THE WTO AND ANTIDUMPING IN DEVELOPING COUNTRIES

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Since the 1995 inception of the World Trade Organization (WTO), developing countries have become some of the most frequent users of the WTO-sanctioned antidumping (AD) trade policy instrument. This paper exploits newly available data to examine sector-level use of nine of the major ''new user'' developing countries, matching data on production in 28 different three-digit ISIC industries to data on AD investigations, outcomes, and imports at the six-digit Harmonized System product level. We present economically significant evidence consistent with theory that developing-country industries that seek and receive AD import protection are responding to macroeconomic shocks, exhibit characteristics consistent with endogenous trade policy formation, and face some changing market conditions consistent with requirements of the WTO Antidumping Agreement. However, the evidence also suggests substantial heterogeneity in determinants of AD use across developing countries, which highlights the flexibility of this policy as a protectionist tool responsive to many different types of political-economic shocks.

1. INTRODUCTION

MORE THAN 40 members of the World Trade Organization (WTO) are now active users of antidumping (AD) policy, and developing countries are some of the newest and most frequent of these users. At the same time that many developing countries have started using AD to limit imports, many of them have also given up most other forms of flexibility in trade policy by adopting WTO disciplines and agreeing to bind their tariffs. Despite AD policy's escalating use by developing countries, relatively little research has examined which industries within developing countries are using AD. This paper exploits a cross-country sample of newly available, relatively disaggregated data as a first attempt to examine empirically the determinants of industrial use of AD in developing countries.

As with any economy, a developing country's adoption of an AD law has implications for the endogenous formation of its trade policy. Under the WTO Antidumping Agreement, any member that uses the policy must create an administrative procedure to investigate demands for AD protection. Firms in an industry that seek this form of import protection must overcome

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the organizational challenges of free riding in order to initiate and success-fully pursue an AD legal proceeding. Before a government can impose a definitive AD import restriction, the Agreement also requires that its ad-ministrating authority solicit and collect substantial economic evidence to confirm that market conditions and behavior of foreign exporters satisfy technical, WTO-mandated legal criteria. The presence of an AD law and the economic incentives it creates imply that domestic industries vary in their need and ability to obtain import protection under this policy. Nevertheless, given that AD has become many WTO member governments' most acces-sible policy to impose new trade barriers, the resulting pattern of AD import protection across industries may be an increasingly important indicator of these countries' overall patterns of import protection.

Which developing countries are the most frequent new users of AD? The columns on the right half of Table 1 document the frequency of AD in-vestigations and imposed measures across a number of WTO members dating from the institution's 1995 inception. While the four "historical" developed-economy users of AD – the United States, the European Union (EU), Canada, and Australia – have continued to be active users during the WTO period, they are no longer the dominant users of the prior decade (1985–1994) under the GATT regime.[1] A sizable share of the global use of AD, at least as measured by the frequency of initiated cases and imposed measures, has been recently made up of "new user" *developing* countries such as Argentina, Brazil, Colombia, India, Indonesia, Mexico, Peru, Tur-key, and Venezuela, the nine developing countries forming the sample of our formal empirical investigation.[2] Of the total use of AD during the WTO's first 10 years by what are now more than 150 member countries, these nine developing countries made up 40% of all new investigations and 45% of all new measures imposed.[3] This is a substantial shift from the prior 10-year

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[1]A substantial prior literature examines different political-economic features of the govern-ment decision to grant AD protection in more developed economies. While there are too many to cite them here, prominent examples for the United States include Finger et al. (1982), Hansen (1990), and Hansen and Prusa (1997). EU examples include Eymann and Schuknecht (1996) and Messerlin and Reed (1995). A recent investigation of Mexico is Francois and Niels (2004). Blonigen and Prusa (2003) and Nelson (2006) provide extensive surveys.

[2]China and South Africa are examples of two other developing countries that have become frequent "new users" of AD during this period, but they are not part of our formal empirical investigation because of limitations of available production data. For similar reasons we do not include countries such as Egypt, Malaysia, and Thailand.

[3]However, this is not to imply that these countries began to use AD in 1995. As Zanardi (2004) reports, most had implemented AD legislation before the WTO's inception: Argentina (1972), India (1985), Mexico (1986), Brazil (1987), Turkey (1989), Colombia (1990), Peru (1991), Venezuela (1992), and Indonesia (1995). While most of these countries did not begin intensive use of AD until after joining the WTO in 1995, there are several exceptions (Mexico in 1987, Turkey in 1990, Brazil in 1992). These countries undertook substantial trade liberalization episodes before joining the WTO and increased their use of AD shortly thereafter. Nevertheless, our estimation focuses on the post-1995 period because this is when various rules for AD and enforcement became consistent across countries, as we detail below.

TABLE 1   COUNTRY USE OF ANTIDUMPING UNDER RECENT GATT AND WTO PERIODS

Country	GATT period, 1985–1994	WTO period, 1995–2004	
	Number of antidumping investigations	Number of antidumping investigations	Number of antidumping measures imposed
"New user" developing countries in the empirical analysis			
Argentina	44	192	139
Brazil	58	116	62
Colombia	11	23	11
India	9	400	302
Indonesia	0	60	23
Mexico	123	79	69
Peru	11	55	34
Turkey	74	89	77
Venezuela	6	31	25
Subtotal	336	1,045	742
(share of total)	(16.2%)	(39.5%)	(44.8%)
"Historical" users of antidumping			
Australia	447	172	54
Canada	223	133	80
European Union	364	303	193
United States	475	354	219
Subtotal	1,509	962	546
(share of total)	(73.1%)	(36.4%)	(33.0%)
Other WTO Members	220	639	368
(share of total)	(10.7%)	(24.1%)	(22.2%)
Total	2,065	2,646	1,656

Notes: The unit of observation for this table is a product-level, foreign country-specific anti-dumping investigation or measure.
Source: Data for the 1985–1994 use of antidumping are taken from Zanardi (2004, Table 2). Data for the 1995–2004 initiations and measures used in this table are taken from WTO (2005a, 2005b).

period, when the four historical developed-economy users initiated almost 75% of all AD investigations.

Within these nine developing countries, which *industries* use AD to pursue protection from imports? Table 2 presents one way to address this question by reporting information from 1995–2002 on the number of years in which each three-digit ISIC industry in each developing country initiated at least one AD investigation and received import protection under at least one newly imposed measure. While the steel and chemical industries sought and received AD protection across each country during the sample, most of the 28 different three-digit ISIC industries also pursued AD in at least one of

TABLE 2 Antidumping Use by Industry across Nine Developing Countries, 1995–2002

Three-digit ISIC Industry	ARG		BRA		COL		IND		IDN		MEX		PER		TUR		VEN	
	Inv	On	Inv	On	Inv	On	Inv	On	Inv	On	Inv	On	Inv	On	Inv	On	Inv	On
311 Food products	3	1	3	3	0	0	0	0	1	0	3	3	3	2	0	0	0	0
313 Beverages	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
314 Tobacco	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
321 Textiles	2	2	2	2	1	0	2	2	0	0	1	1	1	1	3	3	0	0
322 Wearing apparel except footwear	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
323 Leather products	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
324 Footwear except rubber or plastic	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	1	1	1
331 Wood products except furniture	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
332 Furniture Except Metal	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0
341 Paper and products	3	2	1	1	0	0	3	3	0	0	1	1	0	0	0	0	0	0
342 Printing and publishing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
351 Industrial chemicals	5	3	6	5	3	2	7	7	2	1	5	5	3	1	3	2	2	2
352 Other chemicals	1	1	1	1	0	0	3	3	3	2	1	1	0	0	0	0	0	0
353 Petroleum refineries	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
354 Miscellaneous petroleum and coal products	0	0	0	0	2	0	2	2	0	0	0	0	0	0	0	0	0	0
355 Rubber products	1	1	1	1	0	0	0	1	0	0	0	0	1	1	1	1	1	1
356 Plastic products	3	2	3	1	0	0	0	0	0	0	0	0	3	3	0	0	0	0
361 Pottery, china, earthenware	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0
362 Glass and products	5	3	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
369 Other non-metallic min. products	1	1	2	1	0	0	2	2	1	0	1	0	0	0	0	0	0	0
371 Iron and steel	5	5	6	4	3	3	6	6	5	4	5	5	2	2	1	1	4	2
372 Non-ferrous metals	0	0	0	0	0	0	1	1	1	1	0	0	1	1	0	0	0	0
381 Fabricated metal products	6	6	4	3	0	0	1	1	0	0	2	2	1	1	1	1	1	1
382 Machinery except electrical	5	4	1	1	0	0	0	0	0	0	2	1	0	0	1	0	0	0
383 Machinery electric	5	5	2	1	0	0	2	2	0	0	0	0	0	0	0	0	0	0
384 Transport equipment	2	2	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
385 Professional and scientific equipment	2	2	1	0	0	0	1	1	0	0	0	0	4	3	1	1	1	1
390 Other manufactured products	3	3	1	1	0	0	0	0	0	0	1	1	2	2	2	2	0	0
Total	55	46	37	27	9	5	33	32	12	8	24	21	25	20	12	10	12	8

Notes: The unit of observation for this table is aggregated to the industry level, where "Inv" ("On") indicates the number of years the industry initiated at least one antidumping investigation (received at least one newly imposed antidumping measure) during the eight-year period. Countries are Argentina (ARG), Brazil (BRA), Colombia (COL), India (IND), Indonesia (IDN), Mexico (MEX), Peru (PER), Turkey (TUR), and Venezuela (VEN).
Source: Data constructed by the author from Bown (2007).

these developing countries.[4] Finally, it is worth noting the substantial variation across countries as to whether particular industries pursued AD. Our basic empirical approach is to use industry characteristics and changing market conditions from the 1995–2002 period to explain variation in industry pursuit of AD within and between developing countries. We use the criterion specified by the WTO Antidumping Agreement and the theory of endogenous trade policy to motivate our empirical framework.

Do basic features of the industry data in these developing countries suggest specific political-economic characteristics that may affect the pursuit of AD? Table 3 motivates our formal analysis by examining summary statistics from different categories of three-digit ISIC industries in our data sample. The data are taken from 1,053 observations and cover an unbalanced panel of 28 industries across the nine AD-using developing countries between 1995 and 2002: the first set of two columns can be used to compare average characteristics for those industries that pursued an AD investigation in a given year versus those that did not, and the second set of two columns can be used to compare industries that requested and received AD protection with those that did not receive any AD protection.[5]

Consider first a comparison of average industry characteristics from the investigation vs. no-investigation columns in Table 3. Industries that pursued AD in these nine countries were characterized, on average, by higher import penetration (38.09% vs. 30.41%) than industries that did not use AD. Furthermore, the size of an industry may be expected to affect its ability to finance a costly investigation and to politically influence AD authorities. The data indicate that initiating industries were larger than non-initiating industries when measured by the share of value of their output in gross domestic product (GDP) (2.0% vs. 1.4%), although they were not necessarily larger when measured by their mean share of total employment (0.18% in both cases).

The middle rows of Table 3 present data related to a second important element of our analysis, which is to examine whether industries that successfully pursue AD protection in developing countries actually face the changing economic conditions that are legally necessary under the WTO: specifically, injury, dumping, and increased competition from imports.[6]

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[4]With the industry–year combination as the unit of observation, Argentina and India are still the most frequent developing-country users, although their frequency ordering is reversed relative to Table 1. This partly reflects more diversified Argentine use across industries and more heavily concentrated Indian use within industrial chemicals.

[5]It is worth noting that this way of decomposing the data is admittedly very crude, as it allocates industry observations to the ''no AD'' columns provided they did not use AD that year, even though the industry may have used AD during one or more *other* years in the sample. We will explicitly control for this phenomenon in the formal econometric analysis.

[6]We do not suggest that the evidence legally required for imposition of new import restrictions under the WTO Antidumping Agreement is relevant from an economic welfare perspective. Indeed, most economists view AD as nothing more than an easy-to-access alternative to a safeguard import restriction, given that the specified evidence for dumping does not require

Because it is rare for a WTO dispute to challenge developing-country use of AD, there has been little formal WTO oversight of whether even the basic evidentiary conditions of injury, imports, and dumping are satisfied in individual cases.[7] The initial evidence from Table 3 appears mixed on the evidentiary criteria. Industries that initiated AD investigations over the 1995–2002 period were, on average, more likely to be "injured," as they had slower output growth on average (1.3% vs. 5.4%) in the prior three years than non-initiating industries. Furthermore, industries that sought AD protection were more likely to face high capital expenditures – and thus perhaps more likely to face cyclical dumping or have large sunk costs – than non-initiating industries, as they were characterized by a higher average capital expenditure relative to value added (31.23% vs. 19.27%). However, the AD-using industries also appear to have faced a *slower* recent average growth rate in the increase of imports (7.5% vs. 13.0%), relative to in-dustries that did not request AD investigations.

Finally, the prior empirical literature on AD use by developed economies also suggests that changing macroeconomic conditions influence AD filing behavior. First, countries that experience a significant currency appreciation have industries that confront new competition from cheap imports after the shock, increasingly the likelihood of injury. The lower third of Table 3 presents preliminary evidence in support of this concern facing developing countries as well – industries that pursued AD investigations had an exchange rate whose value had depreciated less rapidly on average (9.60% vs. 23.37%) in the prior year than non-initiating industries. Furthermore, AD-initiating industries were at points in the business cycle in which real GDP growth had recently been slower (3.29% vs. 4.10%) than for non-initiators as well.

This paper provides an econometric investigation as to whether the sug-gestive industry and macroeconomic summary statistics for developing countries presented in Table 3 are economically and statistically important once we control for a number of factors. Our formal econometric approach is to estimate determinants of various models of the industry decision to

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predation or anticompetitive elements and can be consistent with other forms of non-predatory behavior (e.g. price discrimination, cyclical dumping via pricing below average cost during periods of economic downturns) legally accepted by many countries in the context of domestic firm behavior. Moreover, the Agreement does not require evidence of a significant causal link (attribution) between injury and dumped imports. This paper simply examines whether the industries pursuing and receiving AD protection face changing economic conditions consistent with the evidentiary criteria specified by the Agreement.

[7]Even though these nine countries collectively initiated over 1,000 AD investigations between 1995 and 2004, WTO members filed only 16 formal disputes against them over AD (Bown, 2006). This contrasts with the United States, which initiated only 354 AD investigations over this same period and yet faced over 30 formal WTO challenges relating to AD alone (Bown, 2005). An alternative form of review could come under the WTO Trade Policy Review Mechanism (TPRM), where member trade policies are examined periodically. Nevertheless, developing-country policies are reviewed very infrequently (the largest are reviewed only once every four years, and most others once every six years). Moreover, the TPRM is not intended to examine the evidence submitted or the rulings in AD investigations on a case-by-case basis.

TABLE 3 COMPARISON OF AVERAGE INDUSTRY CHARACTERISTICS FOR AD-USING VS. NON-USING INDUSTRIES IN NINE DEVELOPING COUNTRIES, 1995–2002

	Investigations		Measures	
	Mean value for industries pursuing AD investigations ($N = 91$)	Mean value for industries not pursuing AD investigations ($N = 962$)	Mean value for industries receiving AD protection ($N = 79$)	Mean value for industries not receiving AD protection ($N = 974$)
Industry-level political-economic determinants (%)				
Import penetration ratio in t	38.09[b]	30.41[b]	37.55[b]	30.58[b]
Employment share of total employment in t	0.18	0.18	0.16	0.18
Output share in gross domestic product in t	2.0[a]	1.4[a]	2.0[a]	1.4[a]
Chemical or steel industry indicator	37.36[a]	4.26[a]	41.89[a]	4.49[a]
Antidumping Agreement's evidentiary determinants (%)				
Ratio of gross fixed capital formation to value added in 1994	31.23[a]	19.27[a]	35.15[a]	19.19[a]
Average percent change in value of industry output, three years before t	1.3[a]	5.4[a]	0.3[a]	5.4[a]
Average percent change in value of industry imports, three years before t	7.5[a]	13.0[a]	7.1[a]	13.0[a]
Macroeconomic determinants (%)				
Percent change in exchange rate between $t - 2$ and $t - 1$	9.60[a]	23.37[a]	9.31[a]	23.15[a]
Percent change in real GDP between $t - 2$ and $t - 1$	3.29	4.10	3.13[c]	4.10[c]

Notes: Total of 1,053 observations are an unbalanced panel of 28 three-digit ISIC industries across nine AD-imposing countries over subperiods in $t = 1995$–2002, where the termination year varies by country depending on underlying industry data availability: 1995 (Brazil), 1996 (Peru), 1997 (Venezuela), 1999 (Argentina), 2000 (Colombia, Mexico, Turkey), 2001 (India), and 2002 (Indonesia).
Superscripts a, b, c denote the reported means in the two columns are statistically different from each other at the 1%, 5%, or 10% levels, respectively.

pursue AD import protection as well as whether the national government affords AD protection. We focus on AD data from the post-1995 period because this is when AD use across all WTO members became guided by a common set of rules for policy application and the possibility of international enforcement for cases in which the policy was misapplied. While there is a substantial literature examining the political-economic determinants of AD in the developed economies of the United States and EU, there is little examination of its use in developing countries, largely because of the prior lack of suitably disaggregated data. We exploit two newly available sources of relatively disaggregated data to examine these questions on a sample of nine developing-country users for a cross-section of 28 three-digit ISIC industries. We match product-level data on AD investigations, outcomes, and imports compiled from original government publications and now made available in the Global Antidumping Database (Bown, 2007) with industry-level production data from the World Bank Trade, Production and Protection Database (TPP) (Nicita and Olarreaga, 2007).

As a preview of our results, we find evidence consistent with the theory of endogenous trade policy formation in the context of an AD law: on average, larger industries that face substantial import competition are more likely to pursue an AD investigation and receive protection from imports. Second, we provide some evidence that AD-using industries face the changing economic conditions consistent with the technical evidentiary criteria specified in the WTO Antidumping Agreement: on average, industries that face slower output growth are more likely to pursue an investigation and receive protection, as are industries that are potentially more susceptible to cyclical dumping due to greater capital investment expenditures. We also provide evidence that changing macroeconomic conditions – e.g. exchange rate and GDP shocks – also affect AD use. The average economic effect of most of these determinants is also sizable, as a one standard deviation change in each underlying variable affects the predicted probability of an investigation by nearly 50%. Nevertheless, in our robustness checks, we highlight estimates from subsamples of data across different AD-using developing countries, and we find evidence of heterogeneity in the most important determinants of this use across countries. This speaks to the flexibility of this particular policy's use by protection-seeking industries and their governments, as well as to the lack of discipline that the WTO Antidumping Agreement may have on attempts to limit AD use in practice.

The rest of this paper proceeds as follows. In the next section we describe the WTO Antidumping Agreement and draw on implications from the theory of endogenous trade policy to generate testable predictions from industry characteristics. Section 3 presents the econometric model and describes the variable construction and data. Section 4 contains our estimation results, and section 5 concludes with a discussion of the broader implications of our results for the WTO and evolution of trade policy in developing countries.

2.   THE WTO ANTIDUMPING AGREEMENT AND THE THEORY OF ENDOGENOUS TRADE POLICY

The proliferation of WTO-authorized AD laws and the global increase in use of this form of administered import protection has been widely recognized (Miranda et al., 1998; Prusa, 2001; Zanardi, 2004). While AD was once a policy instrument used primarily by the United States, Canada, the EU, and Australia, it is now used actively by over 40 WTO member countries. As Table 1 indicates, some of the most frequent new users since WTO inception are developing countries.

To develop a theoretical motivation for our empirical analysis we proceed in two steps. First we describe the WTO Antidumping Agreement, which sets out the general rules for national administration of AD as well as the technical evidence necessary to justify imposition of any new AD measure. Given the political-economic environment created by the WTO Antidumping Agreement, in section 2.2 we use the theory of endogenous trade policy and insights from a substantial prior literature on AD use in developed economies to generate additional testable predictions for the econometric analysis.

2.1   The WTO's Evidentiary Requirements for National Use of AD

Since the 1947 GATT, the rules of the international trading system have authorized countries to establish national AD statutes and to implement AD trade restrictions.[8] During the Kennedy and Tokyo Rounds in the 1960s and 1970s, negotiators attempted to put more structure on the GATT AD rules, but countries adopted the resulting Antidumping Codes only on a pluri-lateral basis. The 1995 inception of the WTO and its Antidumping Agreement (WTO, 1995) provided more detailed guidance for countries to implement and administer AD laws. First, because the Antidumping Agreement was part of the Single Undertaking, it established a common set of basic rules that would apply to all WTO members and be subject to the enforcement provisions of the WTO Dispute Settlement Understanding (DSU).[9] Second, relative to the GATT, the WTO Antidumping Agreement did impose more structure on the evidentiary requirements for a government to implement a new AD measure, although those requirements still allow for substantial government discretion and are at best questionable from the perspective of economic welfare.

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[8]See Article VI of the 1947 GATT. National AD laws predate the GATT, and Article VI was largely written to accommodate these existing pieces of national legislation. Canada is "credited" with the first AD law with an implementation in 1904.

[9]Nevertheless, Article 17.6 of the Antidumping Agreement does still imply that countries are allowed substantial discretion to implement their own version of AD – the WTO mainly requires that the country *administer* its use of AD in a way consistent with its *own* AD law.

Under the Antidumping Agreement, a national government must undertake an investigation and consider substantial economic evidence before it can impose a definitive AD measure that restricts imports. The investigating authority is instructed to consider a number of factors when making its decision, but most critical among them are whether two important legal criteria have been met: that a domestic industry suffers "material injury" and that this injury is the result of "dumped" imports.

The domestic industry provides evidence of dumping to its government's AD authority by showing that foreign export prices of competing products sold in the domestic market were lower than the "normal value" of the product (WTO, 1995; Article 2.1). The government has substantial discretion in calculating the normal value benchmark with which to compare the export price as it can be determined by any of three methods: (i) the price for sales of the same good in the exporter's home market, (ii) the price for export sales of the same good in a third market, or (iii) a constructed measure of the exporter's average cost.[10]

The second major piece of evidence that must be provided to the government in a national AD investigation is that the petitioning domestic industry is "materially injured" by these dumped imports (WTO, 1995; Article 3). When considering evidence that the domestic industry is injured, the Antidumping Agreement suggests that national authorities can consult a number of types of industry data, including "actual and potential decline in sales, profits, output, market share, productivity, return on investments, or utilization of capacity; factors affecting domestic prices; the magnitude of the margin of dumping; actual and potential negative effects on cash flow, inventories, employment, wages, growth, ability to raise capital or investments" (WTO, 1995; Article 3.4).[11]

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[10]There is an extensive research literature questioning these definitions from the perspective of economic welfare. If AD is an instrument in the arsenal of competition policy, there are many non-predatory circumstances in which a profit-maximizing foreign firm would otherwise be expected to price in violation of one of the criteria. A common example of the first is international price discrimination associated with different demand elasticities across countries. A common example of the third is pricing below average cost during short-run periods of low demand, provided the foreign firm can cover at least its variable cost. For other examples see Hoekman and Kostecki (2001, pp. 315–330). Other economic research suggests that there are various ways in which industries may be able to use AD within and across countries as a means of facilitating *anti*-competitive behavior such as collusion. For examples, see Bown (2005) or Prusa (1992).

[11]Economists also argue that these measures of "injury" alleged to be caused by unfair trade are by themselves meaningless, as they are observationally equivalent to injury caused by other sources. One example is an inefficient, import-competing industry that is contracting in the face of newfound "fair" foreign competition following an agreement to liberalize trade. Alternative explanations are that it is an industry facing changing consumer preferences for its products, negative domestic cost shocks, etc. An important limitation of the text of the Antidumping Agreement is that it does not mandate how domestic authorities are to rigorously attribute injury across multiple contributing causes. For an examination of the law and economics of this issue and the jurisprudence of AD disputes challenged at the WTO, see Durling (2003) and Durling and McCullough (2004).

Economists argue that the evidence required by the Agreement is not sufficient to establish whether the domestic industry does face changing economic conditions or anticompetitive practices by foreign exporters that are worrisome from the perspective of economic welfare. Nevertheless, the Antidumping Agreement specifies that the petitioning industry must satisfy *at least* this burden of proof for dumping and injury before the AD authority can impose a new import restriction. Thus, as one way of assessing whether the Agreement imposes any constraints on member governments' use of AD, we examine whether the industries more likely to face the changing market conditions specified by the Agreement are the industries that successfully pursue import protection under the policy.

2.2   Theory of Endogenous Trade Policy in the Presence of an AD Law

In this section we appeal to the theory of endogenous trade policy to identify characteristics of industries likely to pursue protection from imports given the incentives created by an AD law. Adoption of a domestic AD law establishes a legal process through which an industry willing to spend substantial resources may be able to obtain protection from import competition. Even an AD investigation in a developing country constitutes a substantial legal proceeding, which requires that industries marshal resources to hire lawyers and collect and distill economic evidence relating to the dumping and injury criteria.

What are the characteristics of industries most likely to find the marginal benefit from pursuing protection from imports under AD law greater than its marginal resource cost? The first characteristic is size – on the one hand, a larger industry is more likely to pursue AD because it can support the litigation costs associated with the investigation process.[12] Furthermore, given that there is substantial discretion in the national government's administrative process for sorting through evidence provided in an AD investigation (e.g. which method to use to calculate dumping, which data and measures to use to assess injury), the industry's political influence with policy-makers may affect the government-determined outcome in a given case and thus the industry's willingness to pursue an AD investigation. Political influence of the industry might be captured through its financial size, assuming this is positively related to campaign contributions needed for re-election (e.g. Grossman and Helpman, 1994). An alternative measure of political influence might be the number of employees in the industry, to the extent that

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[12]Nevertheless, industry concentration is likely to affect its ability to overcome the free-rider problem. Because all firms in the domestic industry would benefit from an AD trade restriction that shields them from having to compete with imports, each firm individually has little incentive to invest in the process necessary to obtain it. Unfortunately, data on industry concentration are not suitably available for the countries and time period required for our analysis.

employees have sector-specific skills and if the median voter affects trade policy decisions (e.g. Mayer, 1984).[13]

Additional industry characteristics may play a role in the use of AD once we also take into consideration the use of the policy across countries. For example, industries with historical experience of having their exports targeted by foreign AD may be more likely to pursue the policy themselves. One explanation is familiarity – the learning experience of having defended exports in foreign AD investigations may affect the likelihood of pursuing AD as an offensive weapon at home. A second explanation is that industries targeted by foreign AD may be more likely to use it as a means of retaliation (tit for tat) or to discourage future foreign use of AD.

The research literature on US and EU trade policy has examined whether a number of differently constructed variables capturing these elements of the political-economic process help explain the pattern of AD use. Given that both the industry-level data and data on the political process are of much higher quality for the United States and EU than for the developing countries in our sample, we are not able to replicate with precision such measures in our empirical analysis. Nevertheless, we do take advantage of a reasonably disaggregated cross-country panel of industry-level data to construct measures that we use to assess whether many of the same political-economic considerations also affect the use of AD in developing countries. We describe this variable construction, data, and our formal econometric approach in the next section.

3. EMPIRICAL APPROACH AND DATA

What are the determinants of industry pursuit and receipt of AD protection in the new user developing countries? In the following sections we describe the economic model that serves as the basis for our estimation exercise, as well as the available data sources and construction of the variables used to estimate the model. Based on data requirements for the econometric analysis, we construct an unbalanced panel of 28 three-digit ISIC industries in one of nine developing countries in a given year between 1995 and 2002. As we discuss in more detail below, there are a number of data limitations in the TPP, as described in Nicita and Olarreaga (2007). For example, Table 4 lists the subperiods for which there are available production data for each country during 1995–2002, noting the particularly limited availability for Brazil (1995), Peru (1995–1996), and Venezuela (1995–1997).[14]

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[13]Rosendorff (1996) provides a theoretical framework that also examines how such measures of political influence affect the outcome of the AD investigation and, in particular, the proclivity of voluntary export restraints and price undertakings relative to the imposition of duties.

[14]Each country has multiple years of data available before 1995; thus we are able to construct the 1995 values for variables (described below) that require data from prior years. Note also that the need for production data does limit our focus to manufacturing; thus we also lose a handful of observations relating to AD use in agriculture.

TABLE 4 ANTIDUMPING INVESTIGATIONS AND MEASURES IN THE 1995–2002
ESTIMATION DATA SAMPLE

Country	Time period with available TPP data	Number of antidumping investigations during that time period*	Number of these investigations that resulted in imposed antidumping measures*	Share of these investigations resulting in imposed antidumping measures
Argentina	1995–1999	93	57	0.61
Brazil	1995–1995	5	5	1.00
Colombia	1995–2000	14	12	0.86
India	1995–2001	233	203	0.87
Indonesia	1995–2002	48	25	0.52
Mexico	1995–2000	55	33	0.60
Peru	1995–1996	38	10	0.26
Turkey	1995–2000	21	16	0.76
Venezuela	1995–1997	8	3	0.38
Subtotal		515	364	0.71

Notes: *The unit of observation for this table is a product-level, foreign country-specific anti-dumping investigation or measure.
Source: Antidumping data compiled by the author from Bown (2007).

3.1 Econometric Model

Our econometric approach uses maximum likelihood to estimate a binomial probit model that examines determinants of a country's three-digit ISIC industry's binary decision of whether to pursue an AD investigation in a given year. As a robustness check, we also estimate a binomial probit model in which the dependent variable is an indicator defined as the *outcome* of whether or not at least one of these investigations results in government imposition of AD protection.

Before proceeding to a discussion of the variable construction and data, we seek to motivate the logic behind choosing this particular model, as the vast prior literature examining developed economies' use of AD provides an extensive number of alternative modeling approaches from which to choose. First, while the Global Antidumping Database contains sufficiently detailed information across countries about investigations, injury, and dumping decisions so as to make a two-stage estimation procedure theoretically possible, our sources of complementary data impose constraints so as to make such an approach infeasible in practice.[15] This is largely driven by one

[15]The industry-level approach that we adopt here to investigate the cross-country use of AD is closest to the two-stage approach of Hansen (1990), which estimates determinants of a U.S. industry decision to pursue an AD investigation (first stage) and the determinants of the U.S. International Trade Commission injury decision (second stage). Hansen's approach focuses only on the injury decision in the second stage given that in the United States, almost all investigations find evidence of dumping; hence, whether the domestic industry receives import protection under AD is determined de facto by the injury decision.

of the insights of Table 3, i.e. most industries in these countries that pursued
at least one AD investigation in a year also had at least one of those in-
vestigations result in imposition of an AD measure.

The fact that most of the investigations in our estimation sample result in
an outcome in which AD was imposed is a consequence of two features of
the data. First, when examining the raw data of product level, foreign
country-specific (i.e. the "case level") investigations from the Global
Antidumping Database, most of these developing countries in our sample
time period were likely to conclude an investigation with the imposition
of an AD measure.[16] As Table 4 illustrates, 71% of case-level investigations
in this sample of developing economies resulted in the imposition of
measures.[17]

Next, when we concord the information on the 515 case-level AD in-
vestigations to the "industry-level" aggregation required to match available
production data from the TPP, we are left with 91 instances in which an
industry in one of these nine countries initiated at least one case-level in-
vestigation in a given year. Suppose we then define the industry-level AD
outcome variable as a binary indicator taking on a value of 1 when at least
one of the case-level investigations for the industry results in the imposition
of a final AD measure. Under this definition, 79 out of 91 initiation ob-
servations had at least one of the underlying case-level investigations result
in the imposition of an AD measure.[18] Thus aggregating from the case level
to the industry level further reduces the outcome variation within the set of
initiated cases. Thus we obtain few additional (statistically significant)

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[16]The country-level experiences described in Finger and Nogués (2005) provide anecdotes to
support this intuition. Some of the case studies suggest that AD use in Latin American countries
during the 1990s was a cooperative partnership between industries and policy-makers to manage
an overall process of trade liberalization. Indeed, while we refer to it as the industry decision
to initiate an investigation, ultimately it is the government's decision to accept the request to
initiate an investigation, and in some countries government initiation of cases will frequently
take place.

[17]Simply as a point for comparison, Australia, Canada, the EU, and the United States
had only 52% of their case-level investigations initiated during the 1995–2002 period result in
the imposition of measures (Bown, 2007).

[18]Alternative approaches would be to construct a measure of the size of the imposed final AD
import restriction or to use a count measure of the number of measures imposed or investiga-
tions. The first alternative presents serious aggregation and averaging challenges given that most
of these developing countries have not adopted the U.S. model of implementing new AD
measures almost exclusively in the form of an ad valorem duty. It is frequently the case for these
developing countries that one subset of industry imports targeted by AD might be affected by an
ad valorem duty, another subset might be affected by a specific duty, while a third subset might
face a price undertaking. The second alternative of using a count measure also presents ag-
gregation challenges given that the product coverage of HS codes is not standardized across
cases, and/or many product-level investigations may investigate many different exporting
countries. See, for example, Staiger and Wolak (1994) for the caveats associated with con-
structing such measures in the case of the United States.

insights from a two-stage model relative to a single-stage model. For efficacy we report results from a single-stage model of industry-level requests for AD investigations, and we document robustness checks from estimating a similar single-stage model in which the dependent variable is redefined as the AD measure outcome indicator.[19]

3.2 Global Antidumping Database and Construction of Dependent Variables

The AD data used in the empirical analysis are product-level information on AD investigations, outcomes, and affected products constructed from original source national government publications and compiled in the Global Antidumping Database (Bown, 2007). Our analysis examines the nine developing countries whose AD use is documented in Table 1. Although the database includes information on AD use by some of these countries before 1995, we focus on investigations initiated after January 1, 1995, because that is when the Antidumping Agreement came into effect and the rules on DSU enforcement became consistent across countries.[20] We then match database information on the six-digit HS products that are the subject of AD investigations and imposed measures to the available years of industry-level production data using the concordances in the TPP.[21]

As we have described in the last section, we define the decision to pursue an AD investigation as a "1" if the industry pursued at least one investigation over a six-digit imported product during a given year and zero otherwise. As a robustness check, we also estimate determinants of the binomial probit model in which the outcome takes on a value of "1" not only if the industry filed at least one investigation in a given year, but provided at least one of those investigations resulted in the imposition of an AD measure.

3.3 Construction of Explanatory Variables

The construction of many of the explanatory variables needed for the econometric investigation requires disaggregated industry-level data. We obtain these data from the World Bank TPP as described in Nicita and Olarreaga (2007). The TPP has extensive cross-country data for many production-related variables for 28 three-digit ISIC manufacturing

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[19]While the first-stage estimates of a two-stage Heckman (1979) selection model are consistent with those reported here from a single-stage model, the second-stage estimates from such a model are generally not statistically significant. These estimates are available from the author on request.

[20]Before 1995, international enforcement varied across countries under the GATT given that not all GATT Contracting Parties were signatories to the Tokyo Round's plurilateral Antidumping Code and thus subject to its dispute settlement procedures.

[21]We concord the six-digit HS import data to the three-digit ISIC level, allowing each six-digit HS product to be allocated to only one industry.

industries for subperiods with various start and end dates, depending on the country, between 1976 and 2004.[22]

WTO Antidumping Agreement Evidentiary Criteria. As we have described in section 2.1, the WTO AD rules require that a petitioning industry provide policy-makers with technical evidence that it has been injured by dumped imports. In this section we construct a number of variables to proxy for economic conditions that are consistent with the required evidence.

Our first variable is designed to capture the likelihood that the industry is facing dumping, or prices of competing exports that are below "normal value," and our measure is the industry ratio of gross fixed capital formation to value added in 1994.[23] We expect that industries with a greater ratio of capital expenditure and thus higher fixed costs are more likely, ceteris paribus, to face cyclical dumping than industries with less expenditure on capital. While a potential indicator of dumping, we note that such a variable may also capture the presence of industry-level sunk costs and thus the political power of the industry as well.

Next we create two indicators to examine potential evidence of industry-level "injury" caused by imports. The first is the average percent change in value of industry output, for the prior three years.[24] The second is defined as the average percent change in value of industry imports, for the prior three years.[25] We choose this time period because AD authorities frequently rely on data from the most recently completed three-year period in their consideration of injury trends. Therefore, we expect that industries with declining output and which faced increased competition from imports are

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[22]This is admittedly more aggregated than the four-digit-level data typically used to estimate determinants of U.S. AD, for example. While four-digit data for some developing countries are available in a prior edition of the TPP, it is not sufficient for our cross-country analysis as it is extremely limited in terms of country and time-series coverage for the post-1995 period. Nevertheless, we do note that use of three-digit-level data makes our analysis more susceptible to measurement error and our results will be less statistically precise than if we had access to more disaggregated data.

[23]This is the only variable for which we fix the time-series dimension of the data and rely on 1994 values only. For many of the countries in the sample, either the capital formation variable or the value-added variable is missing in a number of years for which the other variables in the dataset are available, thus constructing this ratio on a year-to-year basis would cause us to lose too many observations.

[24]Note that investigation here only compares AD-using vs. non-using industries. For example, Table 3 illustrates that AD-using industries on average had output that was growing more slowly than non-initiating industries. We do not examine whether the users of AD have *shrinking* output (i.e. output growth relative to a benchmark), which may be more conclusive evidence of injury in an actual investigation. Thus, our analysis can only examine whether the data on changing market conditions for AD-using industries are consistent with the evidentiary requirements.

[25]In particular, if t is the year of the AD investigation and Δy_{it} is the yearly log growth of the value of industry i output between $t-1$ and t, we define the first variable as $(\Delta y_{it} + \Delta y_{it-1} + \Delta y_{it-2})/3$. Similarly if Δm_{it} is the yearly log growth of the value of industry i imports between $t-1$ and t, we define the second variable as $(\Delta m_{it} + \Delta m_{it-1} + \Delta m_{it-2})/3$. Both the output value data and import value data derive from the TPP.

more likely to pursue AD import protection. Such industries are better positioned to provide evidence of injury and to be able to blame that injury on dumped imports than industries in which imports have not been increasing.

Macroeconomic Determinants.   While AD authorities are mandated to use *industry*-level measures in their injury determinations, economic researchers have noted that other *macroeconomic* indicators also affect the likelihood of AD use over time. For example, for a set of four developed economies, Knetter and Prusa (2003) report evidence that changes in real GDP and real exchange rates affect the countries' overall number of AD investigation filings on a year-to-year basis.

We use these insights to construct macroeconomic variables for our developing-country analysis. We hypothesize that all industries within a given country may be more likely to use AD if there is a severe appreciation of the currency (making imports cheaper, relative to domestic production) or if the economy is in a recessionary period of the business cycle. We first use yearly data from the World Bank's *World Development Indicators* to construct a measure of each country's real GDP growth, and we expect a negative relationship between growth in year $t-1$ and the likelihood of an AD investigation in t. Second, we use the IMF's *International Financial Statistics* to construct a measure of each country's exchange rate, defined as the units of local currency necessary to purchase a unit of foreign currency, so that a *positive* year-to-year change would reflect a local currency *depreciation*.[26] We then expect a *negative* relationship between any increase in value in year $t-1$ and the likelihood of an investigation in year t – i.e. we expect an *appreciation* of the currency (negative change) to be associated with a higher probability of AD use.

Political-Economic Determinants.   Next consider the variables that the theory of endogenous trade policy suggests as potentially affecting the pursuit and receipt of AD import protection. We construct two variables designed to capture the size of the industry, which may affect both its ability to overcome the resource cost of an AD investigation and the political value to domestic policy-makers of protecting the industry. The first is the share of the value of industry output in the country's GDP. The second variable is the three-digit ISIC industry's share of the country's total

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[26]To construct this measure we would have preferred to use the IFS's real effective exchange rate series measuring the real value of the local currency against a basket of foreign currencies, but this series is not available for all of the countries in our analysis. Thus we use the IFS exchange rate series defined as the units of local currency it takes to purchase an IMF Special Drawing Right. Alternatively available real exchange rate series, such as that provided by the USDA's Economic Research Service, define the real exchange rate vis-à-vis the US dollar and not a basket of currencies. Nevertheless, we do note that the results presented below of this particular variable are sensitive to the choice of exchange rate series.

employment.[27] The theory suggests that larger industries are more likely to pursue AD and to find sympathetic policy-makers willing to grant them protection from imports.

Our last political-economic variable captures the level of import competition facing the industry, measured by the industry's import penetration ratio. The theory predicts that, ceteris paribus, an industry that faces little competition from imports is unlikely to spend resources to pursue AD to shield it from future import competition. A lower value for the import penetration ratio may capture two distinct global competitiveness scenarios facing the industry, but both have the same implication for its future pursuit of AD: the industry may already be shielded from imports because of higher tariff or non-tariff barriers; alternatively, the industry could be one in which the country has a global comparative advantage.[28]

Other Control Variables. We also consider specifications that control for additional concerns. One such factor, illustrated in Table 2, is that industries such as chemicals and steel use AD across all countries. Such industries may be more likely to pursue AD because of learning by multinational firms across countries and/or because of retaliation/enforcement concerns.[29] While we are not able to investigate the underlying cause of this particular phenomenon in the current analysis, we nevertheless seek to control for this feature of the data by including an indictor for the steel and chemical industries in our estimation equation.

Our analysis also includes a binary indicator for whether the industry received prior AD protection within the last five years. If our other industry-level control variables capture the main determinants of industry pursuit of AD, we expect that the coefficient on this variable would be negative, i.e. receipt of AD protection in the past decreases current competition and the probability that it needs new AD protection in the future, ceteris paribus. However, a positive sign on this coefficient may indicate that there is some industry-specific component that is not otherwise being captured through

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[27]The industry output value and the number of industry employees derives from data available in the TPP. The denominator of the employment share variable is the country's "total economically active population" taken from the International Labour Organization's (http://laborsta.ilo.org/) labor force surveys. Because these data are typically available for only one year, we introduce year-to-year variation proportionally with the country's overall population growth data taken from the World Bank's *World Development Indicators.*

[28]Because this variable is capturing the degree of import competition facing the industry, it is not necessary for us to also include variables such as the level of other tariff or non-tariff protection facing the industry.

[29]See, for example, Blonigen and Bown (2003), Feinberg and Reynolds (2006), and Prusa and Skeath (2004). Note, however, that unlike some of these prior studies, we do not include separate measures of retaliatory capacity because we are not examining the case-level question of whether to file an AD investigation (or impose an AD measure) against a particular country. In our industry-level analysis, there is no target country specific variation to exploit such a feature of the data.

our other industrial-level covariates that makes past users of AD more likely to continue its use.[30]

We also include a time trend in the analysis to control for learning during the time period as well as any phase-in of trade liberalization commitments undertaken during the Uruguay Round that may make it more likely for an industry to increase the need to request antidumping over time. We thus expect a positive coefficient on the time trend variable. Finally, in some specifications we include country fixed effects to control for unobservable country-specific differences beyond the country-level macroeconomic shocks for which we introduced controls in the last section. For example, countries may offer differential access to AD policy due to specifics of national law, the efficiency of the administrating bureaucracy, etc.[31]

Table 5 presents summary statistics for the data and constructed variables used in the formal econometric analysis.

4. EMPIRICAL RESULTS

Table 6 reports the marginal effects estimates from different specifications of the basic estimation equation of the probit model. The dependent variable is the binary choice of whether to pursue at least one AD investigation is considered by each three-digit ISIC industry in each developing country each year. The time-series dimension of the panel allows for yearly AD decisions to be made between 1995 and T, where the end year (T) varies across countries according to each country's underlying production data availability in the TPP (see Table 4). Column (4) presents our preferred specification of the model, which focuses on a subsample of data that allows us to control for unobserved country-level heterogeneity through fixed effects. Nevertheless, we begin our presentation of the empirical results with specification (1), which is an estimate of the binomial probit model on the largest sample of data at our disposal without fixed effects. We interpret our basic results as well as their sensitivity to different specifications in detail in the next three sections, and we discuss the *economic* significance of the results in section 4.4.

4.1   What Determines Industry Pursuit of AD Protection in Developing Countries?

Consider Table 6 beginning with specification (1), which reports estimates from the sample of data *without* controls for country-specific effects. While this is not our preferred specification, the coefficient signs for almost all of

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[30]Furthermore, given that AD cases are exporting country-specific, if the initial measures only restricted imports from a few countries, imports from other exporters may increase. For evidence of such trade diversion in the context of U.S. AD, see Bown (2004) and Prusa (2001).

[31]Because our empirical exercise includes only countries that have established and actively used AD, this is less of a concern than if our sample of countries included non-users.

TABLE 5 SUMMARY STATISTICS FOR VARIABLES USED IN THE BASELINE ECONOMETRIC INVESTIGATION

Variables	Predicted sign	Mean	Standard deviation	Minimum	Maximum
Dependent variables					
Binary variable = 1 if industry pursued an AD investigation in t		0.086	0.281	0	1
Binary variable = 1 if industry pursuit of an AD investigation in t resulted in imposed AD measure		0.070	0.256	0	1
Explanatory variables					
Industry-level political-economic determinants					
Import penetration ratio in t	[+]	0.311	0.301	0	1
Employment share of total employment in t	[+]	0.002	0.002	0.000	0.019
Output share in gross domestic product in t	[+]	0.015	0.017	0.000	0.096
Chemical or steel industry indicator	[+]	0.071	0.257	0	1
Time trend	[+]	1,997.489	1.955	1,995	2,002
Indicator that industry received AD protection in the last five years	[−]	0.087	0.283	0	1
Antidumping Agreement's evidentiary determinants					
Ratio of gross fixed capital formation to value added in 1994	[+]	0.203	0.298	−0.066	2.703
Average percent change in value of industry output, three years before t	[−]	0.051	0.143	−0.924	0.806
Average percent change in value of industry imports, three years before t	[+]	0.125	0.191	−0.663	1.479
Macroeconomic determinants					
Percent change in exchange rate between $t-2$ and $t-1$	[−]	0.222	0.326	−0.150	2.048
Percent change in real GDP between $t-2$ and $t-1$	[−]	0.040	0.048	−0.141	0.167

Notes: 1,053 observations data used in specifications (1) and (5). It is an unbalanced panel of 28 industries across nine countries over subperiods in $t = 1995–2002$.

TABLE 6   PROBIT MODEL MARGINAL EFFECTS ESTIMATES OF DEVELOPING COUNTRIES' INDUSTRY-LEVEL AD INVESTIGATION DECISION, 1995–2002

Explanatory variables	Binary dependent variable = 1 if industry pursued an AD investigation in t				
	Full sample of nine countries (1)	Drop output share variable (2)	Drop Brazil and Peru (3)	Add country fixed effects (4)	Argentina, India, and Mexico only (5)
Industry-level political-economic determinants					
Import penetration ratio in t	0.047[b] (0.020)	0.043[b] (0.020)	0.046[b] (0.023)	0.057[a] (0.021)	0.124[a] (0.047)
Employment share of total employment in t	−0.221 (3.324)	4.503[c] (2.672)	5.631[c] (3.234)	8.093[a] (2.850)	24.050[b] (10.717)
Output share in gross domestic product in t*	0.903[b] (0.404)	—	—	—	—
Chemical or steel industry indicator	0.269[a] (0.057)	0.307[a] (0.062)	0.344[a] (0.065)	0.402[a] (0.064)	0.624[a] (0.093)
Time trend	0.005 (0.003)	0.006[c] (0.004)	0.007[c] (0.004)	0.011[a] (0.004)	0.028[a] (0.009)
Indicator that industry received AD protection in the last five years	0.063[c] (0.036)	0.068[c] (0.037)	0.073[c] (0.040)	0.023 (0.026)	−0.003 (0.039)
Antidumping Agreement's evidentiary determinants					
Ratio of gross fixed capital formation to value added in 1994	0.028[a] (0.010)	0.033[a] (0.010)	0.037[a] (0.011)	0.018 (0.014)	0.060[a] (0.020)
Average percent change in value of industry output, three years before t	−0.104[b] (0.043)	−0.091[b] (0.043)	−0.094[c] (0.049)	−0.085[b] (0.043)	−0.260[b] (0.130)
Average percent change in value of industry imports, three years before t	0.025 (0.029)	0.021 (0.030)	0.026 (0.036)	−0.002 (0.033)	0.054 (0.080)

TABLE 6 Continued

| | Binary dependent variable = 1 if industry pursued an AD investigation in t | | | | |
Explanatory variables	Full sample of nine countries (1)	Drop output share variable (2)	Drop Brazil and Peru (3)	Add country fixed effects (4)	Argentina, India, and Mexico only (5)
Macroeconomic determinants					
Percent change in exchange rate between $t-2$ and $t-1$	−0.156[a]	−0.151[a]	−0.168[a]	−0.078[c]	−0.331[a]
	(0.034)	(0.035)	(0.043)	(0.043)	(0.122)
Percent change in real GDP between $t-2$ and $t-1$	−0.388[b]	−0.377[b]	−0.400[c]	−0.341[c]	−0.925[b]
	(0.168)	(0.173)	(0.217)	(0.176)	(0.443)
Country fixed effect	No	No	No	Yes	Yes
Observations	1,053	1,053	984	984	476
Pseudo-R^2	0.25	0.24	0.24	0.29	0.27
Log pseudo-likelihood	−233.17	−234.73	−229.95	−214.19	−142.07
Observations with AD investigations	0.086	0.086	0.091	0.091	0.143
Predicted probability of an AD investigation	0.044	0.046	0.054	0.041	0.082

Notes: Observations are an unbalanced panel of 28 three-digit ISIC industries across nine AD-imposing countries over subperiods of $t = 1995$–2002, where the termination year varies by country depending on underlying industry data availability: 1995 (Brazil), 1996 (Peru), 1997 (Venezuela), 1999 (Argentina), 2000 (Colombia, Mexico, Turkey), 2001 (India), and 2002 (Indonesia). In parentheses are White's heteroskedasticity-consistent standard errors clustered on importer-industry combinations, with superscripts a, b, c denoting estimates statistically different from zero at the 1%, 5%, and 10% levels, respectively. Estimates of the constant term are suppressed.
*Underlying variable is scaled by 1,000.

the explanatory variables are consistent with both the predictions of the theory of endogenous trade policy and the evidentiary requirements specified in the WTO Antidumping Agreement. In accordance with the theory, industries are more likely to pursue an AD investigation if they face more competition from imports and are more politically valuable as measured by their size (share of the value of output in GDP). With respect to the WTO's evidentiary criteria, industries are more likely to pursue AD investigations if they have greater capital expenditure and are thus more likely to face cyclical dumping, and if they face greater reductions in industry output over the prior three years. Industries facing a more rapid increase in competition from imports over the past three years are also more likely to initiate an AD investigation, although the estimate of this effect is not statistically different from zero. The macroeconomic determinants are consistent with theory as well: an increase in the value of local currency (appreciation) is associated with an increased probability of AD use, as is a decline in real GDP. The chemicals and steel industry are statistically more likely than other industries to use AD, as are industries that have already received AD protection within the last five years – although this particular result is not robust to alternative specifications that introduce additional controls. Finally, the estimate on the time trend variable is positive, indicating a general increase in the probability of using AD across all industries over time, although this estimate is also not statistically significant in this specification.

The one variable from specification (1) that is *inconsistent* with the basic political-economic theory is the size measure captured by the share of industry employment in total employment. Nevertheless, this variable is highly positively correlated (0.66) with the output share variable, and thus one explanation for the negative sign in specification (1) is possible collinearity between the two variables. When we drop the output share variable in specification (2), the marginal effect estimate on the employment share variable changes to positive and significant, a result consistent with this possibility. In the remaining specifications we therefore include only the employment share variable and conclude that while there is evidence that size matters for the industry's political-economic decision of whether to initiate an AD investigation, with our available underlying data, it is difficult to distinguish whether it is employment size, output size, or perhaps both.[32]

In specification (3), we drop Brazil and Peru from the sample because they have only one or two years' worth of available TPP production data. Neither the size of the estimates nor their statistical significance changes much when we focus on only the seven remaining developing-country users of AD.

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[32]Because we only include one of the size measures, we choose the employment variable instead of the output variable to minimize general concerns over any potential measurement error that may be common across explanatory variables. That is, the underlying output data are also used to construct two other explanatory variables – the import penetration ratio and the average percent change in industry output.

In specification (4), we add country-specific fixed effects to the estimation on this same subsample of data. The estimated signs of the determinants of interest do not change, while the statistical significance of many of the variable coefficient estimates improves, with the exception of the capital expenditure variable, which loses its statistical significance in this specification. Once again, adding country-specific effects controls for possible differences across the seven remaining developing countries in their probabilities of using AD due to differences in national institutions, government preferences, or other unobserved country-level heterogeneity.

Finally, specification (5) focuses on a pooled panel of data from Argentina, India, and Mexico only. The results are essentially unchanged. As we discuss below, these three countries are an interesting subsample for a number of complementary reasons – including the fact that they were large users of AD across a number of different industries throughout the period of our available underlying production data.

4.2 Are the Results Sensitive to Examination of AD Outcomes as the Dependent Variable?

Next consider Table 7, which presents the same basic specifications as Table 6, except with the dependent variable redefined to be an indicator of whether an industry received the imposition of at least one AD measure. Once again, while our preferred specification is (9) because it includes country-specific fixed effects, for consistency, Table 7 first presents estimates of the model on the largest available sample of data and without these controls before examining additional robustness checks.

Given the discussion in section 3.1 that most of our observations in which there was an industry indicator of an investigation also result in an indicator for an imposed measure, it is not surprising that the results in Table 7 are consistent with their analogue specifications in Table 6, though in a handful of instances coefficients with marginal statistical significance in Table 6 are not significant in Table 7. To summarize, whether examining a dependent variable defined as an indicator of an AD outcome or an imposed AD measure, we find that industries are more likely to use AD when they (i) face greater import competition, as measured by the import penetration ratio; (ii) are larger (whether measured by employment share or output share in GDP); (iii) are relatively more injured, as measured by a recent decline in industry output; and (iv) have recently faced negative macroeconomic shocks, as measured by relative currency appreciation and slower real GDP growth. These results hold after controlling for country-specific effects, the fact that the chemical and steel industries are more likely than others to use AD, and that the imposition of AD measures has been generally increasing in these countries over this time period.

TABLE 7 PROBIT MODEL MARGINAL EFFECTS ESTIMATES OF DEVELOPING COUNTRIES' INDUSTRY-LEVEL AD IMPOSITION DECISION, 1995–2002

Explanatory variables	Binary dependent variable = 1 if industry received AD protection after an investigation initiated in t				
	Full sample of nine countries (6)	Drop output share variable (7)	Drop Brazil and Peru (8)	Add country fixed effects (9)	Argentina, India, and Mexico only (10)
Industry-level political-economic determinants					
Import penetration ratio in t	0.031[c]	0.028[c]	0.029	0.035[b]	0.099[b]
	(0.016)	(0.016)	(0.019)	(0.015)	(0.041)
Employment share of total employment in t	−1.264	2.133	2.795	4.688[b]	19.029[c]
	(2.687)	(2.250)	(2.703)	(2.259)	(10.553)
Output share in gross domestic product in t*	0.648[b]	—	—	—	—
	(0.318)				
Chemical or steel industry indicator	0.226[a]	0.261[a]	0.296[a]	0.352[a]	0.587[a]
	(0.049)	(0.056)	(0.060)	(0.064)	(0.099)
Time trend	0.002	0.003	0.003	0.005[b]	0.021[b]
	(0.003)	(0.003)	(0.003)	(0.002)	(0.008)
Indicator that industry received AD protection in the last five years	0.058[c]	0.062[c]	0.068[c]	0.017	0.008
	(0.033)	(0.033)	(0.036)	(0.019)	(0.040)
Antidumping Agreement's evidentiary determinants					
Ratio of gross fixed capital formation to value added in 1994	0.028[a]	0.031[a]	0.036[a]	0.011	0.052[a]
	(0.008)	(0.008)	(0.009)	(0.008)	(0.017)
Average percent change in value of industry output, three years before t	−0.095[a]	−0.087[b]	−0.092[b]	−0.079[a]	−0.316[a]
	(0.037)	(0.037)	(0.043)	(0.030)	(0.116)
Average percent change in value of industry imports, three years before t	0.032	0.030	0.034	−0.002	0.063
	(0.024)	(0.025)	(0.030)	(0.022)	(0.068)

TABLE 7 Continued

	Binary dependent variable = 1 if industry received AD protection after an investigation initiated in t				
Explanatory variables	Full sample of nine countries (6)	Drop output share variable (7)	Drop Brazil and Peru (8)	Add country fixed effects (9)	Argentina, India, and Mexico only (10)
Macroeconomic determinants					
Percent change in exchange rate between $t-2$ and $t-1$	−0.123[a] (0.025)	−0.120[a] (0.025)	−0.137[a] (0.032)	−0.056[b] (0.025)	−0.223[b] (0.104)
Percent change in real GDP between $t-2$ and $t-1$	−0.368[a] (0.138)	−0.365[b] (0.142)	−0.417[b] (0.179)	−0.301[b] (0.119)	−0.603 (0.414)
Country fixed effect	No	No	No	Yes	Yes
Observations	1,053	1,053	984	984	476
Pseudo-R^2	0.28	0.27	0.27	0.34	0.27
Log pseudo-likelihood	−193.06	−194.29	−189.03	−172.25	−128.96
Observations with AD impositions	0.070	0.070	0.074	0.074	0.122
Predicted probability of an AD imposition	0.030	0.031	0.038	0.020	0.070

Notes: Observations are an unbalanced panel of 28 three-digit ISIC industries across nine AD-imposing countries over subperiods of $t = 1995$–2002, where the termination year varies by country depending on industrial production data availability: 1995 (Brazil), 1996 (Peru), 1997 (Venezuela), 1999 (Argentina), 2000 (Colombia, Mexico, Turkey), 2001 (India), and 2002 (Indonesia). In parentheses are White's heteroskedasticity-consistent standard errors clustered on importer–industry combinations, with superscripts a, b, c denoting estimates statistically different from zero at the 1%, 5%, and 10% levels, respectively. Estimates of the constant term are suppressed.
*Underlying variable is scaled by 1,000.

4.3   *Heterogeneity across Country-Specific Results*

Finally, as a last estimation exercise, we also estimate specifications of the models on subsamples of country-specific data for Argentina, India, and Mexico, which we report in Table 8.[33] For each country we estimate the model first with the dependent variable defined as the industry investigation indicator, and second, with the dependent variable defined as an indicator for whether an industry received any AD protection after initiating one or more investigations in a given year. With one exception, the explanatory variables are also the same as the earlier tables. The exception is the employment variable, which we no longer need to normalize and define as a share (of total national employment) because we only examine within-country heterogeneity in each regression. This variable is thus defined as the number of industry employees.

One implication of the country-specific results presented in Table 8 for the post-1995 period is that there appears to be substantial differences across countries as to the most important determinants of AD use at the industry level. For example, in Argentina, the statistically significant variables are the import penetration, employees, capital formation, and macroeconomic shock variables.[34] In India and Mexico, on the other hand, the macro-economic variables are not statistically important determinants of AD use during this period. For India, significant determinants include the import penetration ratio, capital formation, and the decline in industry output, and for Mexico, the only statistically significant industry characteristic is the size of the variable as measured by the number of employees.[35]

Next, compare the country-specific estimates of Table 8 with results from a model estimated on the pooled sample of data from these three countries of Tables 6 [column (5)] and 7 [column (10)]. While the pooled sample of data indicates the *average* impact of each variable is statistically significant, the country-level estimates of each variable vary considerably in Table 8. In terms of policy implications, one interpretation of this result is that industries and policy-makers in different countries are able to access AD protection for quite different reasons and likely in response to different types

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[33]Each of the other individual countries presents problems for attempts to examine their industry-level AD use in isolation, when using the currently available data. First, Brazil (1995), Peru (1995–1996), and Venezuela (1995–1997) have only limited years and sectors of production data available. Second, Colombia turns out to be a relatively infrequent user when viewed in isolation at the industry level. Finally, while Indonesia and Turkey may be relatively more frequent users, their post-1995 use post-dates our available production data. Nevertheless, the timing of these two countries' use appears to be an immediate consequence of the Asian (and other emerging market) financial crisis and aftermath in the post-1997 period, suggesting their clustering of cases during these years may be explained mostly by macroeconomic shocks.

[34]Recall that Argentina's data sample is 1995–1999 and thus ends before the 2001 Argentine crisis.

[35]That is, for many of these determinants, statistical tests of equality of coefficients (for the same variable across country-level model estimates) can easily be rejected.

TABLE 8 PROBIT MODEL MARGINAL EFFECTS ESTIMATES OF THE INDUSTRY-LEVEL AD USE FOR ARGENTINA, INDIA, AND MEXICO, 1995–2001

	Argentina		India		Mexico	
	Binary dependent variable = 1 indicating					
Explanatory variables	AD investigation (11)	AD measure imposed (12)	AD investigation (13)	AD measure imposed (14)	AD investigation (15)	AD measure imposed (16)
Industry-level political-economic determinants						
Import penetration ratio in t	0.481[a] (0.115)	0.212[b] (0.083)	0.103[b] (0.042)	0.077[c] (0.043)	0.049 (0.034)	0.040 (0.031)
Number of employees in t*	1.170[b] (0.538)	0.461 (0.543)	0.023 (0.034)	0.015 (0.032)	0.746[c] (0.391)	0.732[c] (0.378)
Chemical or steel industry indicator	0.226[a] (0.073)	0.182 (0.126)	0.782[a] (0.109)	0.787[a] (0.111)	0.817[a] (0.072)	0.803[a] (0.093)
Time trend	0.021 (0.031)	0.004 (0.025)	0.027[a] (0.009)	0.023[b] (0.010)	0.022[c] (0.012)	0.016 (0.010)
Indicator that industry received AD protection in the last five years	-0.050 (0.066)	-0.011 (0.058)	-0.019 (0.029)	-0.013 (0.030)	-0.029 (0.020)	-0.028 (0.019)
Antidumping Agreement's evidentiary determinants						
Ratio of gross fixed capital formation to value added in 1994	0.975[a] (0.266)	0.331[c] (0.189)	0.040[b] (0.019)	0.039[b] (0.017)	0.190 (0.135)	0.189 (0.146)
Average percent change in value of industry output, three years before t	-0.060 (0.292)	-0.261 (0.270)	-0.530[a] (0.148)	-0.451[a] (0.137)	0.058 (0.093)	0.021 (0.114)
Average percent change in value of industry imports, three years before t	-0.054 (0.307)	-0.055 (0.199)	0.048 (0.068)	0.073 (0.061)	-0.042 (0.084)	0.022 (0.082)

Macroeconomic determinants						
Percent change in exchange rate between $t-2$ and $t-1$	−2.642[b] (1.134)	−2.053[b] (0.913)	−0.122 (0.431)	−0.302 (0.442)	−0.098 (0.078)	−0.073 (0.070)
Percent change in real GDP between $t-2$ and $t-1$	−1.949[b] (0.832)	−1.333[c] (0.727)	0.525 (1.155)	0.263 (1.074)	−0.418 (0.273)	−0.330 (0.238)
Observations	116	116	196	196	164	164
(years)	(1995–1999)	(1995–1999)	(1995–2001)	(1995–2001)	(1995–2000)	(1995–2000)
Pseudo-R^2	0.30	0.27	0.39	0.41	0.47	0.47
Log pseudo-likelihood	−39.49	−33.96	−45.37	−43.13	−33.25	−30.34
Observations with AD	0.190	0.138	0.128	0.122	0.128	0.110
Predicted probability of AD	0.079	0.045	0.050	0.045	0.020	0.021

Notes: Observations are a country-specific unbalanced panel of 28 three-digit ISIC industries over subperiods of $t = 1995$–2001, where the termination year varies by country depending on industrial production data availability: 1999 (Argentina), 2000 (Mexico), and 2001 (India). In parentheses are White's heteroskedasticity-consistent standard errors, with superscripts a, b, c denoting estimates statistically different from zero at the 1%, 5%, and 10% levels, respectively.
*Number of employees scaled down by 1,000,000.

of political and economic shocks. This highlights both the flexibility of AD policy, but it also speaks to the limits that the WTO rules had on disciplining access to this particular form of import protection during this time period.

4.4 Summarizing and Interpreting the Economic Significance of the Estimates

In this section, we summarize results and provide a discussion of their economic significance. We limit our interpretation to results in our preferred specification (4) of Table 6. After we control for the country-specific effects, we find evidence consistent with the theory of endogenous trade policy formation in the context of an AD law: larger industries that face substantial import competition are more likely to pursue an AD investigation. Furthermore, we also find that industries with more rapidly declining output are more likely to pursue an investigation than other industries, which is consistent with the technical evidentiary criteria mandated by the WTO Antidumping Agreement. Furthermore, industries in countries that face negative macroeconomic shocks as defined by exchange rate appreciations and declines in real GDP growth are also more likely to initiate AD investigations.

Are the specification (4) estimates economically important? First note the predicted probability of an industry pursuing an AD investigation in a given year is equal to 0.041 when the coefficient estimates are evaluated at the mean value of each explanatory variable.[36] With respect to the statistically robust estimates in Table 6, the economic impact of the results of specification (4) are as follows: (i) a 1 percentage point increase in the import penetration ratio increases the probability of an investigation by 0.0057; (ii) a 1 percentage point increase in the industry employment share increases the probability of an investigation by 0.08; (iii) a 1 percentage point drop in the prior three-year average growth of industry output increases the probability of an investigation by 0.0085; (iv) a 1 percentage point appreciation of the local currency increases the probability of an investigation by 0.0078; and (v) a 1 percentage point decline in real GDP growth increases the probability of an investigation by 0.0341. These estimates are economically significant. Ceteris paribus, a one standard deviation change in each variable in the direction indicated above implies a predicted increase in the probability of an investigation by 0.019 (import penetration), 0.021 (employment share), 0.012 (average percent change in industry output), 0.029 (exchange rate appreciation), and 0.010 (real GDP growth) when compared with the predicted probability of an investigation when evaluated at the means of the

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[36]The actual share of the 984 industry–year observations in the sample that pursued an AD investigation was 0.091. Also recall that the statistics reported in the table have already been converted to the marginal effects estimates, and the means and standard deviations of the underlying data are reported in Table 5.

data of 0.041.[37] For many of these variables, this is nearly a 50% increase in the predicted probability of an AD investigation. Finally, the predicted probability of a chemical or steel industry initiating an investigation is 0.402 higher than the other industries in the sample.

5. CONCLUSION

This paper investigates determinants of industry pursuit of AD across nine major developing countries in the 1995–2002 period and provides evidence that this use is consistent with industry characteristics predicted by the WTO's evidentiary requirements, the theory of endogenous trade policy and macroeconomic shocks. After controlling for country-specific effects, a general increase in AD use in these countries over this time period, and that industries like chemicals and steel are major users across countries, we find that the industries that successfully pursue new import protection via AD have the following characteristics: they are larger, they face substantial import competition and more rapidly declining industry output, and they are more likely to have been confronted with negative exchange rate and real GDP shocks. Our results are statistically and economically significant, and they are robust to subsamples of data. Nevertheless, the results are the average across countries, and estimates on country-specific subsamples of data indicate substantial heterogeneity in the key determinants of AD use at the industry level. This highlights both the flexibility of the trade policy instrument, and the lack of discipline that WTO rules have likely had on limiting its use during this time period.

Understanding the causes of developing-country use of AD is important for a number of reasons. First, many of these countries are increasingly taking on WTO commitments that restrict their ability to use other trade-restricting policies. The resulting pattern of AD import protection may thus be an increasingly important indicator for their overall pattern of industrial import protection. Furthermore, the increase in AD use by developing countries raises the concern that much of the trade liberalization commitments they undertook as part of the Uruguay Round negotiations may be offset de facto by new protection. However, some analysts have suggested a potentially important function of the AD undertaken by these developing countries. Finger and Nogués (2005), for example, contains arguments that AD in many of the Latin American countries in our sample helped provided an escape valve to manage an overall program of trade liberalization. The theory is that AD may positively affect the sustainability of the overall liberalization commitment and/or increase a country's ex ante willingness to

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[37]With respect to the coefficient estimate on the capital expenditure variable, even if it were statistically significant in specification (4), its economic impact is relatively small. The marginal effects estimate suggests that a one standard deviation increase in the size of the capital expenditure would only increase the probability of an AD investigation by 0.005.

take on more extensive liberalization commitments than it would take on without such an option.[38]

Even if AD contributes to a country's process of trade liberalization, it is equally important to identify the potential long-term economic costs of this contribution. As a caveat, we conclude by pointing to some of the costs experienced by the historical users of AD where the policy has a longer track record. First, there is evidence that it is difficult for governments to remove an AD measure once it has been imposed and an industry is benefiting from the protection it provides. While Article 11 of the WTO Antidumping Agreement introduced a mandatory five-year "sunset review" investigative procedure for each imposed measure, evidence for the United States suggests that this requirement has little impact on the removal of already imposed measures (Liebman, 2004; Moore, 2006). Furthermore, among WTO members, there is no historical precedent for a country that has been an intensive user of AD suddenly to curtail that use (Zanardi, 2004; Table 2). These combined findings suggest that over time, the *cumulative* impact of imposed AD measures may be substantial even though each distinct new AD investigation may cover only a few products and may thus seem to pose little overall economic threat. Indeed, in a study of the cumulative effects of the U.S. use of AD law, Gallaway et al. (1999) conclude that U.S.-imposed import protection under AD made it the second most costly trade policy program in terms of lost U.S. economic welfare in 1993, trailing only the Multi-Fibre Arrangement.

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[38]For a broader discussion of the theory behind this issue, see Hoekman and Kostecki (2001, ch. 9).

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