The Anti-Dumping Instrument: Time for Reform? - Empirical Evidence for the EU

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The EU Anti-Dumping Instrument aims to prevent non-EU firms from exporting into the EU at a price lower than "normal". However, there is little understanding of its effects on the prices of EU imports. An innovative theoretical model, which includes uncertainty in the imposition of duties and a measure of recidivism is introduced, as well as its empirical interpretation. As expected, the results of the extent of price increases being related to the level of the duty, length of the investigation, higher average price in the sector and ad-valorem duties are all corroborated. Nonetheless, it is shown that when dumping is found to cause no injury, the prices actually increase. Also, both higher dumping margins and recidivism lead to price decreases. In particular, the evolution of the export prices in China and India seems to be independent of the duty level, length of the investigation and recidivism. These findings suggest that reasons other than dumping might be at the origin of the imposition of duties. These are explored in the paper.

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1. Introduction

The Anti-Dumping ("*AD*") instrument, was created in 1995, in the context of the GATT as a tool to ensure that international trade is fair and in the optimal long-run path to achieve free trade. However, there have been substantial changes in the economic environment over the past 17 years. The globalization effect led to increasing production of European firms outside Europe and outsourcing which makes it imperative to reflect on the instrument and its potential reform. The economic justification for the existence of the instrument is often questioned (see Aggarwal, 2002) and it is argued that it no longer serves its initial purposes. Bekker (2006) concludes that Anti-Dumping duties ("*ADDs*") are used to restrain the most aggressive sources of import competition and can therefore be imposed on imports that are being fairly traded. This issue of reciprocal dumping is also explored by Melitz and Ottaviano (2008). The main argument is the use of the AD instrument as a protectionist tool of national industries, against foreign competition and not predatory dumping, and as a retaliation mechanism used by the new AD users from developing countries against the traditional users, giving rise to unfair trade. This is also discussed by Feinberg and Reynolds (2006) and Bloningen and Bown (2003). Nonetheless, Hartigan and Vandenbussche (2010) suggest that the proliferation of AD laws is not driven by retaliatory motives but it is due to a cooperative act amongst WTO members, which use AD as a risk-sharing vehicle in response to adverse shocks incurred by domestic producers.

There is a voluminous theoretical literature on the topic of AD. The trade-off between gains and losses caused by the duties is extensively discussed. Krugman's model of 1984 suggests that import protection can promote exports, by increasing the size of the domestic market and therefore, of the domestic sales, since the average cost is then lower. This would lead to more and cheaper sales in the foreign market. This result is supported by Leidy and Hoekman (1990) who find that the optimal short-run response to a price-based AD law is to

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increase production and to "dump" it on the home market, as long as the firm has some domestic market power. Contrariwise, Bernhofen (1995) finds that if production is reduced there is a loss, but gains still exist due to the lower output level being produced more efficiently and Gormsen (2011) finds that a loss occurs in the country without ADD due to the lower number of entrants.

Besides the extensive literature on the negative effects of AD actions, the case on leather shoes against imports from China and Vietnam led the European Commissioner Peter Mandelson to launch a public consultation on the instruments in 2006. This case raised issues on the weighting of consumers interests when imposing duties and how to proceed when outsourcing is involved. After the final measures were in place, it was shown that the duties were in fact hurting the EU producers who outsourced their production, as they were also paying the duty. The release of the consultation paper, *The Green Paper*, in December of 2006 generated so many conflicts of interests among producers, trading companies, consumer groups, trade unions and political power that the revision was suspended. Yet, the debate on the AD effects prevails and in December 2010, the European Commission announced that changes to the AD instrument would be launched with the *Annual Report on Trade and Investment Barriers*, in 2011, but no changes were included in the report. Despite the growing importance of the AD instrument to international trade, there is little understanding of its effects at the micro level. It is therefore essential to properly evaluate the costs and benefits of this instrument and present evidence of its true impact, that is why the goal of this paper is to shed further light on the use of the AD instrument in the European Union, with respect to its effect on border prices.

Although there are some exceptions (see Pierce, 2011), it is commonly agreed, in the current literature, that the imposition of ADDs leads to lower export sales, with the most common arguments being: (1) targeted exporters can't lower their export price, so their product is less appealing (Egger and Nelson, 2007; Neils, 2003, among others); (2) domestic exporters who outsource

part of their production, import the intermediate goods at a higher price, due to the duty imposed (Antras and Helpman, 2004; Grossman, Helpman and Seidl, 2005; Konings and Vandenbussche, 2009); (3) lower volume of cheap imports, since the goods in the domestic market remain at the same price as before (Prusa, 1997; Veugelers and Vandenbussche, 1999; Zanardi 2004; Konings and Vandenbussche, 2009) and (4) retaliatory reasons for the imposition of the duty, which reduce the accessibility to the foreign market, as discussed above.

Assuming that the level of exports falls, the remaining challenge is to find the effect of ADDs on prices, but this research is limited to a small number of papers. The theory shows that prices in the home market (outside the EU) decrease so that the firms can increase their export price when the dumping duty is imposed (see Dulleck, 2004; Khatibi, 2009; McCalm, 2008; Francois, 2009; Collie and Mai Le, 2010; Dinlersoz and Dogan, 2010 and Metge and Weiss, 2011). However, two authors challenge this result: Crowley (2010) finds that many firms decide to sell a lower quantity and still dump the product, therefore eliminating the duty and Gormsen (2011) similarly concludes that firms lower their price in the home market, so that the product's "normal value" is then lower and firms are able to set a low price for their exports.

Empirical research on the effects of prices is even more scarce and conflictuous. A few papers focus on markups (see Pierce, 2011; Vandenbussche and Zarnic, 2008; Konings and Vandenbussche, 2005; Gil-Pareja, 2002), finding a positive relationship between markups and the imposition of the duty. However, it is not discernible if this is due to higher prices or lower costs (which is compatible with Crowley's argument). Other papers examine the price-cost margin (see Rovegno, 2010; Konings and Vandenbussche, 2005) and also find a positive relationship with the imposition of the ADD.

Some authors empirically analyze the impact of the duty, through the use of year effects (Konings and Vandenbussche, 2009 [France] and 2008 [EU]; Prusa, 1999 [US]) or through the inclusion of a treatment group (Pierce, 2011 [US]), presenting simple and straightforward models that reveal that the duty leads to a price increase in the US, whereas in France, it decreases in the second year of

the duty and increases in the fourth; and in the fourth and fifth years for the EU, which avoids the imposition of another ADD. Other papers have a different focus, such as the impact on investment (Iacovone, 2009), where a price increase is also due to the duty; the steel sector (Prusa and Sharp, 2001) or on trade diversion (Bown and Crowley, 2004). Finally, two papers have some similarities with this work, in the sense that they also evaluate the price evolution, proxied by unit values. Niels (2003) examines the prices in Mexico, controlling for the existence or level of the ADD, real exchange rate and initiation dummies. He finds that the presence of the ADD leads to a price increase, but its level is not significant, nor it is for developing countries and for the sectors of food, textile and rubber. The same effect of the ADD on price is found by Rovegno (2011), for South Korea. The author also looks at the impact of other AD measures, which lead to lower prices, and other duties, as well as to the share of Korean exports on each country's imports.

This paper is different from the two above mentioned by empirically examining the evolution of prices in the EU, while controlling for duty level, as above, but also for the average prices in the sector, the type of duty, duration of the investigation and of the duty and measures of recidivism. A theoretical model is also included and it is the first, to my knowledge, to explicitly include uncertainty in the imposition of duties and a measure of recidivism.

As found by other authors, it is found in this paper that the price increases with the level of the duty. It is also shown that the price moves in the same direction as the average price in the sector and that it increases in cases in which investigations are longer and when ad-valorem duties, as opposed to another type of duty, are imposed. However, it is surprising that when the dumping activity is subsequently found to cause no injury, prices increase and that both higher dumping margins and the number of previous duties for a specific product lead to price decreases. The opposite results would have been expected. Furthermore, the amount of the duty, duration of the investigation and the measures of "recidivism" seem to have no impact in the price evolution of the imports from China and India into the EU. These findings suggest that retalia-

tory and political reasons might be in the origin of the imposition of duties and that a restructuring of the Anti-Dumping instrument might be in order.

The organization of the rest of the paper is as follows. In the next section the legislation and procedures of the Anti-Dumping instrument are described and section 3 introduces the theoretical model. In Section 4 the dataset and a preliminary analysis of the data are discussed. The empirical methodology is described in Section 5 before the results are discussed in Section 6. Section 7 offers concluding comments.

2. Legislation and procedures

The AD instrument allows the current 157 WTO countries to take action against dumped products, when three criteria are met: existence of dumping, injury caused to producers in the home country and benefits to the home country of the imposition of the duty. Dumping takes place when products are exported at a price lower than their normal value, often eliminating the profit margin. The export price evaluated is the export sales price or a constructed one, while the normal value is defined as the price for a like-good in the home market or in an analogous country or, if none of these is possible, a constructed value. Dumping practices are usually considered a cause of injury to the industry in the home country but a proof of material injury is mandatory to initiate an investigation. This is costly, not only monetarily, but it also affects the relationship with the target country with regards to other products and industries, so it is imperative to ensure that the costs are not disproportionate to the benefits to both producers and consumers, which is made through the use of the Community interest test.

The WTO AD Agreement, stating the three referred criteria, is reflected in the European Community (EC) Council Regulation (CR) 384/96, named *Basic Anti-Dumping Regulation* and last amended in 2005.[2]

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[2]Amendments to this EC CR were made to refine the adjustments between domestic and export prices (1996 and 2002) and to revise the list of market economies so as to include

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If an EC industry believes that imported products are being dumped and causing material injury, it may submit evidence to the European Commission requesting an investigation. Within 45 days, the Commission (DG-Trade) decides whether or not to initiate an investigation, depending on whether or not there is sufficient evidence and the complaint represents at least 25% of the total EC production on the concerned product. Up to nine months after the initiation, the Commission may impose provisional duties, for a period of six to nine months, during which the exporters may offer a Price Undertaking, i.e. a minimum selling price. The definitive measures, if imposed, are decided by the Council of Ministers and applicable for five years, unless they are earlier revoked. Reviews may be asked in the European Court of First Instance and should be concluded within twelve months.

3. Theoretical Framework

Suppose *firm i* sells a product at home (h) and in a foreign country (f), where there are also N other producing firms. The firms in each country compete in terms of price and the degree of substitutability between the product of *firm i* and those produced in the foreign country is given by γ. The values of γ range from 0 for independent goods to 1 for homogeneous goods.

The inverse demand function of *firm i* in the foreign market is given by $p_i^f(Q) = a - b(q_i^f + \gamma \sum_{j=1}^{N} q_j^f)$, where Q is a vector $[(N+1)\times 1]$ whose elements represent the output of the (N+1) firms.

The export decision of *firm i* is given by its profit maximization, which takes into account the presence of AD regulations:

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\begin{aligned}
max_{p^f,p^h} \prod_i &= \prod_i^h &+ \prod_i^f \\
&= (p^h - c)q_i^h &+(p^f + \rho t - c)q_i^f
\end{aligned}
$$

where p and q are the price and quantity sold in each market, t is the anti-dumping duty, ρ is the probability that the duty is imposed and c is the constant marginal cost.

Given that the variable of interest is the price in the foreign market, and not quantity, the direct demand function has to be found, which is done through the use of matrices. The following function is found[3]:

$$q_i^f = \frac{a(1-\gamma)-(1+N\gamma-\gamma)p_i^f+\gamma\sum_j p_j^f}{b(1+\gamma-N\gamma-N\gamma^2)}$$

In addition, the probability of the duty being imposed is modeled. The intuition is that if other duties were previously imposed in the same specific product, country and /or sector, the DG-Trade may keep their prices under close surveillance. Also, the higher is the difference between the export price and the average total cost (which in this case equals the constant marginal cost), the higher is the likelihood of an ADD being imposed. Therefore, ρ assumes the following form:

$$\rho = \rho_0 + \alpha(add\_per\_sector + add\_per\_country + Cases) + \beta(c - p^f),$$
$$\rho = Y + \beta(c - p^f),$$

with $Y = \rho_0 + \alpha(add\_per\_sector + add\_per\_country + Cases)$, where add_per_sector and $add\_per\_country$ are the number of ADDs in that specific country and sector, respectively and $Cases$ is a dummy variable which takes the value of 1 if the same product, in a given country, previously received a dumping duty, and 0 otherwise.

Finally, the analysis can be reduced to the maximization of the profit in the foreign country:

$$\begin{aligned} max_{p^f} \prod_i^f &= (p^f + \rho t - c)q_i^f \\ &= (p^f + \rho t - c)\frac{a(1-\gamma)-(1+N\gamma-\gamma)p^f+\gamma\sum_j p_j^f}{b(1+\gamma-N\gamma-N\gamma^2)} \\ &= [p^f + (Y + \beta(c - p^f))t - c]\frac{a(1-\gamma)-(1+N\gamma-\gamma)p^f+\gamma\sum_j p_j^f}{b(1+\gamma-N\gamma-N\gamma^2)} \end{aligned}$$

The first order condition of the profit maximization is:

$$\frac{\partial \prod_i^f}{\partial p_i^f} = 0 \Leftrightarrow$$

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[3]The mathematical demonstration is shown in Appendix A.

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$$\frac{1-\beta t}{b}\frac{a(1-\gamma)-2p^f(1+N\gamma-\gamma)+\gamma\sum_j p_j}{1+\gamma-N\gamma-N\gamma^2}-\frac{t(Y+\beta c)-c}{b}\frac{1+N\gamma+\gamma}{1+\gamma-N\gamma-N\gamma^2}=0\Leftrightarrow$$

$$p^f=\frac{a+\gamma(\sum_j p_j-a)}{2+2\gamma(N-1)}-\frac{t(Y+\beta c)-c}{2-2\beta t}\Leftrightarrow$$

$$t=\frac{(X-p^f)2+c}{(X-p^f)2\beta+Y+\beta}, \text{ where } X=\frac{a+\gamma(\sum_j p_j-a)}{2+2\gamma(N-1)}$$

The following comparative statics are shown for the optimal level of pricing

in the foreign market:

$$\frac{\partial p^f}{\partial t}=\frac{(2\beta(X-p^f)+Y+\beta)^2}{2(A+\beta+\beta c)}, >0$$

$$\frac{\partial p^f}{\partial c}=\frac{1-\beta t}{2(1-\beta t)}=\frac{1}{2}, >0$$

$$\frac{\partial p^f}{\partial Y}=-\frac{t}{2(1-\beta t)}, >0 \; iff: \; \beta t>1$$

$$\frac{\partial p^f}{\partial N}=-2\gamma\frac{a+\gamma\sum_j p_j-\gamma a}{[2+2\gamma(N-1)]^2}, >0 \; iff: \; a\frac{1-\gamma}{\gamma}<\sum_j p_j$$

$$\begin{aligned}\frac{\partial t}{\partial(c-p^f)} &= [\frac{\partial c}{\partial t} & -\frac{\partial p^f}{\partial t} &]^{-1}\\ &= [(\frac{\partial t}{\partial c})^{-1} & -(\frac{\partial t}{\partial p^f})^{-1} &]^{-1}\\ &= [(\underbrace{\frac{1}{(X-p^f)2\beta+Y+\beta}}_{<0 \; iff: \; p^f>X+\frac{1}{2}+\frac{Y}{2\beta}})^{-1} & -(\underbrace{\frac{2(Y+\beta+\beta c)}{(2\beta(X-p^f)+Y+\beta)^2}}_{>0})^{-1} &]^{-1}\\ &= \frac{2(Y+\beta+\beta c)}{2(Y+\beta+\beta c)[(X-p^f)2\beta+Y+\beta]-[(2\beta(X-p^f)+Y+\beta)^2]}\\ &> 0 \; iff: \; p^f>X-c-\frac{Y+\beta}{2\beta}\end{aligned}$$

The model shows that, when the duty is taken into account by the exporting

firm, whose goal is to maximize its own profits, then prices should increase with

the amount of the duty, since firms are likely to pass, at least part of the burden

of the duty to the consumers in the foreign country, and the duty should be

higher for higher dumping margins (p^f-c), as shown above, so as to disincentive

firms to dump.

Finally, the relationships between price and recidivism (Y) and number of

firms in the foreign country (N), depend on the values of the several parameters.

If some sort of "recidivism" occurs, the expectation is that duties should be

higher to deter future dumping activities regarding the same product, and so

the price increase should, in principle, be higher. This is true in the model iff

$\beta t>1$. If the competition in the foreign country is less intense, i.e. low number

of producers, the price tends to be higher, so the price increase wouldn't have

to be as high. This condition holds provided that: $a\frac{1-\gamma}{\gamma} < \sum_j p_j$.

In the foreign country, the imposition of the ADD (t) can be shown as a loss for the consumers. By reducing the level of imports, the export price is increased by the amount of the ADD, such that the producer surplus, in the foreign country, increases by the amount A and the Government receives the tariff revenue (D), as shown in *Figure 1*. Triangles B and C represent the net loss for consumers, which results from a higher price.

[Figure 1 here]

4. Data

4.1. Data collection

A newly available and exhaustive database compiled by Chad Bown is explored. It contains firm-level data on all the successful AD cases in WTO member countries. However, the dataset contains no information on trade volumes or value of exports. This information was then self-collected, using Eurostat data, so as to calculate unit values for imports. Data regarding the number of AD initiations and measures, and main targets and sectors involved in the AD cases was obtained from the WTO AD database.

Chad Bown's data and Eurostat unit values were matched through 8-digit HS codes[4] and cases with missing data on the products' codes or with less than six years of price information were excluded. The final sample in the analysis includes 630 cases with final duties imposed in the period of 1998 to 2007, in a total of 8271 observations, which correspond to 2797 different products, 40 countries and 8 sectors.

One concern with the data is the use of unit values as a proxy for price, but this seems to be the best approach since there is no available information on real prices of the imports per exporting country and per product. Another concern is the representativeness of the chosen sample, due to the excluded cases.

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[4]The Harmonized System (HS) is a commodity classification system which groups articles according to the nature of the materials of which they are made.

However, the sample size is large and the results are only interpreted for the cases in the analysis.

4.2. Data description

Since 1980, there has been a rapid spread of the use of the AD instrument. The focus of this paper is on the duties imposed by the EU, which as shown in *Figure 2*, have slightly decreased since 2000, but continue to be quite high, around 20 initiations per year, while the number of measures imposed is around 10 in each year, since 2004.

[Figure 2 here]

The industries of metals and footwear (see *Figure 3*) have been, since 1998, the most involved in dumping investigations by the EU. Jointly, they account for 61% of the total of ADDs. The sectors of machinery and electrical, and of chemicals account for 13% and 10% of the total number of measures imposed, respectively. The industries of animal and vegetable products and services appear to be quite immune from dumping practices, or at least from the imposition of measures, having had no dumping measures imposed. It seems that the sectors more prone to be protected are those in which Europe is losing its comparative advantage, as imposing duties in foreign, dumped or not, products protects the national producers from foreign competition.

[Figure 3 here]

The ADDs in the sample were mainly petitioned by Germany, Italy, France and Spain, while the investigations are largely directed at exporters in emerging economies, mainly in Asia, where there is a growing source of worldwide competition, as visible in *Figure 4* and *Figure 5*. China has been, since 1995, the main target of EU AD measures, followed, at a considerable distance, by India and South Korea. It is noteworthy that while the EC seems not to file above 20 investigations a year, China appears to become more and more a favorite target of AD investigations.

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[Figure 4 here]

[Figure 5 here]

The type and range of the dumping duties imposed is also important for this work (*Table 1*). Most duties are imposed as ad-valorem duties: 68% of the preliminary and 74% of the final duties. The second most common measure is price undertaking (4% and 16% of preliminary and final duties, respectively), while measures conditional on the exporters decreasing the price under a given level (DPU) were only twice observed as provisional measures but were used as final measures in 9 cases. It is also important to note that only in 24% of the cases, the type of duties imposed is the same for preliminary and final measures.

[Table 1 here]

4.3. Preliminary analysis of the data

This section provides an example of price behavior in the presence of ADDs. The expectations are that the price increases once protection is in place. However, a detailed analysis of several countries shows that there is no significant general pattern in the evolution of unit values that could be related with the imposition of duties.

Japan was chosen as an example for no particular reason, other than having been involved in a reasonable number of cases. The four graphs in *Figure 6* depict the behavior of the unit values corresponding to the allegedly dumped goods and include a yellow dot for the year in which the final ADD was imposed.

It is visible that the price pattern is neither straightforward nor stable. While some goods' prices seem to increase, as expected, after the ADD (cases 1388, 1403 and 1366), the most common behavior (7/16 cases) is a time lag of one or two years between the imposition of the final duty and a price increase. Also, in four of the cases, the price goes straight down after the duty is imposed. This doesn't allow for any definitive conclusions, since price behavior is affected by several different factors and that is why the paper proceeds with the econometric model in the next section.

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[Figure 6 here]

5. Method

5.1. Choice of variables

Tables 2 and 3 define and describe the variables for use in the model specification. To examine the unit value (UV) of a good imported by the EU, product, case and country-level variables are employed. The unit value is obtained through the ratio between the value of imports and its volume, in each year. To account for general changes in the products' prices, the average unit value in the sector is also included ($UVsector$). The higher is the dumping margin, i.e. the difference between the "normal value" and the export price, the higher should the duty be, and because the alleged and assessed margins are often different, the value of the preliminarily assessed and final dumping margins are included (PMg and FMg). The value of the final duty imposed (FAD) is also incorporated in the model as it is different from the dumping margin.

Controls for whether the duty is or not ad-valorem, in the preliminary and final decisions ($PAVD$ and $FAVD$), are also present, as well as the duration, in years, of the investigation and of the duty ($dur(ADD)$ and $dur(inv)$).

When the final impact of the allegedly dumped product is assessed, it is sometimes concluded that the imposition of a duty will worsen the situation of producers and /or consumers. A dummy to control for these cases is included ($noinjury$). There is also a control for duties that are imposed more than once on the same product, in a given country ($cases$).

As mentioned earlier, a number of papers mention political motivations and retaliation as the main reasons for the imposition of an ADD. Therefore, the number of ADDs per country and per sector ($add\_per\_country$ and add_per_sector) and two retaliation controls, which are obtained multiplying the number of initiations (or measures) filed by the EU, by the number of initiations (or measures) against the EU, by a given country ($retaliation1$ and $retaliation2$) are included.

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Finally, macro variables are included to control for each of the 40 countries in the analysis[5].

[Table 2 here]

[Table 3 here]

5.2. Regression method

The canonical specification for quantifying the effect of dumping protection on unit values is a cross-section, identified by the dumping cases, and of the following form:

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\begin{aligned}
Log(1+UV)_{ijct} \quad = \quad & \beta_0 + \beta_1 log(1+FAD)_{ijct} + \beta_2 log(1+UVsector)_{ijct} + \beta_3 log(1+PMg)_{ijct} \\
+ \quad & \beta_4 log(1+FMg)_{ijct} + \beta_5 PAVD_{ijct} + \beta_6 FAVD_{ijct} + \beta_7 add\_per\_country_{ijct} \\
+ \quad & \beta_8 add\_per\_sector_{ijct} + \beta_9 dur(ADD)_{ijct} + \beta_{10} dur(inv)_{ijct} + \beta_{11} noinjury_{ijct} \\
+ \quad & \beta_{12} cases_{ijct} + \beta_{13} year_{ijct} + \beta_{(14+x)} MacroV_{ijctx} \\
+ \quad & \beta_{15} retaliation1_{ijct} + \beta_{16} retaliation2_{ijct} + \varepsilon_{ijct}
\end{aligned}
$$

where i, j and c are the indexes for case, sector and country, respectively, $x = 0, ..., 8$ refers to each of the nine macro variables and $t = 1995, ..., 2009$ corresponds to the time period.

The Fixed Effects (FE) estimator is a standard way of estimating the model. However, in this model the FE estimator would be inconsistent since the variable accounting for the final ADD (FAD) is likely to be endogenous. The reasoning is that duties are more prone to be imposed on products with a lower price, since low quality goods are often associated with lower price and these are the prime candidates for AD petitions. This relationship raises the issue of reverse

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[5]The macro variables included are: population, in thousands (*pop*); exchange rate to US$ (*xrat*); purchasing power parity over GDP, in national currency units per US$ (*ppp*); total PPP converted GDP, G-K method, at current prices, in millions US$ (*tcgdp*);(*cc*), openness at current prices, % (*openc*); ratio of GNP to GDP,% (*cgnp*); PPP converted GDP per capita (Laspeyres), at 2005 constant prices (*rgdpl*); and openness at 2005 constant prices, % (*openk*).

causality. To overcome this problem, the above equation is estimated with instrumental variables. Both *retaliation1* and *retaliation2* are valid instruments as they are not correlated with the price but with the duties imposed. This is also corroborated by the Hansen test. The equation below is therefore estimated by GMM.

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\begin{aligned}
Log(1+UV)_{ijct} \;=\;\; & \beta_0 + \beta_1 log(1+FAD)_{ijct} + \beta_2 log(1+UVsector)_{ijct} + \beta_3 log(1+PMg)_{ijct} \\
& + \;\; \beta_4 log(1+FMg)_{ijct} + \beta_5 PAVD_{ijct} + \beta_6 FAVD_{ijct} + \beta_7 add\_per\_country_{ijct} \\
& + \;\; \beta_8 add\_per\_sector_{ijct} + \beta_9 dur(ADD)_{ijct} + \beta_{10} dur(inv)_{ijct} + \beta_{11} noinjury_{ijct} \\
& + \;\; \beta_{12} cases_{ijct} + \beta_{13} year_{ijct} + \beta_{(14+x)} MacroV_{ijctx} \\
& + \;\; \varepsilon_{ijct}
\end{aligned}
$$

The results of the FE and IV estimations are discussed in the next section.

6. Results

Table 4 shows the expected impact of each variable and the results for the FE and IV estimations. The FE results are reported to serve as a benchmark for the GMM results, and to show that the instruments used in the GMM estimation are not significant in explaining the price evolution.

One concern with the interpretation of these results is that they may be driven by one or a few countries and /or sectors. For this reason, the sample is split, as shown in *Table 5*, based on the targeted countries (China and India vs. all other countries) and then based on the targeted sectors (sector 7, for metals vs. all other sectors). Below the specific effects, on the evolution of the unit values of the exports, of each of the variables present in the model is discussed.

6.1. Dumping duties and dumping margins

The expectation is that the higher is the dumping margin, the higher should be the duty imposed, as this is usually set to make up for the difference between

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the export price and the foreign firm's price at home. Therefore, the price should increase by a similar amount to the duty. As expected, it is found that the higher is the duty (FAD), the higher is the price increase. This result is robust across all the specifications and is also found by Rovegno (2010) for the US and Niels (2003) for Mexico. When the analysis is restricted to China and India, the duty seems to no longer have an impact on prices. This result is surprising as competition in the Chinese and Indian markets is often more intense, such that the price set by the exporting firm has to be lower, thus leading to higher duties imposed. As such, this provides some support to the extensive literature which claims that the duties imposed by the EU on its main targets (of which China and India) are often motivated by retaliation or political reasons and not by dumping.

Surprisingly, the results show that for each unitary increase in the final dumping margin assessed (FMg), there is a decrease of at least 1.40 units in the price level. Although the price does increase due to the duty, this effect is demagnified by higher dumping margins. China and India, however, seem to be a lot less affected by the dumping margin, which suggests that the margins assessed may be biased, as pointed by Bloningen (2007). If firms expect their assessed margins to be higher than the alleged ones, they are less likely to cooperate, leading to biased numbers. As Fox and Moore (2006) show, when Chinese firms don't cooperate, their assessed margins are in fact higher than the margins alleged by the domestic competitors. The preliminary margin (PMg) is also analyzed but its overall impact on prices is not statistically significant. Nonetheless, both for sector 7 (metals) and when excluding China and India, the same effect as that of the final margin is observed.

6.2. Damage extent and recidivism

After the preliminary duty is in place, the European Commission may decide not to impose a final duty if it finds that the alleged dumping causes no injury or if the imposition of the duty is worse than the alleged dumping activity. This

is included in the model by using a dummy labeled *noinjury*. It is found that, in these cases, the price actually increases further. This is odd but it may be because firms want to avoid potential ADDs or further investigations and therefore increase the export price.

When the same product, in a given country, is targeted by dumping duties more than once (*cases*), the change in price is smaller as a result of the duty imposed. The opposite effect would have been expected as it was thought that firms would want to avoid the duties by not charging very low prices. However, it is possible that firms learn from their own experience or from other producers of the same good in their country and realize that it is better not to increase as much the price and pay the duty, or if retaliatory reasons led to the petition of the duty, firms may not want to significantly increase the export price and instead retaliate with duties in the imports from the foreign country. Nevertheless, "recidivism" doesn't seem to affect China and India or sectors other than metals.

Finally, the number of duties per country (*ADD_per_country*) appears to lead to slightly lower price increases, whereas the number of duties per sector (*ADD_per_sector*) does not seem to impact the evolution of prices.

6.3. Duration of the duty and investigation

The duties are usually imposed for a period of 5 years. However, the results show that for longer periods, the price change is lower, although the magnitude of this effect is small (see *dur(ADD)*). This result is robust across all the specifications and is in line with Vandenbussche and Konings (2008 and 2009), where it is found that EU prices only increase in the fourth and fifth year of the duty, and only in the fourth year, for France; and also with Bown and Crowley (2004) who observe a price increase in the first year the duty is imposed, followed by a decrease in the second year.

The opposite impact on prices derives from the duration of the dumping investigation (*dur(inv)*). Longer investigations seem to lead to further price

increases, although this effect is not significant for China and India. An explanation might be that the longer are the investigations, the more firms perceive the probability of the imposition of a duty as higher.

6.4. Other variables:

The type of duty also influences the price evolution. When both the preliminary and final duties are ad-valorem ($PAVD$ and $FAVD$) they negatively affect the price change. This is either because the preliminary duty is set too low, or because its burden is shared with either the Government in the dumping country or the importers. Nonetheless, the opposite effect occurs for imports from China and India, where ad-valorem duties lead to further price increases. The reasoning for this may be that other types of duties are more of a warning signal (imposing a minimum price or waiving duties in the case of price undertakings) such that these firms increase their prices so as not to receive duties for further 5 years.

To control for general changes in each sector's unit values, its evolution is also analyzed, which is shown to be positive and close to 1, meaning that the unit values of a product follow the same general path as that of the sector, if there is no ADD in place, whereas the remaining impact on prices is explained by the variables above discussed.

[Table 4 here]

[Table 5 here]

7. Conclusion

Despite the growing importance of the Anti-Dumping instrument to international trade, there is little empirical research on its impact on export prices. This is of major importance for policy makers, since this instrument is the primary form of trade protection worldwide and its repercussions affect trade flows

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and political relationships. Its analysis is also important to understand how exporting firms react to a major tariff shock.

To examine this issue, a theoretical model is developed and it is the first, to my knowledge, to include uncertainty in the imposition of duties and a measure of recidivism. Its empirical interpretation is also analyzed using worldwide data on exporting firms, through a GMM estimation.

As expected, the results of the extent of price increases being related to the level of the duty, length of the investigation, higher average price in the sector and ad-valorem duties are all corroborated. However, some unexpected results are also found. It is shown that when dumping is found to cause no injury, the prices actually increase, possibly in an attempt to avoid either the imposition of a duty in a subsequent period (even if dumping doesn't occur) or further investigations. Another surprising result is that both higher dumping margins and recidivism lead to price decreases. This may entail biased dumping margins, as a result of little firm cooperation and it may imply that firms can learn (from their own experience or from other national producers of the same good) that it is better to pay the duty other than significantly increase the price. Alternatively, if political reasons led to the investigation, firms may decide to retaliate with duties in the imports from the foreign country. For China and India, in particular, the evolution of the price of their exports into the EU seems to be independent of the duty level, length of the investigation and recidivism.

The above findings suggest that reasons other than dumping might be at the origin of the imposition of duties, as a means of diminishing the loss caused by the duty in the countries that export into the EU. It is peculiar that products where dumping margins are higher have a lower price increase, so dumping margins may also have to be more accurately assessed, perhaps by providing firms with an incentive to cooperate. Furthermore, if dumping duties have previously been imposed in a given product, these cases should be handled more carefully, to avoid duties imposed with retaliatory or protectionist motives. In general, it seems that AD protection is causing more injury than benefits to producers and consumers in both importing and exporting countries. A substantial revision of

the AD instrument is thus necessary to improve trade relationships and welfare of EU producers and consumers.

8. Appendix A

Mathematical Proof for the Direct Demand Function:

The inverse demand function of *firm i* in the foreign market is given by:

$p_i^f(Q) = a - b[q_i^f + \gamma \sum_{j=1}^{N} q_j^f], \; \forall \; i\epsilon[1, N+1]$

In matrix notation, this can be expressed as:

$p = a\tau - b[I + \gamma(\tau\tau' - I)]Q$

which means that the quantity vector is:

$$
\begin{aligned}
q_i^f = \quad & [I + \gamma(\tau\tau' - I)]^{-1} & (a\tau - p)b^{-1} \\[4pt]
& [1 + (N+1)\gamma - [(N+1) - 1]\gamma^2]^{-1}A & (a\tau - p)b^{-1} \\[4pt]
& \frac{I[1+(N+1-2)\theta]-[\tau\tau'-I]\theta}{1+(N+1-2)\theta-(N+1-1)\theta^2} & (a\tau - p)b^{-1} \\[4pt]
& \frac{I[1+(N-1)\theta]-[\tau\tau'-I]\theta}{1+(N-1)\theta-N\theta^2} & (a\tau - p)b^{-1} \\[4pt]
& \frac{a(1-\gamma)-(1+N\gamma-\gamma)p_i^f+\gamma \sum_j p_j^f}{b(1+\gamma-N\gamma-N\gamma^2)}
\end{aligned}
$$

$$
\text{where } A = \begin{pmatrix}
[1 + (N+1) - 2]\gamma & -\gamma & \cdots & -\gamma \\
-\gamma & [1 + (N+1) - 2]\gamma & \cdots & -\gamma \\
\vdots & \vdots & \ddots & \vdots \\
-\gamma & -\gamma & \cdots & [1 + (N+1) - 2]\gamma
\end{pmatrix}
$$

$Q =$ vector $[(N+1)\text{x}1]$ of quantities

$p =$ vector $[(N+1)\text{x}1]$ of prices

$\tau =$ vector $[(N+1)\text{x}1]$ of ones

$I =$ identity matrix $[(N+1)\text{x}(N+1)]$
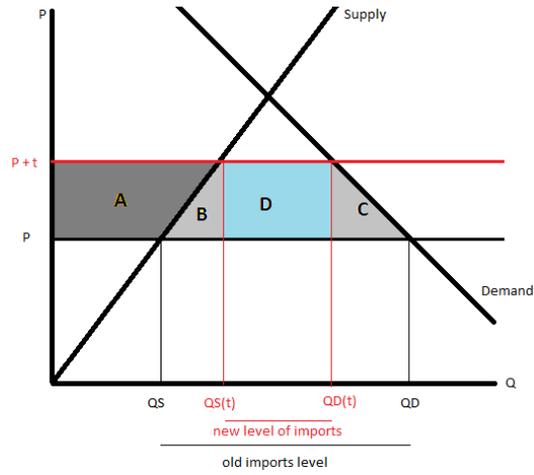
9. Appendix B

Figure 1: Effect of an ADD imposed in the export price
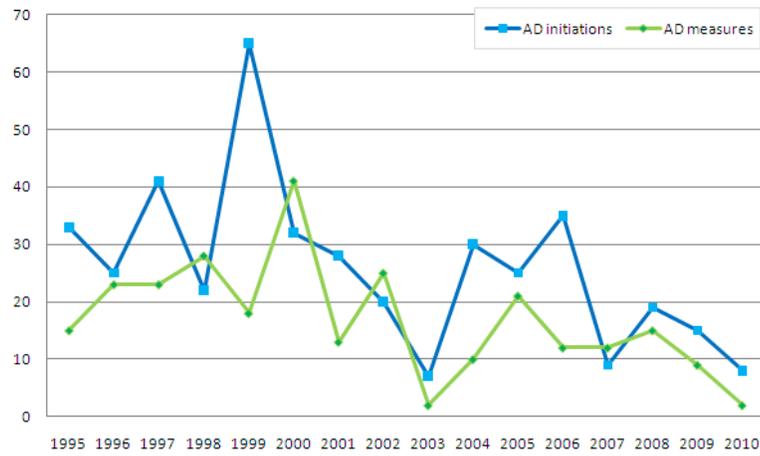
Figure 2: Anti-Dumping Initiations and Measures, 1995-30/6/2010

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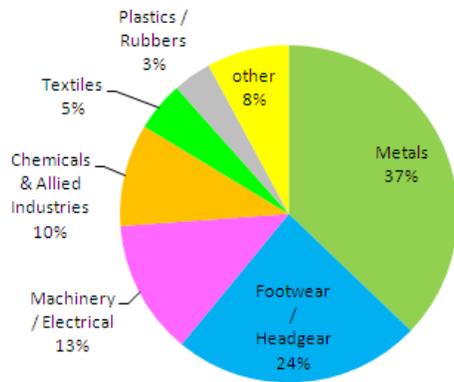
Figure 3: Main sectors with Anti-Dumping Duties, 2/1998-12/2007
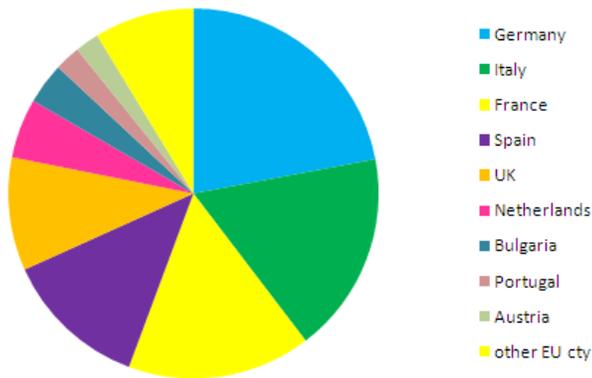
Figure 4: EU countries filing successful dumping complaints, 2/1998-12/2007
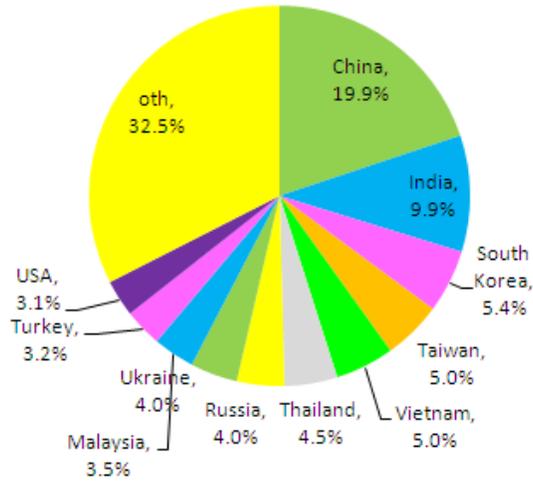
Figure 5: Main targets of EU Anti-Dumping Duties, 2/1998-12/2007

Table 1: Types of Anti-Dumping Duties imposed

Type		Preliminary	Final
AVD	(ad-valorem duty)	442 (68%)	477 (74%)
PU	(price undertaking)	25 (4%)	106 (16%)
AVD/PU		0	30 (5%)
SD	(specific duty)	5 (1%)	12 (2%)
DPU	(conditional on a min.P)	2 ($< 1\%$)	9 (1%)
m.i.		172 (27%)	12 (2%)
total		646	

Figure 6: Pattern of price change in imports from Japan into the EU, 1995-2009

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Table 2: Description of the variables

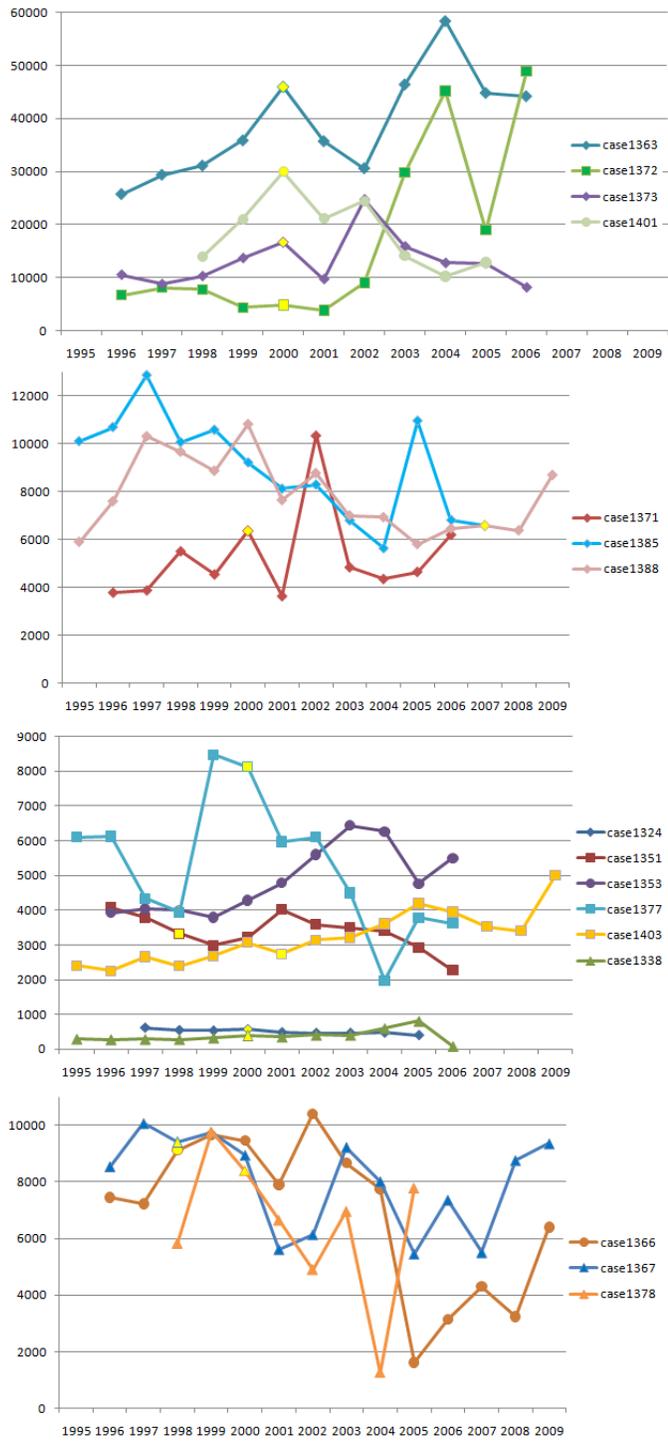| Variable:	Definition:
$log(1+UV)$	logarithm of the unit value, with UV= $log(\frac{value\ imports}{volume\ imports})$
$log(1+UVsector)$	logarithm of the average unit value in the sector
$log(1+FAD)$	logarithm of the final antidumping duty imposed
$log(1+PMg)$	logarithm of the preliminary dumping margin assessed
$log(1+FMg)$	logarithm of the final dumping margin assessed
$pavd$	dummy (=1) if the preliminary duty was ad-valorem
$favd$	dummy (=1) if the final duty was ad-valorem
$add\_per\_country$	number of ADD imposed against a given country, between 1995 and June 2010
add_per_sector	number of ADD imposed in a given sector, between 1995 and June 2010
$dur(ADD)$	duration of the antidumping duty, in years
$dur(inv)$	duration of the investigation, in years
$noinjury$	dummy (=1) if no final duty was imposed
$cases$	dummy (=1) if more than one duty was imposed in a given sector, within a country
$retaliation1$	number of initiations by EU, by the number of initiations against EU
$retaliation2$	number of duties imposed by EU, by the number of duties imposed against EU
$MacroV$	macro variables at the country level (pop, xrat, ppp, tcgdp, cc, openc, cgnp, rgdpl, openk)
$year$	year dummies

Table 3: Data description

Variable:	Observations	Min	Max:
UV	8271	11.17	1112.91
$log(1+UV)$	8271	0.67	3.05
$log(1+UVsector)$	8271	0	1.81
$log(1+FAD)$	8271	0.12	8.78
$log(1+PMg)$	8271	0.26	3.50
$log(1+FMg)$	8271	0.26	4.02
$PAVD$	8271	0	1
$FAVD$	8271	0	1
$add\_per\_country$	8271	1	203
add_per_sector	8271	13	467
$dur(ADD)$	8271	1	10
$dur(inv)$	8271	0	3
$noinjury$	8271	0	1
$cases$	8271	0	1
$retaliation1$	8271	0	1344
$retaliation2$	8271	0	612
$year$	8271	1995	2009
$Country(c)$	8271	1	40
$Sector(j)$	8271	20	96

	Expected (1)	FE (2)	GMM (3)	GMM (4)	GMM (5)	GMM (6)	GMM (7)	GMM (8)
log(1+FAD)	+	-0.02	9.07**	5.82***	4.79***	5.19***	3.85***	3.83***
		(0.01)	(4.26)	(1.81)	(0.97)	(1.02)	(0.74)	(0.74)
log(1+FMg)	+	-0.00	-3.20**	-2.06***	-1.72***	-1.84***	-1.40***	-1.39***
		(0.01)	(1.46)	(0.62)	(0.33)	(0.35)	(0.25)	(0.25)
log(1+UVsector)	+	-0.02		1.09***	0.86***	0.97***	0.57***	0.58***
		(0.09)		(0.40)	(0.28)	(0.27)	(0.20)	(0.20)
FAVD					0.20***	0.22***	0.31***	0.31***
					(0.07)	(0.07)	(0.06)	(0.06)
PAVD					-0.42***	-0.45***	-0.32***	-0.32***
					(0.07)	(0.07)	(0.05)	(0.05)
dur(inv)	+					0.36***	0.25***	0.24***
						(0.07)	(0.06)	(0.06)
cases						-0.22*	-0.22**	-0.22**
						(0.13)	(0.10)	(0.10)
no injury						0.14***	0.14***	0.14***
						(0.05)	(0.04)	(0.04)
dur(ADD)	+					-0.13***	-0.15***	-0.15***
						(0.05)	(0.04)	(0.04)
ADD_per_Country							-0.01***	-0.01***
							(0.00)	(0.00)
ADD_per_Sector								0.00
								(0.00)
log(1+PMg)	+	-0.01						-0.06
		(0.01)						(0.04)
retaliation1		0.00						
		(0.00)						
retaliation2		0.00						
		(0.06)						
constant		2.75	-0.25	-0.86	-0.47	-1.49	-1.10	-1.25
		(14.31)	(1.80)	(1.26)	(0.92)	(1.06)	(0.83)	(0.89)
Macro Variables		yes	yes	yes	yes	yes	yes	yes
Year dummies		yes	yes	yes	yes	yes	yes	yes
N		8271	8271	8271	8271	8271	8271	8271
Root MSE			2.76	1.81	1.62	1.51	1.24	1.23

***, **, * correspond to 1, 5 and 10% significance level, respectively. Standard errors reported in parenthesis.

	China India (1)	China India (2)	Except CI (3)	Except CI (4)	Sector7 (5)	Sector 7 (6)	Except S7 (7)	Except S7 (8)
log(1+FAD)	0.12	0.08	4.33***	4.00***	3.35***	2.72***	1.82***	2.77***
	(0.12)	(0.12)	(1.07)	(1.17)	(0.69)	(0.54)	(0.66)	(1.03)
log(1+FMg)	-0.18**	-0.17**	-0.64***	-0.60***	-0.57***	-0.51***	-0.85***	-1.25***
	(0.08)	(0.08)	(0.14)	(0.15)	(0.09)	(0.08)	(0.28)	(0.44)
log(1+UVsector)	0.76***	0.96***		0.16		0.48	0.15	0.21*
	(0.09)	(0.07)		(0.20)		(0.49)	(0.09)	(0.12)
FAVD	0.82***	0.71***	0.42***	0.43***	0.34***	0.32***		0.12
	(0.05)	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)		(0.10)
dur(ADD)	-0.52***	-0.52***	-0.17***	-0.19***	-0.23***	-0.34***	-0.12***	-0.13***
	(0.06)	(0.06)	(0.04)	(0.03)	(0.07)	(0.03)	(0.02)	(0.03)
no injury	0.13*	0.08	0.05	0.07*	0.10**	0.14***	0.14***	0.10
	(0.07)	(0.08)	(0.04)	(0.04)	(0.05)	(0.04)	(0.05)	(0.06)
ADD_per_Country	-0.01***	-0.01***	-0.00**	-0.00**		0.00	-0.01***	-0.01***
	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)
ADD_per_Sector	-0.00***	-0.00**		-0.00		.		-0.00
	(0.00)	(0.00)		(0.00)		.		(0.01)
PAVD		0.12*		-0.05	-0.25***	-0.33***		0.01
		(0.06)		(0.06)	(0.09)	(0.08)		(0.07)
dur(inv)		0.06	0.51***	0.49***	0.38***	0.39***	0.09	0.23**
		(0.04)	(0.06)	(0.07)	(0.05)	(0.05)	(0.08)	(0.09)
Cases			-1.09***	-1.04***	-0.55***	-0.53***		0.34
			(0.21)	(0.22)	(0.07)	(0.07)		(0.26)
log(1+PMg)		0.11***	-0.27***	-0.26***	-0.22***	-0.17***		-0.01
		(0.02)	(0.06)	(0.06)	(0.07)	(0.06)		(0.04)
constant	5.25***	4.76**	-2.01	-1.61	0.14	0.01	0.11	-0.23
	(0.39)	(0.41)	(1.36)	(1.40)	(0.78)	(1.04)	(0.78)	(1.09)
Macro Variables	no	no	yes	yes	yes	yes	yes	
Year dummies	yes	yes	yes	yes	yes	yes	yes	
N	3117	3117	5154	5154	3003	3003	5268	5268
Root MSE	0.48	0.47	1.01	0.95	0.76	0.88	1.01	0.76

***, **, * correspond to 1, 5 and 10% significance level, respectively. Standard errors reported in parenthesis.

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