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Sanctuary markets and antidumping: an empirical analysis of U.S. exporters

Michael Moore

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Abstract Antidumping proponents in the United States often argue that foreign firms use profits obtained behind home market barriers to "subsidize" allegedly "unfair" pricing abroad. This paper examines this "sanctuary market" hypothesis for antidumping petitions filed against U.S. manufacturing exporters. Econometric results suggest that there is little evidence that the U.S. manufacturing firms facing antidumping actions abroad are beneficiaries of a home market sanctuary during the 1994–2007 time period. This evidence suggests that current WTO disciplines are inadequate to protect firms from antidumping investigations that do not benefit from sanctuary markets.

Keywords Sanctuary market · Antidumping · Trade policy · Trade retaliation

JEL Classification F13 · F14 · L1

1 Introduction

Proponents of antidumping duty procedures have pointed to a number of justifications for their inclusion in the World Trade Organization (WTO) system. Chief among them is the long-standing "sanctuary market" hypothesis. The basic idea is that formal and informal barriers to competition in the home market will result in excessive profits that in turn allow an exporting firm to price "unfairly" in

M. Moore (✉)
Department of Economics, Elliott School, Institute for International Economic Policy, George Washington University, Washington, DC, USA
e-mail: mom@gwu.edu

foreign markets and thereby lead to material injury to domestic firms in the importing country.

This argument is often heard in the United States where support for antidumping procedures traditionally has been very strong.[1] A U.S. government formally submitted a paper to the WTO on the "basic concepts" of antidumping that encapsulates this view:

> [K]ey aspects of the economic system supported by government inaction can enable injurious dumping to take place…For instance, these policies may allow producers to earn high profits in a home "sanctuary market," which may in turn allow them to sell abroad at an artificially low price. Such practices can result in injury in the importing country since domestic firms may not be able to match the artificially low prices from producers in the sanctuary market. (United States 2002, p. 4)

Despite the frequency of such arguments, no formal econometric analysis exists that evaluates whether exporters benefiting from sanctuary markets are more likely to face dumping allegations under the trade remedy laws. This research will take preliminary steps to fill that gap.

I will use a reduced form analysis to investigate whether industry level characteristics of those facing dumping allegations are consistent with expectations of the market sanctuary hypothesis. Ideally, one would examine this by collecting detailed industry level data for all countries. Unfortunately, countries often use distinct domestic classification systems rendering sufficiently disaggregated data incompatible across jurisdictions.

As a consequence, the approach taken here is to focus exclusively on U.S. exporters. This approach has a number of advantages. The first is that examining only one exporting country will assure a consistent methodology for any official statistics used in the study. The second is that most analysts consider official U.S. data to be reasonably reliable or at least not systematically biased. The third is that the results of the study may have particular relevance to antidumping proponents in the United States who would be familiar with industrial structure and government policy in their own market. Finally, the now widely acknowledged spread of antidumping actions to many jurisdictions means that understanding the determinants of antidumping petitions against U.S. exporters will have particular relevance to U.S. policy-makers.

The basic approach of this study is to combine variables identified in the existing literature on determinants of antidumping petitions with regressors consistent with the market sanctuary hypothesis. The econometric model is based on work by Moore and Zanardi (2011), who estimate the probability of observing a new antidumping petition based on country-industry pairs and controls for imports, a number of macroeconomic controls, and reactions against other countries' antidumping actions. The current work will expand on that study by including

[1] For example, advocates for the U.S. steel industry have accused the Japanese government of turning a blind eye towards anti-competitive actions of domestic firms, which in turned allowed these firms to take market share away from U.S. companies (Howell et al. 1988). These arguments have been developed further in Mastel (1998).

detailed industry information available from the U.S. Department of Commerce's Census of Manufacturing, which is conducted every 5 years. These latter variables [all at the 6-digit North American Industrial Classification Schedule (NAICS) code level] will include standard measures of industrial concentration, measures of high entry and exit costs in the industry, and U.S. sectoral tariffs.

The time period analyzed in the formal empirical work will be from 1994 through 2007. This beginning date coincides the start of WTO antidumping rules as part of the Uruguay Round negotiations. The latter date reflects a decision not to include the impact of the financial crisis that began in 2008. Note that the analyzed period will include a large majority of cases brought against the United States as well as the actions of some of the new users of antidumping.

The null hypothesis is that trade flows and macroeconomic conditions will play an important role in explaining filings against U.S. exporters and that variables consistent with the sanctuary market argument (e.g., U.S. applied tariffs that restrict foreign imports, high entry costs, and measures of sectoral competitiveness) will also help predict antidumping petitions. Econometric evidence consistent with this hypothesis would be supportive of the view that antidumping procedures were working as intended by U.S. supporters.

We will see that there is little evidence that U.S. exporters facing antidumping actions fit expectations of the market sanctuary story. However, it is important to note that the results of this study only offer insights into the experience of U.S. exporters; evidence from U.S. experience does not tell us whether other countries' firms benefit from such advantages. But if U.S. firms systematically face antidumping actions despite the absence of market sanctuary benefits, one can ask whether WTO antidumping disciplines are inadequate for safeguarding "fairly" traded goods.

The rest of the paper is organized in the following way. Section 2 includes a brief literature review and a short analysis of the market sanctuary argument. Section 3 lays out some of the basic statistics and patterns of antidumping actions taken against U.S. exporters. Section 4 includes a brief discussion about econometric methodology and construction of the data. I will discuss the econometric results in Sect. 5 and offer some policy implications and suggestions for further research in the conclusion.

2 Literature review and basic approach

Analysis of antidumping has taken a prominent place in the study of international trade policy in recent decades. This reflects its role as one of the most frequently used measures to restrict imports in first the GATT and now the WTO system. Moreover, antidumping use has expanded across a great many new nations, an expansion that has been documented and analyzed by many authors, e.g., Miranda et al. (1998), Prusa (2001), Zanardi (2004) and the various authors in Bown (2011). In addition, study of antidumping actions is important since they represent allowed exceptions to some of the most important WTO principles: most favored nation (MFN), national treatment, and bound tariffs.[2]

The literature on antidumping has focused on many different aspects of its use both from a theoretical and empirical angle [See Prusa and Blonigen (2003) for a useful survey of many of the relevant trends in this literature]. Many authors, including Aggarwal (2004), Feinberg (1989, 2005), Knetter and Prusa (2003), and Leidy (1997), have analyzed the determinants of initiations of antidumping, with special attention to the United States. These authors (and others) have noted the important role of macroeconomic conditions for explaining initiations of antidumping actions. In recent years, there has been an increase in the focus on new users of antidumping in the developing world such as India, Brazil, South Africa and Turkey.[3] For example, Rovegno (2013) has examined how the use of antidumping (and countervailing duties) affects the degree of competiveness within the United States by considering the price–cost markup. She finds convincing evidence that such a relationship exists though the estimated effect is small.

As noted above, very little work has been done on determinants of cases initiated against U.S. exporters, especially compared to the large number of cases focused on determinants of U.S. actions against foreigners. The most notable example of formal empirical analysis of actions taken against U.S. firms is Feinberg and Reynolds (2008). They control for standard measures such as trade volume, exchange rates, and macroeconomic conditions. But they focus on whether U.S. exporters are more likely to face antidumping actions abroad as a result of U.S. actions against importers. They find evidence of such retaliation, especially at the national level.

This study builds upon this earlier work on antidumping initiations but focuses on a new issue—evidence about the market sanctuary hypothesis. A very simple partial equilibrium version of the argument is illustrated in Fig. 1. Suppose that a U.S. firm has a monopoly position in its home market in good x and that domestic demand is linear. In the absence of sales abroad, domestic demand (D) is insufficient for the monopoly to have positive profits: output is at Q1 with average total cost (ATC1) above the associated domestic price. Now assume that the domestic monopolist gains access to the world market where it can sell for Pw. For simplicity and without loss of generality, the U.S. firm is assumed small in international markets.

At this price, the U.S. firm equates marginal revenue across markets and now produces Q3 for the domestic market and Q2–Q3 for the international market. Note that the expansion of production to Q2 from Q1 results in lower domestic average total costs, now at ATC2. The U.S. firm now earns C at home and loses E on international sales. If area C is larger than E, then the U.S. firm would be able to operate profitably overall even though it incurs negative profits on export sales.

Note as well that the U.S. firm is "dumping" by international standards. On the one hand, it is now selling abroad at a price below its average cost of production (i.e., Pw $<$ AC2).[4] In addition, it is practicing international price discrimination by selling at home (P2) above what it charges abroad (Pw). This state of affairs would

[2] MFN is violated since tariffs vary across countries for the same product. National treatment is violated since pricing behavior acceptable by domestic firms (differential pricing across regions) is punished if undertaken by foreigners. Antidumping duties result in tariffs beyond those negotiated in multilateral trade negotiations so that bound tariff commitments are violated.

[3] See for example, Bown (2011), Francois and Niels (2006), Prusa and Skeath (2004), Blonigen and Bown (2003), Bown and Crowley (2007), Moore and Zanardi (2009), and Feinberg and Reynolds (2006).

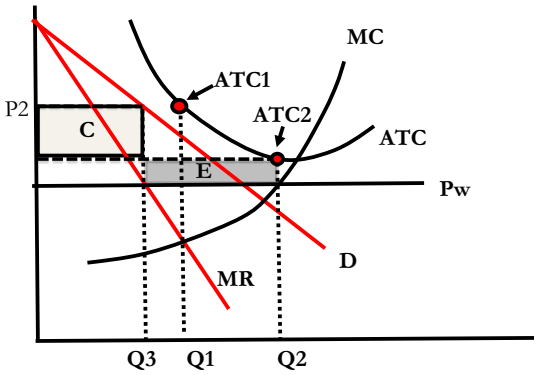

Fig. 1 Sanctuary market

not be able to continue if international arbitrage were at play. Arbitragers would have an incentive to buy internationally acquired goods and sell them in the U.S. market. Consequently, high border barriers are necessary for the market sanctuary strategy to work.

It is important to make two further points about the economic analysis embodied in Fig. 1. First, this example requires that there is substantial monopoly power in the domestic market so that extra-normal profits can exist. Second, this strategy presumes that the firm can lower its costs by expanding production, i.e., it is operating where average costs are decreasing. Without this provision, expanding production through exports when average costs are rising will not yield profits where none existed before.

I will use this simple analysis to examine evidence of the market sanctuary hypothesis for U.S. exporters. I will control for: (1) monopolistic power in the domestic market; (2) high U.S. trade barriers; and (3) high fixed costs that would be associated with possible declining average costs. It is important to note that without these characteristics, the market sanctuary strategy would be very difficult to implement. One important caveat: firms with high fixed costs may continue to produce in the face of a negative demand shock. This will increase the chance that they produce below average total cost but need not reflect operating behind a sanctuary domestic market; it simply might make sense to continue to produce and export in response to a short term shock even in the absence of a market sanctuary.

3 Descriptive statistics

Table 1 includes some basic information about antidumping actions initiated against U.S. exporters from 1978 through 2010.[5] We see that there have been 382 individual

[4] Pricing below *marginal* cost is not the standard in international trade agreements on dumping. Instead, pricing below *production* costs, typically below average total costs in practice, is considered dumping.

petitions brought against U.S. exporting firms for the entire period. This represents 6.6 % of the 5763 cases initiated worldwide from 1978 to 2010.

NAFTA partners Mexico and Canada are the most frequent initiators of antidumping actions against U.S. companies with 79 and 67 petitions, respectively, followed by Brazil (42 cases), and India (34 cases) and China (32 cases). One notable aspect of this information is how the countries targeting U.S. firms have changed over the last few decades. In the earlier period of 1978–1992, the total number of antidumping actions against U.S. exporters by three traditional users (Canada, Australia, and the EU) equaled all other nations in the world combined (60 vs. 61 petitions). For the 1993–2003 period, the new users initiated antidumping actions against U.S. firms 3.5 times as many as traditional users (140 vs. 40). In the 2004–2010 time frame, this ratio had risen to over 4 (65 vs. 16).

Table 2 includes a breakdown of antidumping petitions by sectors for the United States and other countries. These data are based on the 6-digit North American Industrial Classification System (NAICS), which will be the basis of the formal econometric analysis below. The NAICS level of aggregation is similar to the 4-digit ISIC sector.[6]

Just over one quarter (102 of 382 total cases) of all antidumping petitions against U.S. companies were in the chemicals and petrochemical industry compared to 16 % for all countries.[7] The iron and steel sector accounted for only 8 % of the petitions against U.S. exporters compared to 21 % of total worldwide antidumping cases. One notable characteristic of the steel and chemicals sectors: both are relatively capital-intensive sectors with large fixed costs.

Table 3 includes various measures for capital intensity, market concentration and fixed costs for overall U.S. manufacturing and U.S. sectors most frequently cited in foreign antidumping actions.

The measures for the NAICS sectors include the "capital-labor ratio" for 1997 in column 1. The capital-labor ratio is the 1997 reported book value (in thousands of U.S. dollars) divided by the total number of employees of all firms in 1997. The "capital-shipment ratio" in Column 2 is book value divided by the 3-year average value of shipments (for years $t - 2$, $t - 1$, and t). The book value and employment of industrial sectors are collected by the U.S. Census only every 5 years from individual firms; NAICS sector domestic shipments are available every year. We also see that the average capital-labor ratios for all U.S. manufacturing sectors was much lower than the U.S. sectors frequently targeted in antidumping actions. We see similar patterns for the ratio of capital stock to shipments.

In short, we find that U.S. sectors that face the most antidumping actions abroad have higher capital stocks and higher fixed costs of production than average

[5] This information is based on Bown (2014).

[6] The NAICS codes for individual cases were complied by the author by comparing each product name with the U.S. definitions of products on the U.S. Census Bureau website (http://www.census.gov/eos/www/naics). In addition, the Harmonized Tariff System code for each case, compiled by Bown (2014) provided further corroboration for the candidate NAICS code. In cases where the NAICS code was unclear, the petition is included in the "All Others" category.

[7] The sectors included in this category were plastics (NAICS 325211), organic chemicals (NAICS 325199), synthetic rubber (NAICS 325212), and inorganic chemicals (NAICS 325188).

Table 1 Antidumping initiations against U.S. exporters

	Total (1978–2010)	1978–1992	1993–2003	2004–2010
Traditional users				
Canada	67	42	20	5
Australia	29	14	11	4
EU	20	4	9	7
Subtotal	116	60	40	16
New users				
Mexico	79	42	35	2
Brazil	42	4	24	14
India	34	1	20	13
China	32	0	13	19
South Korea	19	3	11	5
South Africa	16	4	9	3
Argentina	5	0	4	1
Others	39	7	24	8
Subtotal	266	61	140	65
Total	382	121	180	81

Source: Bown (2014) and Moore and Zanardi (2009)

Table 2 Antidumping initiations by industrial sector

Sectors	All countries	United States as target
Petrochemicals	898	102
Iron and steel	1226	31
Textiles	178	1
All others	3461	248
Total	5763	382

Source: Bown (2014) and author's calculation

manufacturing, all of which may make them more susceptible to pricing below average total costs with negative demand shocks.

We now turn to two further important aspects of the market sanctuary argument: (1) the presence of non-competitive domestic markets; and (2) high trade barriers that restrict international arbitrage.

I measure the competitiveness of the U.S. market by the standard Herfindahl–Hirschman Index (HHI), which is the sum of the market shares of top firms in a particular sector. The U.S. Department of Justice considers an HHI between 1500 and 2500 to be a moderately concentrated industry, with the potential for anticompetitive behavior increasing as the HHI value increases.[8] Columns 3 and 4 of Table 3 shows the HHI calculated on the basis of value added for the top 50 firms in the sector. The average HHI for the 1997 Census of Manufacturing for all industries[9] exceeds that of the U.S. sectors frequently targeted by antidumping.

Table 3 Sectoral characteristics of select U.S. 6-digit NAICS[a] sectors

Sector (NAICS code)	Capital/Labor[b] (1)	Capital/shipment[c] (3 year) (2)	Herfindahl–Hirschman index[d] (3)	Share of value added of top four firms (4)	U.S. applied MFN tariffs (5)
Overall manufacturing	104	0.39	763	42	4.73
Plastics (325211)	611	0.84	333	29	3.54
Organic chemicals (325199)	503	0.84	237	23	2.6
Synthetic rubber (325212)	342	0.68	725	46	3.54
Inorganic chemicals (325188)	243	0.75	654	39	1.88
Iron and steel (331111)	254	0.65	560	39	2.13

Source: U.S. Bureau of Census (2014) and Nicitia and Olarreaga (2007)

[a] North American industrial classification system

[b] Book value (in thousands of U.S. dollars) divided by the total number of employees of all firms in 1997

[c] Book value in 1997 divided by the 3-year shipment value (for years *t*-2, *t*-1, and *t*)

[d] Herfindahl–Hirschmann index is based on value-added of 50 top firms in sector in 1997

Moreover, the HHI for the latter is far below what the U.S. Department of Justice would deem to be problematic.[10]

The final column of Table 3 includes the average sectoral applied MFN tariff rates[11] for these sectors as well as the overall U.S. manufacturing sector for the period 1993–2004 (which is based on Nicita and Olarreaga 2007 for ISIC categories). One sees that the unweighted manufacturing sector average tariff of 4.73 % is higher than any of the five sectoral averages for U.S. industries especially targeted by foreign governments in antidumping actions. However, these averages do not reflect any non-tariff barriers.[12]

There is little evidence from tariffs alone that firms in these sectors are able to operate within a protected U.S. market that allows them to "subsidize" low sales abroad from excess profits at home.

[8] See http://www.usdoj.gov/atr/public/testimony/hhi.htm. Accessed on 3 September 2012.

[9] A small number of sectors have less than 50 firms in the 6-digit NAICS category; the HHI-50 for these sectors cannot be calculated. There are only four instances where such U.S. sectors have been targeted by foreign antidumping actions.

[10] These patterns are qualitatively identical if the HH index is calculated on the basis of firm shipments. In fact, there is even less evidence of important market concentration based on that measure.

[11] These figures do not reflect preferential trade agreement rates or unilateral preferences, so that these averages are an upper bound of the protection these sectors receive.

The evidence presented in this section is generally not supportive of the market sanctuary hypothesis for U.S. industries most frequently accused of dumping in foreign markets. We do see convincing and consistent evidence that the U.S. plastics, chemicals, and synthetic rubber industries are capital intensive and have high fixed costs relative to national manufacturing averages. Indeed, these four sectors seem to be *more* competitive than national averages face tariffs higher than average for the U.S. manufacturing sector.

4 Econometric strategy and data

I now turn to a more formal analysis of the market sanctuary hypothesis by analyzing what variables help explain the probability of observing an initiation of an antidumping petition against U.S. manufacturing exports in a 6-digit NAICS category.[13] The empirical focus is of a purely reduced form that documents correlation of the data with expected outcomes.

The probability of a filing is characterized by the following:

$$P(y_{ikt} = 1) = \Phi(\alpha + MS\beta_1 + X\beta_2 + R\beta_3)$$

where y_{ikt} takes on a value of 1 if an antidumping petition is filed by importing country i against the United States in sector k in year t and $\Phi(\cdot)$ is the cumulative normal distribution. This suggests a Probit estimation procedure. Antidumping petitions are very rare for particular country/industry/year combinations (<0.03 %). In addition, many U.S. 6-digit NAICS categories have only a minor presence in export markets. An alternative approach to a Probit therefore would be a complementary log–log specification. I used this for results not reported here (but available upon request); the signs and statistical significance of the coefficients are qualitatively very similar to the results below.[14]

MS includes various regressors associated with the market sanctuary hypothesis. Information about conditions inside country i is included in X. This will include data both at the sector and country level. R will include various measures of retaliation and deflection involving other countries' use of antidumping, both of which have been found in the literature to have important explanatory power for initiations.

[12] There may be product level variation within these sectors that reflect more protection than evident from the broad sectoral averages. Bown (2014) reports the HS codes for all antidumping cases brought against the United States. The simple unweighted average applied tariff for these categories was 4.3 % as of March 2013, which is similar to the overall tariff average reported in Table 4. Source: U.S. International Trade Commission (2014a) (http://www.usitc.gov/tariff_affairs/tariff_databases.htm). Accessed March 2013.

[13] I choose to use initiations rather than final antidumping duties for two reasons. The first is that this is more common in the literature. Second, there are only 18 instances in the dataset where there is no dumping found by U.S exporters (out of 220 petitions).

[14] There may be important unobservable country and year variation not captured by the regressors. However, dichotomous models with fixed effects can cause problems associated with the "incidental variables problem". Consequently, I estimate an alternative specification using a linear probability model that includes country and year fixed effects as a robustness check. The results are qualitatively similar to those reported below and are available on request.

Standard errors are clustered on an industry basis reflecting possible heteroscedasticity in the disturbance terms.

Note that most regressors generally are lagged 1 year since antidumping authorities look at past circumstances to decide on the merit of a filing. Petitioners likely take this aspect into account when deciding whether or not to file a case. In addition, lagging the explanatory variables will reduce endogeneity problems.

The data analysis will not include the universe of all countries using antidumping nor all product categories involving U.S. exports. Instead, I restrict the sample to manufacturing sectors alone because the U.S. Census does not collect the detailed data used in this study for agricultural sectors. In any event, a large fraction of the cases involving U.S. firms are in the manufacturing sector. The analyzed countries are either traditional users of antidumping (the European Union, Canada, and Australia) or countries that have become important new users of antidumping (Argentina, Brazil, Colombia, China, India, Mexico, Korea, and South Africa). I only include these importing jurisdictions in the analysis for two reasons. First, I choose not to include countries that have never filed an antidumping petition against the United States. Second, the countries included represent over 98 % of all antidumping petitions brought against U.S. exporters in the sample.

Information about the petitions filed against the United States comes from two sources: Moore and Zanardi (2009) and Bown (2014), both of which are based on government publications rather than submissions to the WTO, which are often incomplete and inaccurate.

As noted above, the basic unit of observation for the study is a 6-digit NAICS category, roughly the same level of aggregation as a 4-digit ISIC sector, and includes 473 manufacturing sectors. This level of aggregation is more detailed than often used in the literature (e.g., Moore and Zanardi 2009, 2011; Feinberg and Reynolds 2007) but less detailed than the 6-, 8-, or even 10-digit Harmonized System Code categorization typically used by an administering authority when implementing antidumping petitions.

Variable names, sources, and basic descriptive statistics for the entire dataset are included in Table 4.

In the regressions below, I report results for three variables for U.S. 6-digit NAICS categories associated with the MS hypothesis: (1) capital-shipment ratio; (2) average sectoral U.S. applied tariffs; and (3) the fifty firm HHI (based on value added). The expected sign for the coefficient of each variable is positive under the hypothesis that U.S. firms targeted by antidumping operate within a domestic sanctuary market.

The U.S. capital-shipment ratio is described in Sect. 3. The numerator is the 1997 book value, based on the 5-year Census of Manufacturing. Two versions of total sectoral shipment are used. The first is the 1997 value of U.S. domestic shipments. This controls for purely cross-sectional differences in sectoral fixed costs and is denoted by "U.S. capital/shipments." The second version is the 3-year lagged average of domestic shipments (which allows for both time and cross-sectional variation and is denoted by "U.S. capital/shipments (3 year)." These variables control for the fixed costs of U.S. manufacturing industries and the consequent possibility of using exports as a way to expand production and lower average costs.

Table 4 Variable definitions and descriptive statistics

Variable name	Description	Source	Mean (standard deviation)
Initiations	Dependent variable = 1 if an antidumping petition is filed in a NAICS sector in year t; 0 otherwise	Bown (2014) and Moore and Zanardi (2009)	0.0025 (0.05)
Importing country sectoral conditions			
U.S. exports (change)	Percentage change in U.S. exports in NAICS category from year $t-2$ to $t-1$ in importing country i	U.S. International Trade Commission (2014b)	75.6 (1642)
U.S. exports (level)	United States exports in NAICS category in year t in importing country i (US$ millions)	U.S. International Trade Commission (2014b)	95.8 (45.4))
Import country macro economic conditions			
GDP growth	Nominal GDP growth in country i for year $t-1$	World Development Indicators (2014)	4.23 (3.66)
CA/GDP	Current account as share of GDP in country i for year $t-1$	World Development Indicators (2014)	−0.77 (3.06)
Exchange rate (change)	Change in exchange rate (local currency per current U.S. dollar) from year $t-1$ to year t in importing country i	World Development Indicators (2014)	30.6 (216)
Foreign tariff	Lowest tariff in importing country in year t in NAICS category k	Nicita and Olarreaga (2007)	24.3 (20.2)
Retaliation and deflection (effects of antidumping use in other sectors)			
Retaliation	Number of antidumping cases filed in the United States against importing country i in year $t-1$, $t-2$, and $t-3$ in same sector	Bown (2014) and Moore and Zanardi (2009)	0.011 (0.242)
Deflection	Number of AD cases initiated in year $t-1$ in NAICS in all countries except for importing country i	Bown (2014) and Moore and Zanardi (2009)	0.44 (3.49)
Market sanctuary variables			
U.S. tariff	U.S. average tariff in NAICS sector for year t	Nicita and Olarreaga (2007)	4.73 (19.47)
HHI	Hirschmann-Herfindahl index (value added) for NAICS sector in largest 50 U.S. companies in 1997	U.S. Bureau of Census (2014)	763.29 (667.12)
U.S. capital/shipments (3 year)	Book value (1997) of NAICS sector divided by the 3-year shipment value (for years $t-2$, $t-1$, and t)	U.S. Bureau of Census (2014)	0.033 (0.012)
U.S. capital/shipments	Book value (1997) of NAICS sector divided by the shipment value (for years $t-1$)	U.S. Bureau of Census (2014)	3.88 (0.239)
U.S. domestic demand (change)	Changes in U.S. domestic shipments for NAICS sector for years $t-2$ to $t-1$	U.S. Bureau of Census (2014)	0.02 (1.04)

Descriptive statistics based on all observations in the dataset

Under the market sanctuary hypothesis, the coefficient for this variable should be positive.

As noted above, the Herfindahl–Hirschmann Index is calculated on the basis of the value added of 50 top firms in each sector for 1997. Less competitive U.S. manufacturing sectors might be more likely to face dumping allegations, suggesting a positive coefficient for this variable.

The tariff rate ("U.S. tariff") is the U.S. MFN applied rate for the NAICS 6-digit category for year $t - 1$.[15] More protected industries might be more likely to dump abroad—the coefficient for this control variable would therefore be positive.

I also include an interaction term for the product of the U.S tariff rate, the Herfindahl–Hirschmann index, and the ratio of book value to shipments. Under the market sanctuary hypothesis, the coefficient on the product of these three variables should be positive: a non-competitive U.S. sector simultaneously enjoying high tariffs and facing fixed costs would be the most likely to benefit from a protected domestic market. One version of this interaction term ("MS interaction") is based on the 1997 shipment data and the other ["MS interaction (3 year)"] is based on the lagged 3-year shipment data.

"U.S. domestic demand (change)" is the percentage change from $t - 2$ to $t - 1$ of net U.S. domestic shipments at the NAICS 6-digit level, defined as the total value of shipments minus the value of exports. This variable will help control for the possibility that U.S. firms react to a drop in domestic demand by increasing exports and therefore more likely to dump abroad. This interpretation would suggest a negative coefficient. The value of shipments is obtained from the U.S. Census and the value of exports from the U.S. International Trade Commission.

The matrix X includes information about the importing country that has been found in the literature to be important in explaining antidumping petitions. I include the importing country tariff level in time $t - 1$ ("Foreign tariff"). The expected sign is ambiguous. All tariff information was obtained from the World Bank's Trade and Production Database as detailed in Nicita and Olarreaga (2007). It is the maximum of all tariff rates in the relevant sector. The data is reported in the original World Bank data at the ISIC 3-digit level and is converted to the NAICS system by careful matching of categories.

A negative sign for "Foreign tariff" might indicate that foreign firms already facing intense international competition might be more prone to turn to antidumping duties. On the other hand, firms that might have political clout and already receive high applied tariffs may feel that they will be likely to win an antidumping case.

The WTO antidumping agreements require that administering authorities find that imports are causing "material injury" to a domestic industry before duties can be applied. Consequently, I include the percentage change in U.S. exports ("U.S. exports (change)") to the importing country in sector k from $t - 2$ to $t - 1$ as an explanatory variable. I also include the level of U.S. exports at the sectoral level ("U.S. exports (level)"), which will control for those sectors in which there is a large U.S. export presence. These data come from the U.S. International Trade

[15] Note that the World Bank's Trade and Production Database does not include U.S. tariffs data for 1994. Consequently, I use a simple average for 1993 and 1995 for the missing data.

Commission (2014b) database ("http://dataweb.usitc.gov"), which includes NAICS 6-digit level U.S. exports from 1997 to 2007. Data prior to 1997 were collected using the SIC classification, which was converted to NAICS categories.

The expected sign on the coefficient for "U.S. exports (change)" is positive: the greater the change in U.S. exports, the more likely that a domestic industry will file an antidumping petition. The working hypothesis is that larger increases of exports will be positively correlated with a positive decision by administering agencies so that firms would be more likely to fall knowing that they might win a case. I also expect a positive coefficient for "U.S. exports (level)"; U.S. sectors with a large export presence may face calls for protection.

Antidumping petitions against U.S. firms of course will depend on conditions within the importing country. I do control for foreign sectoral tariffs and U.S. exports, both of which vary at the country/industry/year level. Naturally, it would be ideal to also control for the other characteristics of the domestic industry. For example, high fixed costs industries in the United States (e.g., chemicals) likely will also be so in foreign markets. In addition, one would want to calculate the U.S. market share of the relevant foreign market and not just the level of U.S. exports.

Unfortunately, the NAICS classification system is not used outside of North America so that time-varying and country-specific industrial characteristics are generally not available in a comparable form. It is also problematic to calculate the U.S. market share within the importing country for similar reasons. Consequently, one must be careful in interpreting the results of the econometrics. For example, "U.S. Exports (level)" simply may be picking up a large sector; the U.S. share of that market would not necessarily be large.

I also control for three country-level variables for the importing economy. These include: (1) the change in the (nominal) bilateral exchange rate at from $t-2$ to $t-1$ with the U.S. ("Exchange rate (change)"), obtained from the U.S. Federal Reserve Board and the IMF and defined as foreign currency units per dollar[16]; (2) the GDP growth ("GDP growth rate in the importing country, obtained from the World Development Indicators (2014) for year $t-1$; and (3) the importing country current account to GDP ratio in year $t-1$, also obtained from the World Development Indicators (2014) CA/GDP").

The expected coefficient for the exchange rate is negative. An appreciating foreign currency vis-à-vis the dollar will make U.S. exports cheaper and thereby increase the competitive pressure on domestic import-competing industry.

The coefficient for "GDP growth" is expected to be negative. The higher the level of overall domestic economic activity, the less likely that domestic firms may be in economic distress, and the less likely that they might decide to file an antidumping petition. However, it is important to note that macroeconomic conditions may tell only a part of the story since sectoral pressures may vary from the overall domestic economy. Therefore, sectoral variation in the importing country would be preferable in principle but, as noted above, the requisite data is not available on a systematic basis for the countries in the sample.

[16] The euro-dollar exchange rate was used for all European Union members and the ecu-dollar rate for pre-1999.

Table 5 Probit estimates with Foreign AD initiation as dependent variable (marginal probabilities)

Variable (expected sign)	Full sample (1)	Full sample (2)	Attenuated sample (3)	Traditional users (4)	New users (5)	Steel/chemicals (6)
GDP growth (−)	0.0213**	0.0252***	0.0313**	−0.0159	0.0170**	0.1391**
	(0.0086)	(0.0098)	(0.0123)	(0.0334)	(0.0084)	(0.0557)
CA/GDP (+)	−0.0025	−0.0006	-1.9×10^{-5}	−0.0100	−0.0022	−0.0128
	(0.0074)	(0.0081)	(0.0103)	(0.0133)	(0.0081)	(0.0379)
Exchange rate (change) (−)	−0.0003***	−0.0004***	0.0010	0.0007	−0.0003**	−0.0027
	(0.0001)	(0.0001)	(0.0013)	(0.0034)	(0.0002)	(0.0027)
Retaliation (+)	0.0272**	0.0283*	0.0343**	0.0370***	0.0801***	0.1764***
	(0.0118)	(0.0147)	(0.0147)	(0.0128)	(0.0216)	(0.0340)
Deflection (+)	0.0080***	0.0101***	0.0101***	0.0056**	0.0068**	0.0174*
	(0.0030)	(0.0036)	(0.0035)	(0.0023)	(0.0029)	(0.0089)
Foreign tariff (?)	4.3×10^{-04}	1.2×10^{-04}	6.9×10^{-04}	3.1×10^{-03}**	-2.6×10^{-04}	1.4×10^{-02}**
	(8.8×10^{-04})	(1.0×10^{-3})	(1.0×10^{-3})	(1.4×10^{-03})	(2.0×10^{-03})	(5.6×10^{-04})
U.S. exports (change) (+)	-1.8×10^{-4}*	-2.1×10^{-4}*	4.0×10^{-04}	-7.0×10^{-4}	-1.2×10^{-4}	-1.3×10^{-4}
	(1.0×10^{-4})	(1.2×10^{-4})	(4.0×10^{-4})	(4.3×10^{-4})	(8.9×10^{-5})	(1.6×10^{-4})
U.S. exports (level) (+)	6.0×10^{-11}***	6.0×10^{-11}***	7.0×10^{-11}***	4.0×10^{-11}**	1.8×10^{-10}***	4.6×10^{-10}***
	(2.0×10^{-11})	(2.0×10^{-11})	(2.0×10^{-11})	(2.0×10^{-11})	(6.0×10^{-11})	$(1.8 \times 10^{-10}$***)
MS interaction (3 year) (+)	–	4.8×10^{-5}	2.9×10^{-5}	2.9×10^{-4}	3.9165***	22.1794**
		(2.2×10^{-4})	(2.8×10^{-4})	(2.7×10^{-4})	(1.2539)	(8.8656)
U.S. capital/shipments (3 year) (+)	–	5.3778***	5.6297***	2.1997	5.5 × 10−5***	8.0×10^{-5}
		(1.8328)	(2.1615)	(2.0817)	(1.6×10^{-5})	(1.9×10^{-4})
MS interaction (+)	4.0×10^{-5}**	–	–	–	–	–
	(1.9 × 10−5)					
U.S. capital/shipments (+)	0.3416***	–	–	–	–	–
	(0.1155)					

Table 5 continued

Variable (expected sign)	Full sample (1)	Full sample (2)	Attenuated sample (3)	Traditional users (4)	New users (5)	Steel/chemicals (6)
U.S. tariff (+)	−0.0176**	−0.0016	−0.0007	−0.0115	−0.0237***	0.4684
	(0.0086)	(0.0080)	(0.0109)	(0.0107)	(0.0071)	(0.3540)
HHI (+)	-1.0×10^{-4}	-9.8×10^{-6}	-1.2×10^{-5}	8.9×10^{-6}	-1.5×10^{-4}**	-1.1×10^{-3}
	(6.2×10^{-5})	(5.1×10^{-5})	(5.7×10^{-5})	(5.6×10^{-5})	(7.7×10^{-5})	(6.9×10^{-4})
U.S. domestic demand (change) (−)	−0.0072	−0.0046	−0.0112	−0.0070	−0.0018	0.4818
	(0.0047)	(0.0054)	(0.0088)	(0.0072)	(0.0044)	(0.7421)
Observations	28,100	28,143	22,459	9664	18,435	3367
Log pseudo−likelihood	−510.1	−521.7	−418.4	−149.8	−353	−260.3
Pseudo R^2	0.12	0.09	0.11	0.07	0.15	0.14

Robust standard errors in parentheses. Attenuated sample excludes observations with U.S. annual export changes >300 %

Traditional users: EU, Australia, and Canada

New users: Argentina, Brazil, Colombia, China, India, Mexico, Korea, and South Africa

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

I also include variables to control for retaliation and deflection involving antidumping cases, both of which have been found to be important in the existing literature.

"Retaliation" is the total number of cases filed against the importing country i in years $t - 1$, $t - 2$, and $t - 3$ in sector k in the U.S. This variable will control for the motivation to initiate antidumping petitions against U.S. industries as a response to the United States filing its own antidumping petitions. Note that Feinberg and Reynolds (2008) found that retaliation is a statistically significant predictor of antidumping actions taken against U.S. exporters.

I also include "Deflection," which is the number of cases filed in year $t - 1$ in sector k in all countries (i.e., including those not in the countries analyzed in this study) except for country i. This reflects the possibility, first explored by Bown and Crowley (2007), that antidumping petitions filed abroad can divert trade to country i and thereby trigger antidumping cases in country i. The expected sign for the coefficient for this variable is also positive; the more cases are filed worldwide in the particular sector, the more likely that trade will flow in country i, thereby increasing the chance that one observes a new petition in that sector.

5 Econometric results

Table 5 includes the results of six different cuts of the data. The reported coefficients are the marginal probabilities for the various regressors.

The first two columns include the full sample but different measures of fixed costs. Column 1 reports results using the 1-year shipment data for calculating "U.S. capital/shipment" and "MS Interaction." The second column includes the 3-year shipment analogs "U.S. capital/shipment (3 year)" and "MS interaction (3 year)". Column 3 excludes outliers when the 1-year change in U.S. sectoral export exceeds 300 %. Column 4 includes only those cases involving traditional users of antidumping (i.e., EU, Canada and Australia). Column 5 includes the balance of the countries in the dataset (Argentina, Brazil, Colombia, China, India, Mexico, Korea, and South Africa, the so-called "New Users"). The final column includes only cases in the steel and chemicals sectors, which are the sectors most commonly involved in antidumping cases worldwide.

The results are as expected for most of the control variables and broadly similar across specifications. We see consistent evidence for "Retaliation" that petitions against U.S. firms are more likely after the U.S. has filed petitions against firms in the same sector. These results are similar to other studies such as Bown and Crowley (2007) and Feinberg and Reynolds (2006). The coefficient on trade deflection antidumping cases is positive and statistically significant for all subsamples; U.S. firms are more likely to face antidumping actions the more that cases have been filed in this sector in the previous year for the world as a whole. The coefficient on the exchange rate change generally is negative, which suggest that a weak dollar is correlated with a higher probability of an antidumping petition against U.S. exporters but it is not consistently significant across subsamples.

Foreign tariff levels do not provide statistically significant explanatory power except for the steel/chemicals and traditional users subsamples.

We also see that a high *level* of U.S. exports to a particular sector raises the probability of observing an antidumping petition in a statistically significant way in every specification. As noted above, the results for this coefficient must be treated with caution since this may simply reflect the overall size of a particular export sector.

We do find that the coefficients for two variables have unexpected signs and are statistically significant. Higher aggregate GDP growth in the importing country is associated with a higher probability of a case filed against a U.S. exporter in all but one of the specifications. In the full sample regressions reported in columns (1) and (2), we see that falling U.S. exports in the sector are correlated with a *higher* likelihood of a petition. However, these results are potentially biased given that there are over 5000 instances where the percentage change in U.S. exports exceeded 300 % in 1 year. In many instances, this simply reflects a low base year. Consequently, I drop these observations in the specification reported in column 3. We see that the statistical significance of this variable goes away after removing these outliers.

I now turn to the main question of the study, which is whether there is evidence that foreign antidumping petitions are filed systematically against U.S. firms that operate behind a closed, uncompetitive domestic market, and then can use expanding exports to reduce average production costs.

We see that high fixed costs are positive and statistically significant in most subsamples. This is true both for the 1-year ("U.S. capital/shipments") and 3-year ["U.S. capital/shipments (3 year)"] version of this variable, with the single exception of the traditional user subsample. These results suggest that the first aspect of the market sanctuary hypothesis may be plausible for many U.S. exporters facing antidumping petitions, i.e., those that have high fixed costs might use exports as a way to lower average production costs. This clearly is not sufficient evidence that U.S. companies utilize a market sanctuary but it does suggest that importing nations may be targeting U.S. firms that might be in the position to use such a strategy. As noted above, there are many antidumping investigations across the world in the same sectors (especially steel and chemicals). This raises an alternative interpretation of this result. High capital cost domestic firms may file antidumping petitions in order to preserve their own quasi-rents.

In contrast, we see no consistent evidence that U.S exporters facing antidumping petitions abroad are either systematically operating behind high formal tariff barriers or unusually uncompetitive. Indeed, the coefficient for "U.S. tariff" is either statistically insignificant or negative, which is contrary to the market sanctuary expectations. We also see no evidence that the probability of observing an antidumping petition is positively correlated with a less competitive domestic market ("Herfindahl–Hirschmann Index") for any subsample.

I use the "MS interaction" variables to examine whether U.S. firms that simultaneously operate in a protected domestic market, with low levels of competition and relatively high import barriers, were more likely to face antidumping petitions. We see only limited evidence that such combinations

contribute to the predicting initiations for full sample using the 1-year shipment data (column 1) new users and the chemicals/steel sectors (columns 5 and 6).

I also include the measure of recent U.S. changes in net domestic shipments. As noted above, this is to evaluate the frequent claim that antidumping is a necessary part of the international system to counter the incentives of firms to deal with dropping demand by ramping up exports. In fact, we see no evidence that falling U.S. domestic shipments helps explain the pattern of cases brought against American firms in any of the columns of Table 5.

6 Conclusion

This research is the first effort to evaluate the argument offered by supporters of antidumping that this WTO sanctioned import restriction is necessary to counter firms using a sanctuary market at home to "dump" in foreign markets. I do so by analyzing petitions filed against U.S. firms operating in twelve important trading partners for the 1994–2007 period. The research does so by exploiting detailed U.S. industry-level data at the six-digit North American Industrial Classification System.

There is little evidence that foreign antidumping petitions are targeting U.S. firms that correspond to the market sanctuary hypothesis. Most notably, the results suggest that neither import barriers nor standard measures of anti-competitive markets help predict antidumping cases brought against American exporters. While it is conceivable that foreign firms are missing opportunities to file against U.S. companies that truly exploit a favorable market situation at home, it is more likely that antidumping cases are filed for other reasons.

I find that U.S. exporters with high fixed costs are more likely to face these petitions. This is consistent with a world in which a company might temporarily price below average total costs and become ensnared in the antidumping net. The U.S. high fixed costs chemicals and plastics industries are especially prone to face trade remedy actions. The results also suggest an important role for retaliation and deflection, which is consistent with earlier research on antidumping petitions.

There are nonetheless a few important caveats. This study uses U.S. data collected at the 6-digit NAICS level, which allows us to control for important U.S. sectoral level data, including the Herfindahl–Hirschmann Index, exports, and measures of capital intensity. But this approach also means that it is impossible to control simultaneously for importing country characteristics at the same level of aggregation since NAICS is not a worldwide standard. This reality suggests that a useful approach for future research would be to repeat this exercise using other countries' own detailed sectoral data.

This research suggests that there is little indication that market sanctuary considerations play a significant role in predicting when foreign countries will file antidumping actions against U.S. companies. It is critical to note that this evidence cannot help us understand whether firms in *other* countries operate behind closed uncompetitive markets that then "unfairly" compete with U.S companies. Those firms indeed may exploit formal and informal barriers to "subsidize" their exports into the United States. But the results of this research certainly suggest that firms

that do not have the advantage of a home "market sanctuary" can be swept up into the antidumping net. This alone means that world antidumping rules might be rewritten to avoid "catching" firms that simply have high fixed costs but otherwise are operating within a competitive framework.

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