

## Anti-dumping actions and macroeconomic fluctuations

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Using a significantly larger panel of countries than previous studies, we find strong confirmation that macroeconomic factors (real GDP growth and changes in the real effective exchange rate) affect the frequency of anti-dumping investigations. A reduction in real GDP growth or a depreciation of the real effective exchange rate leads to increased use of anti-dumping. Most previous studies of “traditional users” and “new users” of anti-dumping tend to associate real exchange rate appreciation with more anti-dumping activities. Because of the possible endogeneity of trade liberalization and anti-dumping actions, we caution against the inclusion of contemporaneous measures of trade openness in the explanatory variables. Even if this advice is ignored, no convincing evidence exists that greater trade openness or reductions in most favored nation (MFN) tariffs by developing countries increase the number of their anti-dumping filings. An important caveat to our results is the large number of zero anti-dumping actions in the data set, which may not have been adequately controlled for in the regressions

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### 1. Introduction

Although the financial and economic crisis arising from the bursting of the US housing and financial bubble does not appear to have precipitated a systemic increase in trade protectionism, the World Trade Organization (WTO) has nevertheless documented a substantial increase in the number of anti-dumping investigations and new anti-dumping measures in 2008. There were 208 initiations of new anti-dumping investigations in 2008, when the crisis

intensified, as compared to 163 in 2007, or an increase of 28 percent. The number of new anti-dumping measures rose by about the same rate, from 107 in 2007 to 138 in 2008, or an increase of 29 percent.<sup>1</sup>

Certainly, if one examines data over the past three decades, there seems to be a strong link between anti-dumping action and the global business cycle (Figure 1). Figure 1 shows that periods when global GDP decelerated (as in 1980-82, 1990-91, and 2000-02) were marked by increases in the number of anti-dumping investigations. This is probably to be expected given that countries can take anti-dumping actions where there is material injury to domestic industry. This link is confirmed by empirical research on the issue, although most of the studies so far have been concentrated on a small group of developed and developing countries. The contribution of this research is to examine this link between macroeconomic fluctuations for a more heterogeneous group of developed and developing countries, controlling for intercountry differences and the dates when anti-dumping legislation went into effect.

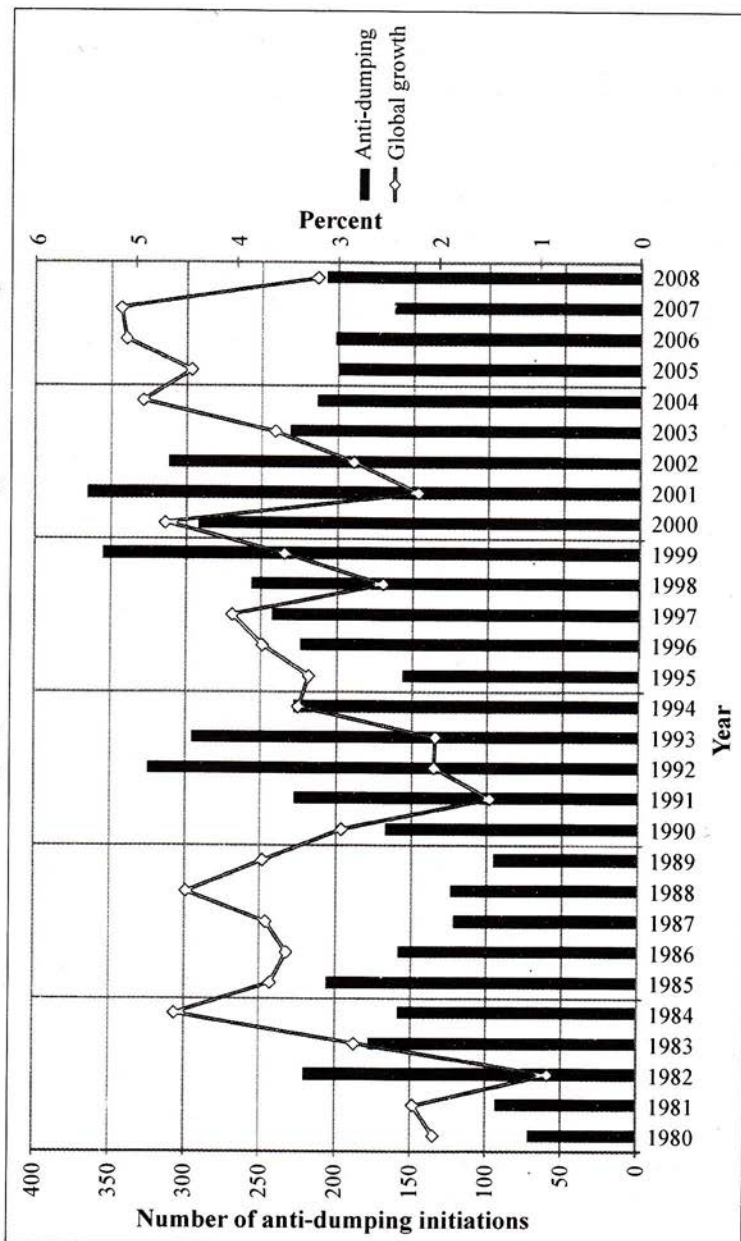
The question why firms dump is an old problem in international trade. Viner [1923] noted that the practice was prevalent among European, Canadian, and Japanese firms in 1890. Viner has also provided us with the classic economic analysis of dumping—as price discrimination between national markets. As old as dumping is anti-dumping action. The first anti-dumping legislation was adopted by Canada in 1904 [Ciuriak 2005]. By the early 1920s, Australia, Canada, New Zealand, the United States, and a number of European countries had anti-dumping laws in place [CBO 1994]. Beginning in the 1980s a number of developing countries began to adopt anti-dumping and other trade remedy legislation. Internationally, anti-dumping provisions were incorporated into the General Agreement on Tariffs and Trade (GATT) following the Second World War, expanded in detail in the form of an anti-dumping code during the Tokyo Round of multilateral negotiations, and strengthened into its current form as the Anti-dumping Agreement under the WTO.

In brief, the agreement allows a WTO member to take an anti-dumping action against imports if an investigation, conducted by its authorities, determines that foreign goods are being dumped, i.e., sold below the price at which it sells in the exporter's home market, and that the dumping is causing material injury to domestic industry. The anti-dumping action can take the form of a duty, which must not exceed the dumping margin, or it can take the form of a price undertaking, where the exporter agrees to set its price above the dumped level. However, it is not necessary for an anti-dumping investigation to end in a determination to apply a duty to have a trade effect. Staiger and Wolak [1994] have shown that the filing of a request for an anti-dumping investigation can reduce imports. Thus, the threat—sometimes even the mere possibility—of duties can also restrict trade.

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<sup>1</sup>See WTO [2009].

Figure 1. Anti-dumping initiations and the global business cycle



## 2. Anti-dumping and business cycles

A number of papers have examined how the frequency of trade contingent measures is linked to reductions in aggregate demand and changes in the real exchange rate. A decrease in the level of domestic economic activity makes it more likely for domestic industry to suffer reductions in sales, profits, and employment, all of which make it easier to prove injury. But real exchange rate changes have opposing impacts on the dumping margin and injury. When the domestic currency undergoes a real appreciation, the general response of a foreign exporter servicing the domestic market is to lower the domestic currency price of its exports. This price response implies that the foreign exporter has increased the foreign currency price of shipments to the domestic market relative to its home market by less than the appreciation of the domestic currency, i.e., there is no full pass-through of exchange-rate changes, thereby reducing the likelihood of a dumping finding. But the domestic-currency appreciation reduces the competitiveness of domestic industry against imports and makes an injury finding more likely. A real exchange rate depreciation will have the opposite effect, making it easier to show dumping but increasing domestic industry's competitiveness against imports and making injury less likely.

Leidy [1997] suggests that pressures for US firms to seek anti-dumping protection increase during macroeconomic downturns and recede with higher levels of resource utilization. His estimates indicate that a one percentage-point increase in the US unemployment rate results in an expected 54 additional anti-dumping petitions in the first year. Feinberg [1989] found evidence that a real exchange rate depreciation of the dollar against the yen leads to an increase in anti-dumping filings by US firms against Japanese imports. A later study by Knetter and Prusa [2003] extended the analysis to include the other "traditional users" of anti-dumping: Australia, Canada, and the European Union. They found that the number of anti-dumping filings was negatively and significantly related to the petitioning country's real GDP growth. With respect to real exchange rate changes, and in contrast to Feinberg [1989], they found that real exchange rate appreciation was associated with more anti-dumping initiations, with a one-standard deviation real appreciation of the domestic currency increasing anti-dumping filings by a third. Thus, their results suggest that in the case of real exchange rate changes, the effect on injury tends to dominate the effect on the dumping margin.

Given the growing importance of developing countries in anti-dumping filings, studies have begun to explore the role of macroeconomic conditions in explaining their anti-dumping initiations. Niels and Francois [2006] studied Mexico's experience with anti-dumping protection between 1987 and 2000 and found that the number of anti-dumping complaints in Mexico increased when its real exchange rate appreciated or its current account deficit widened, and when manufacturing output slowed down. The paper by Hallworth and Piracha [2006] looked at four developing countries that have become major users of anti-dumping: Argentina, Brazil, India, and South Africa. The results they obtained for the exchange rate and GDP are similar to previous studies though more pronounced. They also found a positive effect of foreign GDP growth on the number of anti-dumping investigations in the domestic (importing) country, which they judged to be counterintuitive. Finally, Aggarwal [2004] examined the anti-dumping history of 99 countries over the period 1980-2000. He concluded that while domestic macroeconomic factors (measured by the lag in the growth rate in industrial value added) are important for developed countries, they do not matter much for developing countries. Rather, he concluded that anti-dumping in developing countries appear to be a response to rising trade pressures and to tariff rate reductions. Developing countries in the process of lowering their tariff barriers tend to be active users of anti-dumping. However, Aggarwal's study suffers from not including the real exchange rate in the set of explanatory variables and not distinguishing which countries have adopted anti-dumping legislation and which have not.

The contribution of this paper in the literature is to systematically expand the number of countries for study while controlling for the increased heterogeneity of the sample. The criterion used to decide which countries are included in the data set is whether these countries have put in place anti-dumping laws and/or whether they have notified the GATT/WTO about anti-dumping actions. We also try to ascertain when the laws were adopted, since a count of zero anti-dumping initiations only makes sense if an investigation had been possible but did not actually materialize because economic circumstances were such that domestic industry had no incentive to lodge a petition and/or authorities saw no evidence to warrant an investigation. If the country did not have anti-dumping legislation in place, it would not have been possible to initiate an investigation in the first place. We do not look into the timing of the adoption of anti-dumping laws, although Vandebussche and Zanardi [2008] and Kucik and Reinhardt [2008] have examined this question and have argued that retaliation is an important motivation. They suggest that the cumulated number of anti-dumping actions that a country has received in the past strongly affects the probability of its adopting anti-dumping law.

### 3. Estimation approach and data

The econometric model used in the analysis is the negative binomial regression. The negative binomial distribution involves a random variable that takes on non-negative integer values. It generalizes the Poisson distribution by allowing for the variance of the distribution to differ from the mean. This feature is represented by a "dispersion parameter", which can be estimated simultaneously with the other parameters of interest.

The appropriateness of using the negative binomial distribution to model anti-dumping actions is twofold. First, anti-dumping investigations are count variables, taking on non-negative integer values. Second, as can be seen from Table 1, the variance of anti-dumping actions is a very large multiple of the mean, i.e., there is overdispersion of the count. The overall average of anti-dumping initiations over the 1979-2008 period was 4.2 with a variance of 123.3.

The likelihood function of the negative binomial is given by<sup>2</sup>

$$\begin{aligned}
 L(\beta; y_{it}; a, b) = & \sum_{i=1}^N \ln \Gamma(a+b) + \ln \Gamma \left( a + \sum_{t=1}^T (\exp(x_{it}\beta)) \right) + \\
 & \ln \Gamma \left( b + \sum_{t=1}^T y_{it} \right) - \ln \Gamma(a) - \ln \Gamma(b) - \\
 & \ln \Gamma \left( a+b + \sum_{t=1}^T (\exp(x_{it}\beta)) + \sum_{t=1}^T y_{it} \right) + \\
 & \sum_{t=1}^T \left( \ln \Gamma((\exp(x_{it}\beta)) + y_{it}) - \ln \Gamma(1 + y_{it}) - \right. \\
 & \left. \ln \Gamma(\exp(x_{it}\beta)) \right)
 \end{aligned} \tag{1}$$

where  $y_{it}$  is the number of anti-dumping investigations conducted by country  $i$  in year  $t$ ;  $x_{it}$  are the explanatory variables, i.e., GDP, real exchange rate, etc.;  $\beta$  are the parameters (assumed to be the same across countries) that are to be estimated; and  $\Gamma(\dots)$  is the gamma function.<sup>3</sup> The dispersion parameter is assumed to be the same for all observations relating to a given country but varies randomly from country to country. The inverse of the dispersion parameter is assumed to have a beta distribution.<sup>4</sup>

<sup>2</sup>This is the "random effects" form of the negative binomial regression. See Hilbe [2007:212].

<sup>3</sup>The gamma function is defined as  $\Gamma(t) = \int_0^{\infty} x^{t-1} e^{-x} dx$  for  $t > 0$ .

<sup>4</sup>The family of beta distributions applies to continuous random variables taking on values in the interval (0, 1). The uniform distribution over the interval (0, 1) is a special case of the

**Table 1. Mean and variance of anti-dumping initiations (1979-2008), by country**

<i>Country</i>	<i>Mean</i>	<i>Variance</i>	<i>Country</i>	<i>Mean</i>	<i>Variance</i>
Albania	0.0	0.0	Jordan	0.2	0.2
Antigua and Barbuda	0.0	0.0	Korea, Rep. of	4.4	24.9
Argentina	10.0	133.1	Kyrgyz Republic	0.0	0.0
Armenia	0.0	0.0	Latvia	1.8	8.3
Australia	29.2	632.3	Liechtenstein	0.0	0.0
Austria	0.7	2.4	Lithuania	1.2	5.8
Bahrain	0.0	0.0	Malaysia	1.4	5.9
Bangladesh	0.0	0.0	Mexico	11.5	180.8
Barbados	0.0	0.0	Moldova	0.0	0.0
Bolivia	0.0	0.0	Morocco	0.0	0.0
Brazil	10.6	66.1	New Zealand	3.1	15.1
Bulgaria	0.1	0.1	Nicaragua	0.1	0.3
Cameroon	0.0	0.0	Nigeria	0.0	0.0
Canada	18.4	232.2	Norway	0.0	0.0
Chile	0.8	2.0	Pakistan	1.0	7.4
China, P. R.	12.6	121.2	Panama	0.2	0.3
Chinese Taipei	0.5	1.7	Paraguay	0.2	0.1
Colombia	3.0	6.4	Peru	3.7	13.5
Costa Rica	0.6	1.3	Philippines	1.6	4.5
Croatia	0.0	0.0	Poland	2.8	44.7
Cuba	0.0	0.0	Romania	0.0	0.0
Czech Republic	0.4	0.6	Saint Lucia	0.0	0.0
Dominica	0.0	0.0	Senegal	0.0	0.0
Dominican Republic	0.0	0.0	Singapore	0.1	0.2
Ecuador	0.1	0.1	Slovak Republic	0.0	0.0
Egypt	5.4	21.7	Slovenia	0.1	0.1
El Salvador	0.0	0.0	South Africa	7.4	123.5
Estonia	0.0	0.0	Spain	0.3	0.3
European Community	28.7	148.5	Sweden	0.9	4.2
Fiji	0.0	0.0	Switzerland	0.0	0.0
Finland	1.0	2.9	Thailand	2.3	23.6
Grenada	0.0	0.0	Trinidad and Tobago	0.7	1.5

beta distribution with parameters  $a = b = 1$ . There is a relationship between the gamma and beta distributions: if  $X$  and  $Y$  are independently distributed as gamma with parameters  $(a, \theta)$  and  $(b, \theta)$  respectively, then the random variable  $X/(X + Y)$  has a beta distribution with parameters  $a$  and  $b$ . For this see Weisstein [2009].

**Table 1. Mean and variance of anti-dumping initiations (1979-2008), by country (continued)**

<i>Country</i>	<i>Mean</i>	<i>Variance</i>	<i>Country</i>	<i>Mean</i>	<i>Variance</i>
Guatemala	0.1	0.1	Tunisia	0.0	0.0
Honduras	0.0	0.0	Turkey	8.3	67.5
Hungary	0.0	0.0	Uganda	0.0	0.0
Iceland	0.0	0.0	Ukraine	1.0	5.4
India	24.1	688.9	United States	35.7	410.7
Indonesia	5.2	13.7	Uruguay	0.5	1.3
Israel	1.9	5.3	Venezuela, Bol. Rep.	2.0	8.9
Jamaica	0.1	0.1	Vietnam	0.0	0.0
Japan	0.3	0.9			
Overall mean	4.2		Overall variance	123.3	

The mean of the number of anti-dumping investigations  $y_{it}$  conditional on the exogenous variables  $x_{it}$  is given by

$$E(y_{it}|x_{it}) = \exp(x_{it}B) \quad (2)$$

In our benchmark negative binomial regression, the number of anti-dumping actions is a function of GDP growth and the real exchange rate. It is hypothesized that the number of anti-dumping actions increases with a decline in the importing country's GDP. The impact of real exchange rate changes on the frequency of anti-dumping actions is less clear. To be successful, a dumping petition must prove that dumping is taking place and that it is causing injury to domestic industry. But as noted by Knetter and Prusa, a real appreciation of the importing country's currency has two opposing effects. If foreign exporters do not fully pass through the exchange-rate appreciation to the price of their export good, then the domestic currency price of the imported good rises relative to domestically produced goods, which weakens the claim that dumping is taking place. However, a real appreciation also makes domestic industry less competitive against foreign producers, which makes domestic industry more vulnerable to injury. Thus, whether a real exchange rate appreciation leads to more anti-dumping investigations depends on whether the latter effect outweighs the first effect. We also consider the role of changes in global GDP in the regressions with the hypothesis that a decrease in global GDP would lead to more anti-dumping filings in the domestic or importing country. The reason for this is that faced with a decline in foreign macroeconomic activity, foreign



suppliers will more readily reduce the prices of their exports, not only making a dumping finding more likely in the importing country should an investigation be initiated, but also contributing injury to the domestic industry.

Aggarwal claims to find a positive relationship between trade reform and anti-dumping actions, concluding from this that countries undergoing trade reform are more likely to file anti-dumping cases. However, both theoretical and empirical considerations suggest that there is endogeneity between anti-dumping actions and trade liberalization. The introduction of anti-dumping laws can facilitate deeper commitments by countries to trade liberalization, since domestic industry is provided a safety valve to increase the level of protection if liberalization leads to injurious imports. The introduction of anti-dumping in a trade agreement may be thought of as anticipating the difficulty in adjusting to import protection and the political pressure for protectionism that it gives rise to, and providing a means to deflate this pressure with a temporary reversal of liberalization [Jackson 1997]. Evidence from case studies involving Latin American countries shows that trade contingent measures, including anti-dumping, assisted them in their process of trade reform [Finger and Nogués 2006].<sup>5</sup> Beyond case studies, some recent econometric papers demonstrate that the adoption of anti-dumping law and the use of anti-dumping measures are associated with further liberalization. Feinberg and Reynolds [2007] examined the pattern of anti-dumping activity and reductions of bound tariffs under the Uruguay Round. They find that for the developing countries in their sample, tariff reductions agreed to under the Uruguay Round not only increased the likelihood of a country using anti-dumping protection, but also the total number of anti-dumping petitions. They interpret this increased frequency in anti-dumping actions as a quid pro quo for the trade liberalization commitments made by developing country members of the WTO. Kucik and Reinhardt [2008] find empirical support for the hypothesis that the opportunity provided by the anti-dumping provision in the GATT/WTO to impose higher duties without having to face retaliation from trade partners encourages GATT/WTO members to engage in deeper commitments and to sustain them over time. These theoretical arguments and empirical results suggest that there is a degree of jointness or simultaneity in the decision to undertake trade reform and to use anti-dumping. This implies that including some contemporaneous measure of tariff reduction or trade openness in the right-hand side of equation (2) is not warranted and will introduce correlation between the error term and the explanatory variables.

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<sup>5</sup>The case studies involved Argentina, Brazil, Colombia, Chile, Costa Rica, Mexico, and Peru.

Some 81 countries are included in the data set. As explained in the previous section, these are countries that we are certain have adopted anti-dumping legislation. Information about the year in which these countries adopted anti-dumping law is taken from Zanardi [2004] and from notifications to the WTO. Data on the number of anti-dumping initiations are taken from the WTO Secretariat while statistics on real GDP and the real exchange rate come from the International Monetary Fund's (IMF) International Financial Statistics and its World Economic Outlook database. Data on the ratio of merchandise imports to GDP are from the World Bank's World Development Indicators while data on average most favored nation (MFN) tariff rates are taken from the United Nations Conference on Trade and Development's (UNCTAD) Trade Analysis and Information System (TRAINS) database.

#### **4. Estimation results and interpretation**

We report the results of the negative binomial regression in Table 2. The results are shown as incidence rate ratios (IRRs). The incidence rate ratio is an estimate of the factor by which the "rate" of anti-dumping actions will change if there is a one-unit increase in one of the explanatory variables while holding constant all the other variables in the negative binomial regression model. An IRR of less than one implies a negative relationship between the explanatory and dependent variable; an IRR of greater than one implies a positive relationship between the explanatory and dependent variable.

GDP growth is defined as the one-period difference in the natural logarithm of GDP. As can be seen from column (A) of Table 2, domestic GDP growth has a negative effect on the number of anti-dumping initiations. All other things being held constant, a one-percentage point reduction in domestic GDP increases the number of anti-dumping initiations by 4.3 percent.

The real exchange rate series is constructed so that an increase in the index represents a real appreciation. For the purpose of the estimation, we have transformed the data by taking its natural logarithm.<sup>6</sup> The estimate in column (A) of Table 2 indicates that an appreciation (depreciation) of the lagged real exchange rate leads to a significant decrease (increase) in anti-dumping. On average, a one-unit increase of the exchange rate lagged one period reduces anti-dumping initiations by 74 percent. The negative effect of the real exchange rate on the frequency of anti-dumping initiations means that the increased material injury is outweighed by the greater difficulty of proving dumping in the first place. This result is similar to that obtained by Feinberg [1989] but opposite to the result obtained by Knetter and Prusa [2003] and Hallworth and Piracha [2006].

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<sup>6</sup>Knetter and Prusa [2003] also use the lagged value of the natural logarithm of the real exchange rate.

**Table 2. Main results of panel negative binomial regressions**  
(Coefficients are incidence rate ratios)

<i>Explanatory variables</i>	(A)	(B)	(C)	(D)
GDP growth	0.957 **	0.957**	0.954 **	1.034
Lagged real exchange rate	0.257 ***	0.248 ***	0.264 ***	0.832
World GDP growth	-	1.01775	-	-
Share of trade in GDP	-	-	0.588 *	-
Average MFN tariff	-	-	-	0.938 **
Number of observations	818	807	777	285
Number of countries	46	46	46	40
Average number of observations/country	17.8	17.5	16.9	7.1

\*Significant at the 10 percent level.

\*\*Significant at the 5 percent level.

\*\*\*Significant at the 1 percent level.

Note 1: All the regressions use random effects.

Note 2: The magnitude of the incidence rate ratio implies the direction of change of the dependent variable with respect to a change in the explanatory variable. An incidence rate ratio greater (less) than one means that a unit change in the explanatory variable, holding all other variables constant, leads to an increase (a decrease) in the dependent variable.

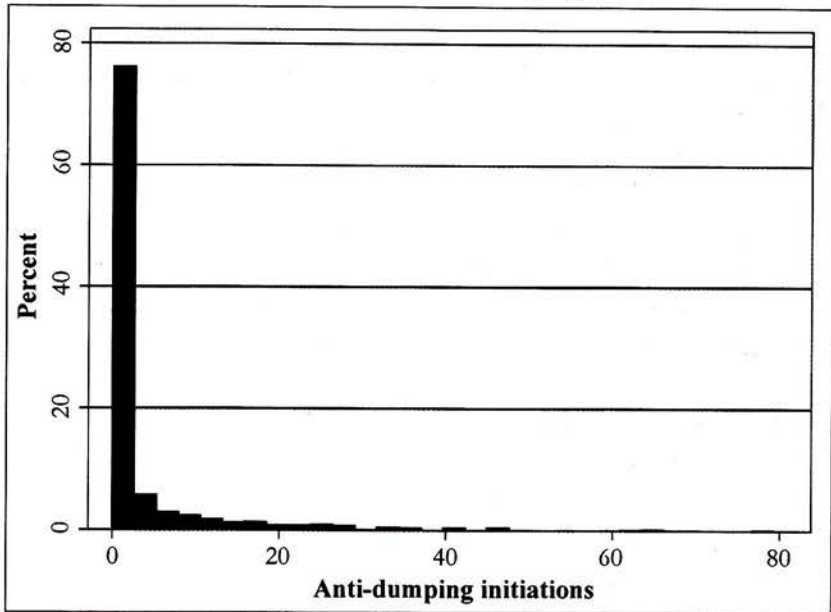
Note 3: GDP growth is defined as the one-period difference in the natural logarithm of GDP. The real exchange rate series is transformed by taking its natural logarithm.

It turns out that global GDP growth is not a statistically significant explanatory variable, if both the real exchange rate and domestic GDP growth have already been taken into account (see column [B] of Table 2).

We have argued that the endogeneity of trade liberalization and anti-dumping makes it inappropriate to include contemporaneous measures of trade opening in the right-hand side of equation (2). To underscore this point and to illustrate some of the problems that can arise, we have disregarded our own arguments and included trade liberalization as an additional explanatory variable. We have used two different indicators of trade liberalization. The first is the share of trade in GDP; the second is the level of applied MFN tariffs. Including the share of trade in the regressions, we find that all three variables—country's GDP growth, real exchange rate, and the trade share of GDP—are statistically significant (see column [C] of Table 2). However, the sign on the trade share variable is opposite to that hypothesized. The more open a country is, the fewer are the number of anti-dumping filings. A one-percentage rise in the share of trade to GDP reduces anti-dumping filings by 41 percent. Using the second indicator of trade liberalization—average MFN tariff rates—yields arguably worst results. Both real GDP growth and the real exchange rate become insignificant, although now the sign on average tariff rates is in the right direction (see column [D] of Table 2). The higher the average MFN tariff rate, the fewer is the number of anti-dumping filings. Thus, we arrive at contradictory results if we attempt to include some contemporaneous measure of trade openness in the right-hand side of equation (2). Using one indicator of openness (share of trade in GDP) suggests that liberalization leads to less anti-dumping actions. But using another measure of openness (average MFN tariff rate) suggests the opposite conclusion that more openness leads to more anti-dumping actions.

One caveat to our results must be mentioned. Even though we have been careful to include in the sample only those countries that have anti-dumping laws, there are still a large number of countries with zero counts of anti-dumping actions. The zeroes constitute nearly 69 percent of the observations (see Figure 1). We believe that this is an important structural feature of data sets that cover many countries beyond the so-called traditional and new users (developing countries like China, India, Argentina, Brazil, Mexico, Turkey, etc., which are now frequent users of anti-dumping). There are numerical methods to handle so-called zero-inflated Poisson and negative binomial models, but unfortunately they have not yet been developed for longitudinal or panel data. It would therefore be interesting to revisit some of our results when these more powerful methods become available.

**Figure 1. Histogram of anti-dumping initiations**



## 5. Conclusion

The results of this study strongly support the business cycle explanation for anti-dumping action and extend it to a larger group of countries than had been studied earlier. Both reductions in domestic economic growth and movements in the real exchange rate have a significant impact on the number of anti-dumping actions. A one percent reduction in domestic GDP increases the number of anti-dumping initiations by 4.3 percent. On average, a one unit increase of the exchange rate lagged one period reduces anti-dumping initiations by 74 percent. While some studies have suggested that the business cycle explanation of anti-dumping is not relevant for developing countries and far more important is whether they are going through a process of trade reform, there are strong theoretical and empirical arguments against this. Trade liberalization and the use of anti-dumping are likely to be simultaneously decided on by countries. The depth of trade liberalization commitments will hinge on how much flexibility countries can have to use trade-contingent instruments such as anti-dumping, safeguards, and countervailing measures. This conclusion is confirmed by the contradictory findings when we include several contemporaneous indicators of trade openness in the regression equations involving anti-dumping.

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