),\sigma_r)$. Results from Johnson and Kotz (1969, Chapter

[7]In Staiger and Wolak, 1994, we constrained all r-subscripted variables to be equal across all regions.

5), imply that f_{grit} has a negative binomial distribution with parameters σ_r and $\mu_{rit} = \exp(X_{it}'\gamma_r + \delta_r\theta_i)$. We abbreviate this as $f_{grit} \sim NB(\sigma_r,\mu_{rit})$. This discrete density takes the following form:

$$pr[f_{grit} = k] = \begin{pmatrix} \sigma_r + k - 1 \\ \sigma_r - 1 \end{pmatrix} (\mu_{rit}^{f})^{k} (1 + \mu_{rit}^{f})^{-(\sigma_r + k)} \qquad (4)$$

The mean of f_{grit} is $\sigma_r\mu_{rit}$. We assume that conditional on θ_i, f_{grit} is independent of f_{hqjs} so long as any one of the four subscript indexes differ.

Our data generation process captures the following logic. In each period t, λ_{grit} the filing rate against product class g imported from region r in industry i is drawn from a $\Gamma(\exp(X_{it}'\gamma_r + \delta_r\theta_i),\sigma_r)$ distribution. Conditional on this draw of λ_{grit} and the value of θ_i, the actual filing behavior against an individual product class from region r evolves according to a Poisson process with rate λ_{grit}. For each regional import source, this compound distribution model allows for differences in filing rates against product classes within an industry. At the same time, for each regional import source, the model imposes the restriction that the filing rates against imports for all product classes within an industry have the same expectation. From our estimation procedure we can recover estimates of the parameters of both the distribution $\Gamma(\exp(X_{it}'\gamma_r + \delta_r\theta_i),\sigma_r)$ and the filing Poisson process conditional on the realized value of λ_{grit}.

The filing of an antidumping suit is a rare event, but when it occurs there tends to be clustering in the number of filings. Within the context of our econometric model we can think of this clustering of suits as caused by the positive skewness in the gamma distribution for λ_{grit}, so that most realizations of the rate of the Poisson process are very small. However, a large realization occurs very rarely, which in turn implies a large number of observed filings. In

addition, the unobserved heterogeneity across industries represented by θ_i allows for a much larger (or smaller) level of filing activity from a given industry than is predicted by its observable characteristics. Both the stochastic nature of the mean filing rate and the impact of unobservable industry-level heterogeneity θ_i on the filing rate allow for a substantial amount of variability in the TSUS code product-level filing rates across industries.

To compute f_{rit}, the total number of suits filed within industry i against region r during period t, we sum f_{grit} from g=1 to G_{it}, the total number of TSUS product codes within industry i in period t. This summation yields

$$f_{rit} = \sum_{g=1}^{G_{it}} f_{grit} \tag{5}$$

This industry-level annual amount of filing activity against region r is the observable dependent variable used to estimate the parameters γ_r and σ_r and the across-industry distribution of heterogeneity $f(\theta)$.

To construct the conditional density of f_{rit} given θ_i, we utilize the fact that the sum of two independent NB(α,β) random variables is NB(2α,β). This implies that f_{rit} possesses a negative binomial distribution with parameters $G_{it}\sigma_r$ and $\mu_{rit} = \exp(X_{it}'\gamma_r + \delta_r\theta_i)$, conditional on the value of θ_i. Consequently, the conditional distribution of f_{rit} given θ_i is

$$pr[f_{rit}|\theta_i] = \frac{\Gamma(G_{it}\sigma_r + f_{rit})}{\Gamma(f_{rit} + 1)\,\Gamma(G_{it}\sigma_r)} \exp(f_{rit}(X_{it}'\gamma_r + \delta_r\theta_i))\,(1 + \exp(X_{it}'\gamma_r + \delta_r\theta_i))^{-(G_{it}\sigma_r + f_{rit})} \tag{6}$$

where $\Gamma(\alpha)$ is the gamma function $\Gamma(\alpha) = \int_0^\infty t^{\alpha-1}e^{-t}dt$.

We have also made use of the relationship $\Gamma(\alpha+1) = \alpha!$. The joint density function of $f_i = (f_{1i}, f_{2i}, \ldots, f_{Ri})$, where $f_{ri} = (f_{1980,i}, f_{1981,i}, \ldots, f_{1985,i})'$ is

$$pr(f_i \mid \theta_i) = \prod_{r=1}^{R} \prod_{t=1980}^{1985} pr[f_{rit} \mid \theta_i]. \tag{7}$$

where $pr[f_{rit}|\theta_i]$ is defined in (6). Henceforth let t=1,...T=6, denote the years 1980-1985. The structure of (7) accounts for several aspects of our underlying data generation process. First, it allows for contemporaneous correlation across regions in the filing rates for a given industry. Second, it allows for correlation over time in filing rates both for a given region and across regions. Finally, it accounts for the discrete, non-negative support, and extreme positive skewness in the density of filings for each region.

We now turn to our model of the impact of antidumping investigation activity and outcomes on industry-level imports and output which is linked to the model of filing activity through the unobserved industry heterogeneity θ_i. As discussed above, because we are attempting to measure the within-year effects of the stages and various outcomes of the antidumping investigation process from annual magnitudes, we first specify a model for the rate of imports of product class g in industry i from region j within any given year t which incorporates how each of the stages and outcomes of the investigation process effects this rate. We then aggregate this regional import-rate equation over regions to obtain the (multilateral) import rate equation.

Specifying an analogous equation for the rate of domestic output, we then aggregate these two within-year flow equations to obtain the annual level of imports and domestic output by product class. This aggregation process produces indexes of annual suit activity consistent with our model of import and domestic output flows. Aggregating these TSUS code-level annual level equations over all products in each 4-digit SIC industry yields industry-level equations which can be estimated using our industry-level data.

Specifically, let IMP_{gjit} denote the level of imports from region j for product class g in industry i in time period t. Let OUT_{git} denote the level of output produced domestically in product class g in industry i in time period t. We treat time period t as the interval of time [t, t + 1).

Our within-year model of the impacts of suit activity assumes that for any year t and industry i, the following linear differential equations characterize the instantaneous annual rate of change in the quantity of imports from region j and domestic output at the TSUS code-level:

$$\frac{dIMP_{gjit}}{ds} = \beta_j^m \theta_i + \xi_{jt}^m + \sum_r \sum_k \beta_{jrk}^m I_{grit}^k(s) + e_{gjit}(m) \qquad (8r)$$

$$\frac{dOUT_{git}}{ds} = \beta^o \theta_i + \xi_t^o + \sum_r \sum_k \beta_{rk}^o I_{grit}^k(s) + e_{git}(o). \qquad (9)$$

where β_j^m and β^0 are coefficients quantifying the impact of the unobservable industry heterogeneity on the rate of change of imports from region j and industry i and of output in industry i for all time, ξ_{jt}^m and ξ_t^0 are fixed time effects for the two rates of change for year t, and Σ_z denotes a summation over the range of the index z. The indicator variables $I_{grit}^k(s)$ (k=OGP, OGPLFV,

OGSUS, OGWD, and OGD) count, respectively, the number of currently ongoing antidumping petitions (OGP), ongoing affirmative preliminary less than fair value determinations (OGPLFV), ongoing suspension agreements (OGSUS), ongoing withdrawn petitions (OGWD), and ongoing antidumping duties (OGD) for all $s \in [t,t+1)$ against product class g from region r in industry i and time period t. Hence, (8r) allows for the possibility that suit activity k against region r can affect import flows from region j (as measured by β_{jrk}^{m}). The variables $e_{gjit}(m)$ and $e_{gjit}(o)$ are independent identically distributed shocks to the rate of imports from region r and output for product class g, in industry i, in period t.

We now aggregate the regional import rate equation (8r) over the R = 5 regions to obtain the (multilateral) import rate equation (8) analogous to the output rate equation (9):

$$\frac{dIMP_{git}}{ds} = \beta^{m}\theta_{i} + \xi_{t}^{m} + \sum_{r}\sum_{k}\beta_{rk}^{m} I_{grit}^{k}(s) + e_{git}(m) \qquad (8)$$

where $IMP_{git} = \Sigma_j IMP_{gjit}$, $\beta^m = \Sigma_j \beta_j^m$, $\xi_t^m = \Sigma_j \xi_{jt}^m$, $\beta^m{}_{rk} = \Sigma_j \beta_{jrk}^m$, and $e_{git}(m) = \Sigma_j e_{gjit}(m)$. The coefficients β_{rk}^{l}, (l=o,m) quantify the impact of a one unit change in region r's count variables $I_{grit}^{k}(s)$ on the annual rate of (multilateral) imports and domestic output for good g in industry i during time period t. We assume that the disturbance vector $e_{git} = (e_{git}(m), e_{git}(o))'$ possesses a bivariate normal distribution with mean zero and covariance matrix Σ. We assume that e_{git} is independently and identically distributed across goods, industries and over time.

To clarify how the workings of antidumping law effect the quantity of imports and domestic output in our model, consider the following example. Suppose that no antidumping investigation or action is currently in effect on imports from product class g in industry i during year t. In this case the rate of imports in product class g in industry i is

$$\frac{dIMP_{git}}{ds} = \beta^{m}\theta_{i} + \xi_{t}^{m} + e_{git}(m). \qquad (10)$$

Suppose now that an antidumping investigation is initiated some time during period t on imports in this product class from region r. The variable $I_{grit}^{OGP}(s)$ will then take on the value 1 for all $s \in [t,t+1)$ such that the antidumping investigation is currently active. Consequently, the rate of imports will increase by the value of $\beta_{r,OGP}^{m}$ because an investigation is currently ongoing against goods of that product class from region r. Should another petition be filed against imports within this product class from somewhere else in region r during the same time interval, then $I_{grit}^{OGP}(s)$ will take on the value 2 for as long as both sets of investigations are ongoing; it will return to the value of 1 when a single investigation is again active and zero when no investigations are active. Each of the other count variables behaves in a similar manner.

Continuing with the derivation of our TSUS product code-level import and output equations, we integrate (8) and (9) with respect to s from t to t + 1 to obtain

$$IMP_{git} = \beta^{m}\theta_{i} + \xi_{t}^{m} + \sum_{r}\sum_{k}\beta_{rk}^{m}k_{grit} + e_{git}(m) \qquad (11)$$

$$OUT_{git} = \beta^{o}\theta_{i} + \xi_{t}^{o} + \sum_{r}\sum_{k}\beta_{rk}^{o}k_{grit} + e_{git}(o) \qquad (12)$$

where $k_{grit} = \int_{t}^{t+1} I_{grit}^{k}(s)ds.$ In order to compute industry-level import and output equations from these product-level equations, we must aggregate over all of the product classes g within industry i in period t. Summing over all g yields:

$$IMP_{it} = \beta^{m}\theta_i G_{it} + \xi_t^{m} G_{it} + \sum_r \sum_k \beta_{rk}^{m} k_{rit} + \eta_{it}(m) \qquad (13)$$

$$OUT_{it} = \beta^{o}\theta_i G_{it} + \xi_t^{o} G_{it} + \sum_r \sum_k \beta_{rk}^{o} k_{rit} + \eta_{it}(o) \qquad (14)$$

where

$$IMP_{it} = \sum_{g=1}^{G_{it}} IMP_{git}, \quad OUT_{it} = \sum_{g=1}^{G_{it}} OUT_{git}, \quad k_{rit} = \sum_{g=1}^{G_{it}} k_{grit} \quad \text{and} \quad \eta_{it}(l) = \sum_{g=1}^{G_{it}} e_{git}(l),$$

for l = m,o. This aggregation procedure implies that $\eta_{it} = (\eta_{it}(m),\eta_{it}(o))'$ is $N(0,G_{it}\Sigma)$ so that η_{it} is heteroscedastic conditional on G_{it}. Dividing (13) and (14) by G_{it} yields a model more amenable to estimation. This form of the model is analogous to the conventional fixed time-effects, random individual effects panel data model. The model is

$$IMP_{it}/G_{it} = \mu_{it}^{m} + \eta_{it}(m)/G_{it} \quad \text{and} \quad OUT_{it}/G_{it} = \mu_{it}^{o} + \eta_{it}(o)/G_{it} \qquad (15)$$

where

$$\mu_{it}^{m} = \beta^{m}\theta_i + \xi_t^{m} + \sum_r \sum_k \beta_{rk}^{m} k_{rit}/G_{it} \quad \text{and} \quad \mu_{it}^{o} = \beta^{o}\theta_i + \xi_t^{o} + \sum_r \sum_k \beta_{rk}^{o} k_{rit}/G_{it} \qquad (16)$$

The variables μ_{it}^{m} and μ_{it}^{o} are the conditional means of the normalized annual imports and output from industry i in period t. Each of the normalized count variables now can be interpreted as a measure of the intensity of suit activity. The normalized error vector η_{it}/G_{it} is still heteroscedastic because of the distribution for η_{it} given above. Consequently, we apply the appropriate weighting scheme in the construction of the likelihood function.

Using our distributional assumptions we can construct the joint density of IMP_i^* = $(IMP_{i1}/G_{i1},...,IMP_{iT}/G_{iT})'$ and OUT_i^* = $(OUT_{i1}/G_{i1},...,OUT_{iT}/G_{iT})'$ conditional on θ_i as follows. Conditional on the value of θ_i, the joint density of the two-dimensional vector $(IMP_{it}/G_{it},OUT_{it}/G_{it})'$ is

$$\phi(IMP_{it}/G_{it},\ OUT_{it}/G_{it}|\theta_i\ ) = \frac{1}{2\pi}|G_{it}^{-1}\Sigma\ |^{-1/2}\exp(-1/2(v_{it}'(G_{it}^{-1}\Sigma)^{-1}v_{it})). \tag{17}$$

where $v_{it} = ((IMP_{it}/G_{it} - \mu_{it}^m),\ (OUT_{it}/G_{it} - \mu_{it}^o))'$. This implies that the joint density of $(IMP_i^*,OUT_i^*)'$ conditional on θ_i is

$$h(IMP_i^*,OUT_i^*\ |\ \theta_i) = \prod_{t=1}^{T}\phi(IMP_{it}/G_{it},\ OUT_{it}/G_{it}\ |\ \theta_i). \tag{18}$$

Combining this joint density with the joint density of regional filings over the sample period yields the following joint density of filings against the five regions, output and imports over our sample period conditional on θ_i:

$$g(f_i,IMP_i^*,OUT_i^*\ |\ \theta_i) = h(IMP_i^*,OUT_i^*\ |\ \theta_i)pr(f_i\ |\ \theta_i). \tag{19}$$

To complete the construction of the unconditional joint density of filings, output, and imports over our sample period for any industry we must integrate this conditional density with respect to the density of θ. We choose a discrete factor approximation to this unknown density. Recent Monte Carlo work by Mroz and Guilkey (1991) has found these discrete factor structures

are able to model a wide-variety of potential heterogeneity distributions. For many models involving discrete and continuous endogenous variables the parameters of the conditional distribution of interest estimated from these models were found to dominate those obtained from the maximum likelihood estimator in terms of mean squared error loss for sample sizes considered. Integrating with respect to this discrete density of θ, (π_h,θ_h) h=1,...,H, where H is the number of points of support of the discrete density and π_i the probability associated with the point of support θ_h, yields

$$p(f_i,IMP_i^*,OUT_i^*) = \sum_{h=1}^{H} \pi_h g(f_i,IMP_i^*,OUT_i^* \mid \theta_h) \tag{20}$$

In our empirical work, we found that choosing H = 3 was sufficient to adequately estimate $f(\theta)$. We found that for larger values of H the parameters of the conditional mean function for the five filing variables and the imports and domestic output equations did not change appreciably.[8] Taking the log of $p(f_i,IMP_i^*,OUT_i^*)$ and summing from i=1 to N yields the log-likelihood function for our model.

Before presenting the estimates of the parameters of the joint density of these seven variables we must first discuss the variables entering X_{it}, the vector of observable industry characteristics shifting the conditional mean of the filing rate of industry i and time period t. Because we wish to allow for the possibility that firms pursue the outcome-filer strategy against some regions, and the process-filer strategy against others, we include in X_{it} variables suggested by both filing strategies. Note that the absence of an r subscript on the vector X_{it} reflects the

[8]This result is consistent with the Monte Carlo evidence in Mroz and Guilkey (1991), who found small values of H were sufficient to adequately capture variability due to θ.

restriction that regional filing rates do not depend on the characteristics of the regions. Our lack of data at the regional level necessitated this restriction.

Our main objective in selecting outcome-filer variables for inclusion in X_{it} follows from the logic that if a variable is used to determine injury in an antidumping suit proceeding and industries are aware of this, then these variables should be predictors of future dumping suit activity (under the outcome-filer strategy). Although the domestic industry must concern itself with the establishment of injury, a LTFV determination is also necessary for dumping to be found. Moreover, the margin by which the Commerce Department finds that final sales to the domestic market are made at less than fair value determines the magnitude of the antidumping duties that the petitioning industry can expect. Nevertheless, the Commerce Department's final LTFV margin is extremely unpredictable and there are biases inherent in the process used to determine its level which favor finding a positive margin.[9] For these reasons, we hypothesize that firms pursuing the outcome-filer strategy file primarily based on the observable industry characteristics that determine injury, and allow for a sufficiently rich stochastic structure for our model to account for unobservable differences in filing behavior across industries.

A major indicator of injury to the petitioning firms is the import penetration ratio $IMPEN_{it} = IMP_{it}/(IMP_{it} + OUT_{it})$. A large value of IMPEN is indicative of a large foreign presence in the domestic market which may be injurious to the domestic firms. A second variable which is used

[9] This uncertainty is due in part to the different methodologies, sometimes for a single suit, that can be used to determine this margin. Boltuck and Litan (1991) contains several papers which discuss the large amount of uncertainty inherent in the dumping margin determination process. In addition, a conclusion which is fairly consistent throughout most of the papers in this volume is that there are strong biases in the process towards finding a positive dumping margin. The papers by Francois, Palmeter, Anspacher and Boltuck, Francois, and Kaplan in the Boltuck and Litan (1991) volume are particularly persuasive in this regard.

to assess injury is the domestic firm's capacity utilization rate, which we represent at the industry level by $CAPU_{it} = OUT_{it}/CAP_{it}$ (where OUT_{it} is real shipments and CAP_{it} is real capital stock). We compute OUT_{it} as the nominal value of annual shipments divided by the industry specific shipments price index. All real magnitudes are in 1972 dollars. We include $IMPEN_{it-1}$ and $CAPU_{it-1}$ in X_{it}, because they are both predetermined as of the beginning of year t. We also include time fixed effects in X_{it} to account for any trends in filing activity not accounted by changes in observable or unobservable industry characteristics.

We also include several additional variables to account for the fact that the magnitude of IMPEN and CAPU necessary to find harmful dumping may vary with the size and the structure of the domestic industry. We measure the size of an industry by EMP_{it}, aggregate employment for industry i in period t, and expect that a given level of IMPEN and CAPU is more likely to be associated with a finding of injury the larger the size of the industry. We attempt to proxy for the (vertical) structure of an industry by value-added per dollar output in the industry $VADD_{it}/OUT_{it}$, and expect that a given level of IMPEN and CAPU is more likely to be associated with a finding of injury to the domestic industry the lower is VADD/OUT, i.e., the farther downstream the domestic industry is located, and thus the smaller the share of primary factor payments in total industry cost and the more sensitive those factor payments will be to industry price changes. The final control variable we include is the percentage of all workers in the industry that are unionized, UNION. We hypothesize that this variable captures the ability of the industry to organize and file antidumping petitions against foreign competitors. Because these variables are predetermined at the beginning of year t, lagged values of VADD/OUT, EMP, and UNION (their values for period t - 1) are included in X_{it}.

As we have noted above, under the process-filing strategy we would expect filing to be related to CAPU and little else, and in particular not to be related to other measures important for the final determination of dumping (IMPEN, EMP, and VADD/OUT). As with outcome filers, we also hypothesize that UNION captures the ability of the industry to organize and file antidumping petitions against foreign competitors under the process filing strategy.

Table 1 contains the sample means and standard errors for all of the variables used in our analysis. The most striking aspect of the table is the large standard deviation of all filing and suit resolution process variables. In addition, the sample skewness of these variables is also very large and positive. These properties are indicative of the extreme rare event nature of antidumping suit activity and underscore the importance of specifying a statistical model which accounts for these characteristics of the economic environment. As mentioned above, all dollar magnitudes are in real 1972 dollars.

Results

Tables 2-6 presents estimates of the parameters of the filing rate equation for our five importing regions. We first will discuss these results and then turn to a discussion of our import and output equations.

To interpret the results in Table 2-6, recall that under our assumptions the mean of the filing rate against region r in industry i for period t is $E(f_{rit}) = \exp(X_{it}'\gamma_r + \delta_r\theta_i)\sigma_r$. Taking the natural logarithm of both sides of $E(f_{rit})$ yields:

$$E(f_{rit}) = X_{it}'\gamma_r + \delta_r\theta_i + \ln(\sigma_r).$$

Consequently, each element of γ_r can be interpreted as the percentage increase in the mean number of filings against region r as a result of a one unit change in the associated element of X_{it}. This result allows us to make unitless comparisons of elements of γ_r across regions.

Before discussing differences across the tables in parameter estimates we describe our test of whether these differences are statistically significant. We tested whether all of the elements of γ_r (besides the constant term and time dummies) were equal across the five regions. This involves imposing 20 equality constraints in moving from the null model with 5 coefficients on (IMPEN, CAPU, EMP, VADD/OUT, and UNION) to 25 coefficients (5 variables and 5 regions) in the unrestricted model. Under both the null and alternative hypotheses we allow the σ_r and time dummies and constant terms to differ across regions. The value of the likelihood ratio statistic for this test is 124.19 which is significantly larger than the 0.01 critical value from a χ^2_{20} random variable of 37.57. Hence there is strong evidence of significant differences in filing behavior across the five regions.

The general conclusion to emerge from a comparison of results across these tables is that for filing behavior against the European region and the Japan/NICs region, the outcome filing strategy seems the most plausible, while filing behavior against the Canada/Mexico region yields results most consistent with the use of a process filing strategy. For filings against Europe and Japan and the NICs, the coefficient on IMPEN is precisely estimated and of the expected sign, something not shared by the estimation results for any other regional grouping. In addition, the estimated coefficients on CAPU for the European region and on EMP for the Japan/NICs region, additional variables which are important to the ITC's final injury determination, are also estimated with precision and of the expected sign. This is consistent with our outcome filer interpretation. In contrast, for filings against the Canada and Mexico region, only CAPU is a strong predictor of filing activity, both in terms of its relative magnitude and statistical precision. The other variables important for the ITC's final injury determination lack predictive power for filing behavior against this region. This is consistent with our process filer view. For the planned

economies and for our residual other region, it is difficult to argue if the data is at all informative as to which of the two strategies is more likely.

Perhaps the most strikingly uniform result across all of the regions is the dramatic predictive power of UNION. For all importing regions, a higher percentage of unionized workers in an industry predicts a significantly higher number of filings against that region. This presumably reflects the general importance of overcoming the free-rider problem associated with bearing the cost of bringing an antidumping petition forward.

Comparing the Japan/NICs results to the Europe results yields several conclusions. First is that CAPU appears to be both an economically and statistically more important predictor of filing activity against Europe than against Japan/NICs. Second, the opposite conclusion holds for IMPEN, when comparing the two regions.

Tables 7 and 8 present our import and domestic output equation results, which yield estimates of the parameters of the conditional mean functions given in (16) which are used to assess the impact of the investigation process itself and of the outcome of the investigation on the flow of both imports and domestic output.

We make a number of observations. First, the investigation effects implied by the coefficient estimates for $\beta^{m}_{r,OGP}$ and $\beta^{m}_{r,OGPLFV}$ in Table 7 and for $\beta^{o}_{r,OGP}$ and $\beta^{o}_{r,OGPLFV}$ in Table 8 are consistent with our findings regarding the filing strategies across regions noted above. In particular, the filing of a petition against firms in Europe or the Japan/NICs region leads to a rise in the rate of imports up until an affirmative preliminary LTFV determination, at which point the rate of imports falls precipitously and remains low until the conclusion of the investigation. These investigation effects are consistent with the outcome filer hypothesis. In contrast, the filing of a petition against firms in the Mexico/Canada region leads to an immediate

fall in the rate of imports, which remains low until the conclusion of the investigation. These investigation effects are consistent with the process filer hypothesis. As was true with the filing equation results, the investigation effects implied by the planned economy and the residual other regions are inconclusive with regard to the implied filing strategy. The results from the output equation estimation reinforce these conclusions, although the parameters are estimated less precisely.

As for the differing effects of investigation outcomes on post-investigation imports and domestic output, our parameter estimates imply that the imposition of antidumping duties against any region strongly reduces imports of the products involved, while the response of domestic import-competing output is positive but less precisely estimated. Petitions against a region which are subsequently withdrawn appear to have no lasting effects on imports or domestic output, confirming our earlier findings (Staiger and Wolak, 1994). Finally, the paucity of suspension agreements in our sample makes it difficult to assess regional differences (the Japan/NICs region, for example, did not negotiate any suspension agreements with the United States during our sample period), but to the extent that the estimates are informative they suggest that only suspension agreements with Europe are successful in restricting imports of the products involved. This, of course, does not necessarily imply that suspension agreements with other regions do not reduce bilateral imports from those regions, but only that such agreements are not effective in reducing the overall imports of the relevant product into the U.S. market.

IV. Conclusion

Our cross-country analysis of the determinants and impacts of antidumping suits has revealed a substantial amount of heterogeneity between the different trading regions. At the most basic level these results show that although there is a large stochastic component, antidumping

suit filings are predictable events using observable industry magnitudes. Against Western Europe and Japan and the NICs, the use of antidumping law appears to be consistent with the view that firms file in expectation of obtaining relief via antidumping duties or suspension agreements--outcome filers in our nomenclature. This is suggested by the pattern of filing against these regions, which appears to reflect a concern for meeting the injury requirements necessary to secure a finding of dumping, as well as by the import and domestic output responses to filing and the various phases of the suit resolution process. But we have also argued that a distinctive filing strategy against Canada and Mexico would be expected on *a priori* grounds, and in particular that Canada and Mexico are the most likely targets of process-filing by U.S. firms over our sample period, because their export production is predominantly destined for the U.S. market and accounts for a relatively high and stable U.S. market share. In line with these a priori views, we find evidence in the use of antidumping law against Mexico and Canada which is consistent with our process filer logic, where firms file primarily to obtain the protection afforded during the investigation process itself. This is supported by the pattern of filing against these countries, which appears to be driven primarily by the level of capacity utilization but unrelated to other observable measures of injury, as well as by the import and domestic output responses to filing and the various phases of the suit resolution process.

Finally, we can use our coefficient estimates in Table 7 to provide a rough idea of the magnitudes of all the trade-distorting effects, by region and by type of effect, that are associated with the use of antidumping law during our sample period. We compute the total sample distortions to U.S. imports from the investigation process associated with petitions against region r as follows:

$$D^{m}_{INVr} = \sum_{i} \sum_{t} \beta^{m}_{1r} OGP_{rit} + \beta^{m}_{2r} OGPLEV_{rit}$$

The total sample distortions to U.S. imports from the post-investigation effects due to petitions against region r are computed as follows

$$D^{m}_{ENDr} = \sum_{i} \sum_{t} \beta^{m}_{3r} OGSUS_{rit} + \beta^{m}_{5r} OGD_{rit}$$

We exclude the effects of withdrawn petitions because the coefficients associated with $OGWD_{rit}$ in the import equation are never statistically different from zero. We then compute IMPTOT, defined as the sum of multilateral imports over all industries and years in our sample, and express D^{m}_{INVr} and D^{m}_{ENDr} as a percentage of IMPTOT.

For our sample of industries and for the six years of available data, the total amount of U.S. import reductions from all investigation effects against Western Europe amounts to approximately -0.05 percent of total U.S. imports over the sample period, while the total distortions attributable to post-investigation effects against Western Europe is -1.14 percent of total imports over the sample period. For Japan and the NICs, the distortions to U.S. imports from investigation and post-investigation effects from petitions against this region amounts to 0.87 percent and -2.31 percent, respectively, of total U.S. imports.[10] For both these regions, the major import distortions associated with the use of antidumping law are attributable to post-investigation effects. For Mexico and Canada, on the other hand, the relative importance of investigation and post-investigation effects is reversed: The distortions to U.S. imports associated with investigation and post-investigation effects of petitions against Mexico and Canada are -0.84 percent and -0.25 percent, respectively, of total U.S. imports. This conforms to our findings that

[10] The positive boost to U.S. imports associated with investigation effects of petitions against Japan and the NICs reflects the fact that the effect of filing on imports is positive and relatively large and the effect of an affirmative preliminary LTFV determination, while negative, does not persist long enough to reverse this cumulative positive effect.

U.S. firms appear to be outcome filers against Europe and Japan and the NICs, and hence the main import restrictions come with the explicit remedies provided by the law (duties or suspension agreements), while U.S. firms appear to be process filers against Mexico and Canada, and hence the main import restrictions come from the investigation effects.

A final implication of our process-filer/outcome-filer distinction is that the frequency with which outcome filers ought to secure duties should be substantially higher than for process filers. To investigate this hypothesis we computed the sum of OGD_{rit} in Mexico and Canada for all industries and all six years in our sample, and then divided this sum by the sum of f_{rit} for all industries and all six years for the same region. This ratio gives the per-suit level of duty activity against Mexico and Canada, the region against which U.S. firms appear to be process filers. We then repeated this same calculation for Europe and Japan and the NICs, treating this as the aggregate region against which U.S. firms appear to be outcome filers. Dividing the "outcome filer ratio" by the "process filer ratio" yields 3.73, suggesting that in our sample, a product-level antidumping petition is 3.73 times more likely to end in duties when it is filed against firms in Europe, Japan, or a NIC versus firms from Canada or Mexico. This result is consistent with the view that suits against Canada and Mexico are filed less for the eventual protection provided by duties than are suits against Europe and Japan and the NICs.

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Table 1: Means and Standard Errors of Variables			
2040 Year-Industry Observations (i=1,...,N=338 industries and t=1,...,T=6 years)			
Variable	Definition	Mean	Standard Error
f_{it}^{Japan}	Total Filings from Japan and NICs	0.231	2.454
f_{it}^{Europe}	Total Filings from Europe	0.249	4.021
$f_{it}^{Planned}$	Total Filings from Planned Economies	0.078	1.694
f_{it}^{CANMEX}	Total Filings from Canada or Mexico	0.062	1.455
f_{it}^{Other}	Total Filings from Other Countries	0.280	6.157
Git	Total TSUS Codes	33.63	131.86
IMP_{it}	Real Imports in 10^6 1972 dollars	289.55	1147.98
OUT_{it}	Real Output in 10^6 1972 dollars	2174.03	4152.99
EMP_{it-1}	Industry Level Employment x 10^3	41.97	62.37
$VADD_{it-1}/OUT_{it-1}$	Value-Added per Dollar of Real Output	0.483	0.133
$CAPU_{it-1}$	Capacity Utilization Rate	2.856	1.929
$IMPEN_{it-1}$	Import Penetration Ratio	0.109	0.140
$UNION_{it-1}$	Percentage of Workers Unionized	12.25	28.98
OGP_{it}^{Japan}	Ongoing Antidumping Petition against Japan and NICs	0.164	1.649

$OGPLFV_{it}^{Japan}$	Ongoing Preliminary Less Than Fair Value against Japan and NICs	0.055	0.603
$OGSUS_{it}^{Japan}$	Ongoing Suspension against Japan and NICs	0.00[a]	0.00[a]
$OGWD_{it}^{Japan}$	Ongoing Withdrawal against Japan NICs	0.020	0.595
OGD_{it}^{Japan}	Ongoing Duties against Japan and NICs	0.170	2.231
OGP_{it}^{Europe}	Ongoing Petition Against Europe	0.131	2.238
$OGPLFV_{it}^{Europe}$	Ongoing Preliminary Less Than Fair against Europe	0.033	0.871
$OGSUS_{it}^{Europe}$	Ongoing Suspension Against Europe	0.065	1.488
$OGWD_{it}^{Europe}$	Ongoing Withdrawal Against Europe	0.354	6.971
OGD_{it}^{Europe}	Ongoing Duties Against Europe	0.065	1.347
$OGP_{it}^{Planned}$	Ongoing Petition Against Planned Economies	0.043	1.074
$OGPLFV_{it}^{Planned}$	Ongoing Preliminary Less Than Fair Value Against Planned	0.014	0.269
$OGSUS_{it}^{Planned}$	Ongoing Suspension Against Planned	0.027	0.495
$OGWD_{it}^{Planned}$	Ongoing Withdrawal Against Planned	0.017	0.773
$OGD_{it}^{Planned}$	Ongoing Duties Against Planned	0.002	0.044

OGP_{it}^{CANMEX}	Ongoing Petition Against Canada or Mexico	0.038	0.997
$OGPLFV_{it}^{CANMEX}$	Ongoing Preliminary Less Than Fair Value Against Canada or Mexico	0.012	0.412
$OGSUS_{it}^{CANMEX}$	Ongoing Suspension Against Canada or Mexico	0.003	0.077
$OGWD_{it}^{CANMEX}$	Ongoing Withdrawal Against Canada or Mexico	0.013	0.581
OGD_{it}^{CANMEX}	Ongoing Duties Against Canada or Mexico	0.008	0.277
OGP_{it}^{Other}	Ongoing Petition Against Other	0.165	3.563
$OGPLFV_{it}^{Other}$	Ongoing Preliminary Less Than Fair Value Against Other	0.045	1.146
$OGSUS_{it}^{Other}$	Ongoing Suspension Against Other	0.080	1.810
$OGWD_{it}^{Other}$	Ongoing Withdrawal Against Other	0.149	4.178
OGD_{it}^{Other}	Ongoing Duties Against Other	0.052	0.951

[a]No suspension agreements with Japan or the NICs were made during our sample time period.

Table 2: Filing Rate Equation Estimates for Japan and NICs		
N = 338 Industries for T=6 years		
Variable	Coefficient Estimate	Standard Error
Constant	-2.807	1.153
$IMPEN_{it-1}$	5.523	1.580
$CAPU_{it-1}$	-0.188	0.121
EMP_{it-1}	0.0079	0.0024
$VADD_{it-1}/OUT_{it-1}$	1.165	2.335
$UNION_{it-1}$	0.061	0.018
$\sigma \times 10^4$	4.970	0.858
YEAR81	1.036	0.821
YEAR82	1.136	0.851
YEAR83	2.039	0.813
YEAR84	1.359	0.824
YEAR85	1.671	0.749

Notes: NICs = Taiwan, Singapore, South Korea, and Hong Kong.

Table 3: Filing Rate Equation Estimates for Western Europe		
N = 338 Industries for T=6 years		
Variable	Coefficient Estimate	Standard Error
Constant	-5.386	1.871
$IMPEN_{it-1}$	3.939	1.963
$CAPU_{it-1}$	-0.298	0.121
EMP_{it-1}	0.0028	0.0032
$VADD_{it-1}/OUT_{it-1}$	3.859	2.528
$UNION_{it-1}$	0.119	0.023
$\sigma \times 10^4$	6.023	1.185
YEAR81	-1.897	1.192
YEAR82	-0.819	0.937
YEAR83	2.229	0.796
YEAR84	0.431	0.815
YEAR85	1.759	0.786

Table 4: Filing Rate Equation Estimates for Planned Economies of Eastern Europe		
N = 338 Industries for T=6 years		
Variable	Coefficient Estimate	Standard Error
Constant	-8.948	3.915
$IMPEN_{it-1}$	-5.572	5.948
$CAPU_{it-1}$	-0.280	0.345
EMP_{it-1}	0.0041	0.0072
$VADD_{it-1}/OUT_{it-1}$	4.515	5.406
$UNION_{it-1}$	0.203	0.060
$\sigma \times 10^4$	3.705	1.383
YEAR81	-1.993	1.705
YEAR82	-1.512	2.406
YEAR83	-2.998	2.700
YEAR84	0.387	1.856
YEAR85	2.447	1.716

Table 5: Filing Rate Equation Estimates for Canada or Mexico		
N = 338 Industries for T=6 years		
Variable	Coefficient Estimate	Standard Error
Constant	-3.508	2.051
$IMPEN_{it-1}$	0.176	0.652
$CAPU_{it-1}$	-0.487	0.145
EMP_{it-1}	-0.0047	0.0032
$VADD_{it-1}/OUT_{it-1}$	1.824	2.510
$UNION_{it-1}$	0.142	0.029
$\sigma \times 10^4$	3.492	1.254
YEAR81	-3.335	0.643
YEAR82	-1.067	0.652
YEAR83	2.012	1.112
YEAR84	-1.028	0.580
YEAR85	-0.839	0.652

Table 6: Filing Rate Equation Estimates for All Other Countries		
N = 338 Industries for T=6 years		
Variable	Coefficient Estimate	Standard Error
Constant	-1.991	2.216
$IMPEN_{it-1}$	-9.127	4.650
$CAPU_{it-1}$	-0.456	0.178
EMP_{it-1}	-0.0068	0.0052
$VADD_{it-1}/OUT_{it-1}$	-2.283	3.206
$UNION_{it-1}$	0.074	0.022
$\sigma \times 10^4$	5.132	1.324
YEAR81	-0.022	1.717
YEAR82	4.860	1.371
YEAR83	2.121	1.325
YEAR84	2.875	1.324
YEAR85	4.229	1.293

Table 7: Import Equation Estimates		
N = 338 Industries for T=6 years		
Variable	Coefficient Estimate	Standard Error
OGP_{it}^{Japan}/G_{it}	41.95	30.52
$OGPLFV_{it}^{Japan}/G_{it}$	-80.11	35.83
$OGSUS_{it}^{Japan}/G_{it}$	0.0	0.0
$OGWD_{it}^{Japan}/G_{it}$	-33.79	55.02
OGD_{it}^{Japan}/G_{it}	-39.19	18.47
OGP_{it}^{Europe}/G_{it}	11.70	12.28
$OGPLFV_{it}^{Europe}/G_{it}$	-51.37	24.48
$OGSUS_{it}^{Europe}/G_{it}$	-36.59	19.28
$OGWD_{it}^{Europe}/G_{it}$	-7.48	16.62
OGD_{it}^{Europe}/G_{it}	-13.65	6.38
$OGP_{it}^{Planned}/G_{it}$	-59.22	60.51
$OGPLFV_{it}^{Planned}/G_{it}$	77.88	103.45
$OGSUS_{it}^{Planned}/G_{it}$	49.31	22.43
$OGWD_{it}^{Planned}/G_{it}$	-45.91	60.38
$OGD_{it}^{Planned}/G_{it}$	-11.10	3.14
OGP_{it}^{CANMEX}/G_{it}	-42.05	20.11
$OGPLFV_{it}^{CANMEX}/G_{it}$	-69.59	119.63
$OGSUS_{it}^{CANMEX}/G_{it}$	-156.73	186.89
$OGWD_{it}^{CANMEX}/G_{it}$	18.41	35.54
OGD_{it}^{CANMEX}/G_{it}	-25.56	11.34
OGP_{it}^{Other}/G_{it}	-77.86	100.34
$OGPLFV_{it}^{Other}/G_{it}$	87.88	98.13
$OGSUS_{it}^{Other}/G_{it}$	-3.80	14.50
$OGWD_{it}^{Other}/G_{it}$	-8.12	22.17
OGD_{it}^{Other}/G_{it}	-18.02	11.24

Constant	11.64	1.45
YEAR81	-0.74	2.03
YEAR82	0.50	2.23
YEAR83	2.05	2.40
YEAR84	6.12	2.96
YEAR85	7.97	3.26

Table 8: Output Equation Estimates		
N = 338 Industries for T=6 years		
Variable	Coefficient Estimate	Standard Error
OGP_{it}^{Japan}/G_{it}	29.92	50.49
$OGPLFV_{it}^{Japan}/G_{it}$	25.24	16.81
$OGSUS_{it}^{Japan}/G_{it}$	0.0	0.0
$OGWD_{it}^{Japan}/G_{it}$	8.58	8.51
OGD_{it}^{Japan}/G_{it}	9.47	21.24
OGP_{it}^{Europe}/G_{it}	-27.10	39.61
$OGPLFV_{it}^{Europe}/G_{it}$	25.54	16.48
$OGSUS_{it}^{Europe}/G_{it}$	-99.83	176.60
$OGWD_{it}^{Europe}/G_{it}$	-20.59	50.81
OGD_{it}^{Europe}/G_{it}	27.05	12.11
$OGP_{it}^{Planned}/G_{it}$	17.92	22.89
$OGPLFV_{it}^{Planned}/G_{it}$	68.81	125.40
$OGSUS_{it}^{Planned}/G_{it}$	51.48	24.18
$OGWD_{it}^{Planned}/G_{it}$	-44.48	51.28
$OGD_{it}^{Planned}/G_{it}$	8.14	4.01
OGP_{it}^{CANMEX}/G_{it}	38.17	21.17
$OGPLFV_{it}^{CANMEX}/G_{it}$	-85.01	190.89
$OGSUS_{it}^{CANMEX}/G_{it}$	-44.50	76.83
$OGWD_{it}^{CANMEX}/G_{it}$	24.48	57.01
OGD_{it}^{CANMEX}/G_{it}	12.19	10.31
OGP_{it}^{Other}/G_{it}	29.07	45.06
$OGPLFV_{it}^{Other}/G_{it}$	-69.70	172.29
$OGSUS_{it}^{Other}/G_{it}$	71.53	145.04
$OGWD_{it}^{Other}/G_{it}$	-98.43	194.73
OGD_{it}^{Other}/G_{it}	15.41	17.92

Constant	285.49	10.31
YEAR81	-8.59	18.39
YEAR82	-16.17	18.45
YEAR83	-14.33	18.43
YEAR84	4.05	18.41
YEAR85	4.45	18.53