

The Trade Effects of EU Antidumping Measures

Rod Falvey, David Greenaway, Sarut Wittayarungruangsi

July 2004

1 Introduction

The implementation of antidumping measures could alter the incentives and behaviour of firms engaged in an antidumping case. Although there have been a large number of theoretical studies on AD, we still do not know much about firms' responses in the presence of a third country whose producers are not subject to antidumping action. It is also difficult in theory to incorporate into the model the fact that different dumping firms who are in the same antidumping case actually face different degrees of protection.

Though absent in theory, some empirical studies attempt to analyse the effects of AD on the named countries as well as on those non-named. The key finding is that antidumping action reduces imports from the named countries but increases them from non-named ones. This type of effect is called "trade diversion". Three major works regarding the trade diversion effect are Prusa (1997), Konings et al. (2001) and Brenton (2001).

Prusa (1997) considers US antidumping cases initiated between 1980 and 1988 and finds that the increase in imports from the non-named is large enough to offset the fall in imports from the named countries. This suggests that trade diversion in the US is so strong that it could mitigate the effect of AD action or even hurt US producers. As for the EU, Konings et al. (2001) examine AD cases filed between 1985 and 1990 while Brenton (2001) covers those filed between 1989 and 1994. Both also find that trade diversion is evident in the EU; however, it is not as strong as in the US.

A salient paper by Staiger and Wolak (1994) argues that the threat of antidumping activity could undermine trade from the named countries even

if the findings turn out to be negative. The producers named in a petition significantly reduce their exports destined to the US during the period of investigation. This implies that, whether or not the case is successful, the presence of antidumping law can distort the behaviour of firms involved in the case. In the AD literature, this effect is called the “investigation effect”.

In this study, we aim to investigate the trade effect of EU antidumping measures. Even though this work can be classed within the same group as those which focus on trade diversion, the main question asked here is slightly different. Whereas other papers examine the trade effect on named and non-named countries as a whole, we would like to analyse the effect on each dumping country. Thus we treat different countries in the same petition separately. This is due to the fact that, though named in the same petition, different producers face different AD measures.

Besides, other works take into account all AD cases filed and these include cases ending up with a negative decision, antidumping duties and price undertakings. We narrow down our focus and consider the EU cases ending up with definitive duties only. This is to highlight the extent to which the size of duty, which reflects the level of protection, influences the volumes of dumped imports.

As evident in Staiger and Wolak (1994), the initiation of an antidumping petition discourages trade volumes from the named countries even if the real antidumping action does not take place. Moreover, in the EU, price undertakings are frequently undertaken. Therefore, if one tries to emphasise how the dumping firms respond to the AD duties, it would be complicated to separate the effect of duty out of the others’ when AD cases with other types of action are also included. Hence we exclude those from the analysis and concern ourselves only the cases where definitive duties are levied. By doing this, we are unable to compare the effects of different types of AD action, but will understand the role of AD duty more clearly.

The last feature that distinguishes this study from others is the time span we cover. Here we take our sample from more recent cases. All EU cases with definitive duties which were first imposed between 1989 and 1998 are brought into the analysis. This could add more recent evidence to the literature and it is hoped that the results found here could bring about better understanding of this issue.

The rest of the paper is organised as follows. Section 2 gives the overview of EU antidumping activities. In section 3, we analyse the data and summarise some descriptive statistics. The following section concerns model

specification and framework for econometric technique employed here. In section 5, we report and discuss the results. Finally, concluding remarks are given in section 6.

2 EU Antidumping Activities

In this section, we begin by giving a brief overview of EU antidumping activities. The source of information is the WTO website (www.wto.org). This summarises the statistics regarding antidumping initiations and antidumping measures of the member countries from 01/01/95 to 31/12/03 which is up to date as compared to what is presented in the existing literature. This provides a broad picture of recent EU antidumping practice (for a thorough summary of antidumping practice worldwide, see Zanardi, 2004)

Then we present an overview regarding EU affirmative cases with duties being imposed. Due to data limitations and different sources of information, we are unable to cover the same time period as above. The limitation of trade data used in our formal analysis forces us to consider the EU antidumping cases with duties being first collected in the year 1989 to 1998.

Although time periods in the following two subsections are different, there is some overlap, and we have not observed the long-run substantial change in EU antidumping activities over the 1990s and early 2000s. Therefore, the qualitative view over the two time spans should be rather similar.

2.1 Overview of EU Practice

From 1995 to 2003, the EU was the third heaviest initiator of antidumping cases, following India and the US. As shown in Table 1, the top five AD initiators are India, the US, the EU, Argentina and South Africa. The EU initiated 274 antidumping cases from 01/01/95 to 31/12/03.

Unlike India that has become a new aggressive user of AD policy, the data for the EU does not show a significant upward trend in AD activities during this period, but short-run fluctuations are observable. The EU average number of AD initiations is approximately 33 cases per year. The number peaks at 65 cases in 1999 but hits the bottom at 7 in 2003.

The low number in 2003 is rather curious since, among top initiators of AD cases, the number for Argentina drops from 14 cases in 2002 to only 1 in 2003. Likewise, the figure for India is 81 in 2002 but 46 in 2003. As far

as all WTO members are concerned, the number of AD initiations in 2003 is 210 which is the lowest after 1995.

Table 1: AD Initiations

<i>Country</i>	1995	1996	1997	1998	1999	2000	2001	2002	2003	<i>Total</i>
India	6	21	13	27	65	41	79	81	46	379
United States	14	22	15	36	47	47	76	35	37	329
EU	33	25	41	22	65	32	29	20	7	274
Argentina	27	22	14	8	23	45	26	14	1	180
South Africa	16	33	23	41	16	21	6	4	6	166

Of all 274 cases filed by the EU, 187 cases are affirmative. As we rank the top five countries that really pursue antidumping action, the list is identical to those top initiators. Table 2 shows the numbers of AD measures in the top five countries. These countries are again India, the US, the EU, Argentina and South Africa. To interpret the data, one has to keep in mind that the data for each year normally stems from the cases initiated one year before. For example, if the EU imposes 25 AD measures in 1996, these 25 measures are unlikely to come from the cases filed in 1996 but mostly from those filed in 1995.

Table 2: AD Measures

<i>Country</i>	1995	1996	1997	1998	1999	2000	2001	2002	2003	<i>Total</i>
India	7	2	8	22	22	57	38	64	53	273
United States	33	11	20	16	24	32	33	24	12	205
EU	15	23	23	26	18	41	13	25	3	187
Argentina	13	20	11	12	9	15	15	24	19	138
South Africa	0	8	18	14	34	13	5	15	1	108

The success of EU antidumping filings is approximately two thirds. Comparing to other heavy AD users, this rate is consistent with those for other countries except that for Argentina which has a success rate slightly over 75%. This number is exceptionally high as compared to most WTO members.

As with AD initiations, the data on EU antidumping measures does not show a long-run upward trend in AD action but reveals that there is fluctuation over this period. The average number of EU antidumping measures is

about 20 per year. The highest number is 41 in 2000 whereas the lowest is 3 in 2003.

It is well known that one type of antidumping action frequently pursued by the EU is price undertaking. If a dumping foreign firm agrees to raise the price to the negotiated level, the duty will not be levied. This type of antidumping action is not widely used elsewhere and it is one unique feature of EU antidumping practice. Therefore, of all successful EU cases, some end up with price undertakings while some end up with duties. In addition, even in the same antidumping cases, some dumping firms could agree to perform undertakings whereas others would prefer to pay duties. Hence, according to the unavailability of the data, it is not possible to report here what proportion of EU dumped imports is subject to price undertakings and what proportion is subject to duties.

As concerns sectors most involved with EU antidumping cases, the sector that initiates AD filings the most is base metals and article of base metals. There are 92 filings made by this sector which account for approximately one third of all AD initiations over 1995-2003. The industry coming second as the most aggressive AD filers is chemical and allied products which initiated 45 cases. These two industries are the same as the US counterparts as well as those in many other countries. It is interesting to understand why this is the case.

There are a few papers that investigate the role of political factors in determining the outcomes of AD filings, and it turns out that those factors are significant. These papers are Moore (1992) and Baldwin and Steagall (1994) for the US, and Tharakan and Waelbroeck (1994) for both the EU and the US. Moreover, as pointed out by Irwin (2002), the costs associated with an AD cases are high. Thus it is more likely that the industries in which a large market share is in the hands of a few big producers would file AD cases since it is easier for them to form a link with the government. Also, as the costs of filing are high, the free-rider problem is less likely to occur in the industries in which there are only a few large firms. Accordingly, it is easier for these industries to coordinate.

2.2 AD Cases with Definitive Duties

While the above subsection provides an overview of EU antidumping activities in the world context, this subsection focuses on EU cases considered in our sample only. We are now concerned with the affirmative cases with the

decisions to impose definitive duties made from 01/01/89 to 31/12/98. It is our intention to focus on the cases with AD duties but, as mentioned earlier, in some AD cases there are more than one type of AD action being made. In some cases, though named in the same petition, some firms accept price undertakings whereas some others pay the duties. This suggests that it is not plausible to rule out the role of price undertakings from our analysis.

From 1989 to 1998, there are 104 AD petitions that are affirmative and result in AD duties. This number may not be accurate since, in some petitions, the decision for different producers named in the same petition are not made at the same time. However, this is quite rare, so it is reasonable to presume that our number is very close to the real one. Not all these AD cases are new. Some of them are renewed after their termination. This is due to the fact that EU antidumping cases automatically terminate after 5 years, so if the EU producers would like to extend the length of time the duties are imposed, it is necessary that they renew the cases. There are 6 renewed cases in our sample, 3 of which are against China.

Regarding the number of countries named in the same petition, the un-weighted average is 2.64 countries per case. The maximum number is 7 countries per case. It can be seen from our data that, in more recent years, the EU tends to include more countries in the same petition. In the sample, all AD decisions where more than 4 countries are subject to the duties are made after 1994. In 1998 alone, there are 2 affirmative decisions that levy duties on more than 5 countries. One is on stainless steel fasteners with 6 countries involved and the other is on fax machine with 7 countries.

The increasing cumulation of various countries in the same petition could be explained by the “super additivity effect”. In fact, since 1979, EU antidumping law has allowed the EU complainants to name several producers in the same petition, but it was not until the second half of the 1990s that economists formally studied the linkage between the probability of winning the case and the number of countries named.

According to Hansen and Prusa (1996) and Tharakan, Greenaway and Tharakan (1998), it is evident in both the EU and the US that, holding the market share of dumped imports constant, an increase in the number of named countries significantly increases the probability of an affirmative finding. If the complainants have become more aware of this effect, it is not surprising to see cumulation in more recent cases and in the future.

As regards countries subject to AD duties, there are 31 countries filed against by the EU: to avoid double counting, we do not count the Soviet

Union and Czechoslovakia. Among these, the main targets are countries from the Far East and Eastern Europe. Table 3 ranks the top five countries subject to EU measures the most.

Table 3: EU Antidumping Targets

<i>Country</i>	<i>No.of Measures</i>
China	35
Korea	18
Japan	14
Thailand	12
Russia	9

China is the first target for the EU as well as for the rest of the world. From Table 3, Chinese producers are subject to duties in 35 EU cases. This number is twice that of Korea, the second biggest target, which has 18 cases resulting in duties. The rest of the table ranks Japan, Thailand, and Russia respectively. Note that the number for Russia does not take into account that for the Soviet Union before 1992.

As in the subsection above, two industries involved most with the EU antidumping measures are steel and chemicals. However, Japan and Korea systematically differ from most countries in that most dumped imports from the two countries are high-tech products. These include, among others, fax machines, photocopiers, TV camera systems and CD players. This fact implies that not only does the EU pursue AD action against low-cost countries, it also does so against those that have comparative advantage in some particular products.

3 Data Analysis

This section summarises descriptive statistics of EU imports from named countries. For each antidumping case, where data is complete, we collect trade volumes from the named countries for 8 consecutive years starting from two years before the duties start to be imposed until five years after the definitive duties are first collected. That means if we let $t = 0$ be the first year in which the duties are imposed, we take the data from year $t = -2$ to $t = 5$.

Our source of trade volumes is EUROSTAT, Comext CD-Rom, Intra- and Extra- EU Trade. EUROSTAT contains the data in both quantity and value terms and both are used here. The data is available from 1988 to 1998. As a consequence, there are many AD cases where volumes of imports cannot be obtained for up to 8 years. We do not exclude those cases from the sample but treat the missing years as missing data.

The level of disaggregation for trade data is 8 digit as categorised in Combined Nomenclature since this is the level of disaggregation of products named in almost all AD cases. In some rare petitions where dumped products are classified at 6 digit, we use trade data at 6 digit as well.

Below we take a brief look how dumped imports from the non-EU dumpers change as the dumping countries face antidumping duties. In an earlier section, we stated that there were 104 cases in our sample. On average, there is more than one named country in one petition. Thus if we treat one country in one petition as one case and treat another country in the same petition as another, we have 190 cases. We do not aggregate trade volumes from different countries named in the same petition together because different producers pay different duties. By separating them, we will be able to understand more clearly the behaviour of *each* named country when subject to AD measures.

We will calculate growth rates of imports from dumping countries in both value and quantity terms. Then we compute percentage changes of imports from named countries as compared to the year $t = -1$ and $t = -2$ respectively.

For clarification, note that, for any case, $t = 0$ is the first year definitive duties are levied. Therefore, in most cases, $t = -1$ is the year the petition is filed and $t = -2$ is the last year of free trade.

The growth rates of dumped imports from named countries are calculated as $gv_t = \frac{(v_t - v_{t-1})}{v_{t-1}}$ and $gq_t = \frac{(q_t - q_{t-1})}{q_{t-1}}$ where v and q are value and quantity of imports respectively.

From Table 4, it can be seen that number of cases differs across years, and this is because of unavailability of the data for some AD cases. As trade data is available only up to 1998, the cases initiated in that year or a few years earlier will have shorter time series as compared to those initiated early.

The figures on gv_{-1} and gq_{-1} suggest there is an increase in imports from named countries in both value and quantity terms from the last year of free trade to the year the cases are initiated. The growth rates in value and quantity are 16% and 18% respectively. Then the dumping exporters reduce their trade in the first year AD duties are collected. Afterwards, the imports

from these countries keep going at a positive rate. It is noticeable that the standard deviations are high. Strikingly, from $t = 0$ to $t = 1$, the average growth is remarkably high, 382% in value and 462% in quantity. Moreover, the standard deviations are more than 10 times bigger than the mean.

Table 4: Growth Rates of EU Imports

Variable	No. of Observations	Average	Standard Deviation
gv_{-1}	156	0.16	0.89
gv_0	176	-0.16	0.78
gv_1	149	3.82	45.68
gv_2	119	0.20	1.03
gv_3	91	0.76	4.77
gv_4	81	0.07	0.66
gv_5	57	0.56	1.62
gq_{-1}	156	0.18	0.94
gq_0	176	-0.18	0.75
gq_1	149	4.62	55.06
gq_2	118	0.23	1.12
gq_3	90	0.37	1.51
gq_4	79	0.04	0.62
gq_5	57	0.24	1.16

These curious numbers raise serious concern about the outliers in the data set, and it is important to remedy this problem. We will discuss the technique used in mitigating this problem in a later section.

At this point, it is worth looking into some examples of outliers who dump onto the EU market. There are several cases which have trade data so peculiar that the overall results of this study could be significantly changed if this problem is not overcome. We select two of to present here.

First, Russia was subject to EU antidumping duties on hematite pig-iron (CN Classification 72011019). There were three other countries also named in this petition including Brazil, Poland and Ukraine. The affirmative decision was made on 16/07/94 which means that the definitive duties were collected from that day for 5 years. The import value of hematite pig-iron from Russia was 51,129,000 ECU in 1994 which is more than 3 times that in the year 1993 (15,128,000 ECU). In 1992, the number was only 2,559,000 ECU. The value reached its peak at 71,058,000 ECU in 1995 which is one year after

the decision was made. After that, the imports fall. This pattern clearly contrasts the intuition and the evidence in the literature.

The second example is a case on ammonium nitrate (CN Code 31023090 + 4096) against Russia. The European Commission received the petition on 09/06/94 and determined the case to be affirmative on 23/08/95. The value of imports from Russia grew from 16,987,000 ECU in 1993 to 24,097,000 ECU in 1994. Then, in 1995 (year $t = 0$), the imports did not drop but went up to 56,822,000 ECU. The number continued to grow to 114,157,000 ECU in the following year.

Table 4 tabulates the growth rates of imports from named countries. In what follows, we show the percentage changes of imports comparing to $t = -1$ and $t = -2$ respectively. By doing so, we have a benchmark to compare trade volumes in each year and will be able to see how those imports evolve over time once subject to AD measures.

Table 5: Percentage Changes in EU Imports Comparing to $t = -1$

Variable	No. of Observations	Average	Standard Deviation
pv_0	176	-0.16	0.78
pv_1	143	-0.09	1.15
pv_2	116	0.08	1.40
pv_3	90	0.37	1.73
pv_4	80	0.54	2.16
pv_5	59	0.56	3.00
pq_0	176	-0.19	0.75
pq_1	143	-0.12	1.15
pq_2	116	0.01	1.36
pq_3	90	0.30	1.76
pq_4	80	0.48	2.27
pq_5	59	0.56	3.37

In table 5, percentage changes of EU imports, comparing to $t = -1$ are presented, recalling that $t = -1$ in the year most petitions are filed. We compute percentage changes as $pv_t = \frac{(v_t - v_{t=-1})}{v_{t=-1}}$ and $pq_t = \frac{(q_t - q_{t=-1})}{q_{t=-1}}$ where pv is the percentage change in value and pq is that in quantity.

In the first year of definitive duties, as compared to the year before, imports from named countries drop by 16% in value and by 19% in quantity. Then they start to go up but they are still lower than in the year the petition

were filed ($t = -1$). In the following year, they get back to the levels slightly above those in year $t = -1$. Then they exceed those from the benchmark year. This pattern reveals that although each EU antidumping measure lasts for five years, the named countries do not necessarily export less for the whole five years. This is because the case could be revised upon request by the dumping firms. Moreover, new entrants from the named countries who are not subject to AD could export to the EU more aggressively.

The next table reports the descriptive statistics of percentage changes in imports in comparison to the year $t = -2$. In year $t = -2$, trade in most cases is in the absence of AD threat whereas in some others there might be a small effect from investigation process. The percentage changes are expressed as $pcv_t = \frac{(v_t - v_{t=-2})}{v_{t=-2}}$ in value terms and $pcq_t = \frac{(q_t - q_{t=-2})}{q_{t=-2}}$ in quantity terms.

Table 6: Percentage Changes in EU Imports comparing to $t = -1$

Variable	No. of Observations	Average	Standard Deviation
pcv_{-1}	156	0.16	0.89
pcv_0	156	0.07	2.29
pcv_1	124	0.20	2.93
pcv_2	102	0.30	2.29
pcv_3	79	0.95	3.58
pcv_4	69	1.12	4.03
pcv_5	49	0.50	2.29
pcq_{-1}	156	0.18	0.94
pcq_0	156	-0.02	1.61
pcq_1	124	0.08	2.08
pcq_2	120	0.39	3.30
pcq_3	79	1.11	4.98
pcq_4	69	1.24	5.06
pcq_5	49	0.52	2.64

As above, the value of imports grows from $t = -2$ to $t = -1$ at 16% and the quantity grows by 18%. Then the imports fall significantly but, in value term, they do not fall below those in the absence of AD threat ($t = -2$) while, in quantity term, they fall below those in free trade by 2%. Once again, for year $t = 0$, the standard deviations are extremely high relative to the means. Ignoring this for the moment, the imports then start to go up until the year $t = 4$ and fall again in $t = 5$.

As seen from Tables 5 and 6, the extreme mean numbers are removed. Nonetheless, the standard deviations are still high. Some variables generate standard deviations that are extremely large compared to the means. We therefore can believe that the problem of outliers is serious in this study, and we will control for it in our regressions.

Keeping in mind that the outliers cannot be overlooked, the figures from the tables above confirm the analyses in some existing papers that there is an import surge to the EU in the year prior to the petition. Once antidumping action has taken place, there is a significant decrease in imports subject to AD.

4 Model

This section is divided into two parts. First, we set out the model specification and our hypotheses. Second, we present some theoretical background regarding the econometric technique used in the regressions.

4.1 Model Specification

Whereas, in other papers, trade volumes from all named countries in the same petition are aggregated together so that the effect of AD on dumped imports as a whole is analysed, we treat different countries named in the same petition as different observations since our focus here is on a slightly different issue. In order to emphasise the role of AD duties and investigate how different countries respond to different duties applied to them, it is essential to treat different countries, though named in the same petition, as different observations. Moreover, it is also important to apply different duties to different dumpers.

The issue is complicated in that EU antidumping practice is conducted against imports from specific firms, not all firms from specific countries. Then imports from the same country could be subject to several measures. As trade data is not available at the firm level but the duty is firm specific, the question arising here is which duty should be applied to each country. We will discuss this matter shortly.

We also control for other factors that could be responsible for changes in the volumes of EU imports from the named countries. These factors are the size of named country (*size*), the number of countries named in the petition

(*ne*), whether or not the named country is a non-market economy (*trans*), import penetration of the named country (*prop*), and time dummies. Each factor is discussed individually below.

The basic equation to be estimated can be written as

$$y_{it} = b_0 + b_1duty_i + b_2size_{it} + b_3trans_i + b_4ne_i + b_5prop_{it} + \sum b_6t_{j=0-5} + e_{it} \quad (1)$$

Regarding the left-hand-side variable, the variable y_{it} is defined as the ratio of import volumes from country i at time t to import volumes from that country two years before the duty is first imposed ($\frac{v_{it}}{v_{it=-2}}$). As mentioned above, in most cases, $t = -2$ is the last year before the petition is filed and we put $v_{it=-2}$ as the denominator so that the year without AD threat would be our base year when making comparison between cases, or within the same case but different years. In other words, this is the reason why this variable is defined in relative terms; otherwise trade volumes across cases (different products) are not comparable. It is difficult to compare changes in imports of different products if we express the dependent variable in absolute terms.

Under EU law, each antidumping measure is in effect for 5 years if the case is not renewed. Hence, for each country in each AD case, we have values of y_{it} from $t = -1$ to $t = 5$. It is not appropriate to start from year $t = 0$ because in year $t = -1$, even though the definitive duty is not yet collected, the investigation effect is already there (Staiger and Wolak, 1994).

Note that, as i refers to one country named in one petition, “different countries in the same petition” and “same country named in different petitions” are treated equally. What makes them different are the initial trade volumes and the values of right-hand-side variables.

In what follows, we discuss the explanatory variables and expected signs of coefficients.

(1) *duty*

The variable *duty* is the size of duty imposed on the product named from country i as calculated by the European Commission. Before the affirmative decision is made, the European Commission usually announces provisional duties and levies them for a few months. After that, the definitive duties start being collected. Because of differences in the law, the definitive duties in many countries tend to be the same as the provisional ones but, for the EU, this is not necessarily the case. It is not unusual in the EU for definitive duties to be slightly lower than their provisional counterparts.

Notwithstanding the fact that the two types of duties may not be the same, the provisional duties are applied only for a short period and the difference between the two tends to be small. That being the case, we believe that this problem is negligible and use only definitive duties in our regressions.

As pointed out above, AD measurers are firm specific, not country specific. It is important to pick a reasonable representative duty for each AD case. An ideal way to overcome this complication is to calculate the weighted average duty for each country, but this cannot be done due to limitations of the data. Using unweighted averages is not appropriate since it would lead to some degree of bias. We respond to this problem by using the maximum duty levied on each country in each AD case. Although the maximum duty does not apply to all firms in the same country, one major advantage of this over all other measurers is that every firm that does not respond to the European Commission and those that do not complete the questionnaire (regarding alleged dumping behaviour) in time are likely to be subject to the maximum duty imposed on other firms. Once again, to make duties from different petitions comparable, we express them in percentage terms.

Before moving on, two points are worth mentioning. First, the duty in year $t = -1$ is zero whereas, from year 0 to 5, the duty is positive. Second, for each case, this size of duty is time invariant, but in practice the European Commission can revise the case and adjust the sizes of duties if the named firms request. So the duty is not always fixed over time. However, it is unlikely that we can track the changes of duties in all antidumping cases. Thus we treat it as a time invariant variable but will use time dummies to remedy this problem. The estimated coefficient on this variable is expected to be negative.

(2) *size*

This variable refers to the market size of the dumping country. The hypothesis on this is drawn purely from our theoretical model (Falvey and Wittayarungruang Sri, 2004). The key prediction from the model is that a reduction in imports from a large country tends to be larger than that from a smaller country. Thus the sign of the coefficient is expected to be negative.

The variable is included for two reasons. First, by including it, we are able to test the prediction from our theoretical model which emphasises the role of market size in determining the incentives of firms involved. Second,

whether or not the prediction is correct, it has not been analysed in the literature whether the characteristics of the named countries systematically affect how they respond to EU measures.

We define *size* in two ways. One is the volume of domestic production of country i plus imports minus exports. Ideally, the level of disaggregation should be the same as that of dumped imports named in the petitions. Nonetheless, the data is not available for most countries outside the EU. We then use trade and production data provided by the World Bank and the data is as classified as ISIC 3 digit.

The other way we define *size* is to measure it as the size of economy (GDP deflated to 1995). Measured in this way, we have less missing data.

(3) *trans*

This variable is a dummy taking a value of 1 if country i is an economy in transition, and 0 otherwise. It is seen from subsection 2.2 that China and Russia are among the top five targets of EU antidumping measures. Taking into account all countries subject to EU duties, non-market economies, especially China and those from Eastern Europe, account for a large number of EU antidumping cases. When looking at raw data, the imports from those countries sometimes even rose sharply despite being subject to AD. This may differ from imports from market economies in a systematic way. Moreover, once producers face trade protection, interference by the government could be stronger in emerging countries and these producers may be less hurt than those in market economies.

Therefore, we suspect that, once subject to AD action, the producers from countries in transition are less sensitive to AD action. This dummy variable is expected to have a positive coefficient.

The countries in transition are like those in Miranda (1998) and Zanardi (2004) except that we include China into this group as well. These include Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, China, Czech Republic, Cuba, Estonia, Georgia, Hungary, Latvia, Kazakhstan, Kyrgyzstan, Lithuania, Republic of Macedonia, Moldova, Poland, Romania, Russia, Serbia and Montenegro, Slovak Republic, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan and Yugoslavia.

(4) *ne*

ne is the number of countries named in the same petition, In case where not all countries named are subject to definitive action, we include only those

that have to pay AD duties. The literature regarding trade diversion views this variable as a factor responsible for the degree of diversion. Prusa (1997) hypothesises that if many countries are named in the same AD case, trade diversion should be weaker. However, his finding turns out to be that the diversion is in fact stronger when more countries are named. This result is striking but he does not give any explanation of why this is the case. Brenton (2002) follows the technique used by Prusa (1997) and finds the same result for the EU. Again, there is no explanation given.

We verify the result found in those papers. Our hypothesis is that the coefficient of this variable should be positive. If many countries are named in the same petition, it is more likely that the dumped imports are responsible for higher market share of the EU imports than when a few countries are named.

From the viewpoint of a dumping firm, if a large amount of trade volumes from other countries are also subject to AD (proxied by the number of countries), the effect of AD on that firm would be mitigated because the cost disadvantage does not belong to that firm only but also to many others.

(5) *prop*

prop is the proportion of EU imports from country i to EU imports from all countries. On the one hand, if *prop* for a named country is large, that country may be a big producer and it could be the main target of EU antidumping. Hence the country may want to switch to non-EU markets to avoid AD. On the other hand, *prop* may be high for a country because it has the EU as its main market. In this respect, the effect of AD is lessened if the EU is important for the producers in that named country.

The coefficient sign for this variable is therefore uncertain.

(6) t

We put t as time dummies capturing year 0 to year 5, that is, year -1 is our benchmark of slope coefficient. The time dummies are important because there are always some unobservable characteristic changes occurring over time. This is due to AD revision. The change of AD duty arising from revision is firm specific and time variant, but we are unable to let duty vary over time in our model because the data used here is country specific and we stick to the maximum duty. The revision could also end up with price undertakings and it is not possible to say what proportion of imports meet price negotiation.

Since AD action is dynamic but hard to capture quantitatively, we include time dummies in the regressions. The coefficients of time dummies tell the slope differences from that of year -1 , then they are expected to be negative because the impact of real action should be stronger than that of AD threat. The magnitudes of these dummies reveal how the responses by dumping firms evolve over time.

In running regressions, the dependent variable is expressed in both value and quantity terms. The variable *size* is also measured in two ways. As for trade value, equation (1) is rewritten as

$$rv_{it} = b_0 + b_1duty_i + b_2countrysize_{it} + b_3trans_i + b_4ne_i + b_5propv_{it} + \sum b_6t_{j=0-5} + e_{it} \quad (2)$$

and

$$rv_{it} = b_0 + b_1duty_i + b_2marketsize_{it} + b_3trans_i + b_4ne_i + b_5propv_{it} + \sum b_6t_{j=0-5} + e_{it} \quad (3)$$

where *rv* is the variable *y* in value term, *countrysize* is GDP in logarithm and *marketsize* is domestic market size in logarithm.

The equations in quantity terms are

$$rq_{it} = b_0 + b_1duty_i + b_2countrysize_{it} + b_3trans_i + b_4ne_i + b_5propq_{it} + \sum b_6t_{j=0-5} + e_{it} \quad (4)$$

and

$$rq_{it} = b_0 + b_1duty_i + b_2marketsize_{it} + b_3trans_i + b_4ne_i + b_5propq_{it} + \sum b_6t_{j=0-5} + e_{it} \quad (5)$$

where *rq* is the variable *y* in metric tons.

Note that when the left-hand -side variable is expressed in value terms, *prop* is also expressed in value. Similarly when *y* in quantities, *prop* is measured in quantity term.

We also experiment by splitting our sample between market and non-market economies in order to check the robustness of the results. To do so, the dummy *trans* is not put into the regressions.

Though we do not focus on trade diversion effects, it is worth performing simple regressions to examine whether imports from other countries benefit from AD action faced by a particular named country. We exclude the variable *size* and *trans* from this set of regressions since they are specific to a dumping country, but should not significantly affect the volumes of imports from other countries as a whole.

The basic equation for this type of regression in value terms is written as

$$nrv_{it} = b_0 + b_1duty_i + b_2ne_i + b_3propv_{it} + \sum b_4t_{j=0-5} + e_{it} \quad (6)$$

For each case, nrv_{it} is the proportion of import value from all countries except the particular named one to import value from everywhere.

In quantity term, the equation is written as

$$nrq_{it} = b_0 + b_1duty_i + b_2ne_i + b_3propq_{it} + \sum b_4t_{j=0-5} + e_{it} \quad (7)$$

where nrq_{it} is in quantity terms.

One might argue that defining the dependent variable in this way would take into account imports from other countries named in the petition. However, it is reasonable to do so if our objective is to examine how AD action encountered by a dumping country influences trade from other exporters. In the literature concerning trade diversion, dumping countries and non-dumping countries are separated so that we can examine whether trade diversion is strong enough to cause perverse effects of AD in such a way that the domestic filers are hurt from AD action. Nevertheless, in our case, we perform our regressions simply to check the responses of other exporters when a particular country is subject to an AD duty. Excluding other named countries and considering only non-named countries in each AD case would distort the overall result. For clarification, we can take one example.

A petition on potassium permanganate was made in 1997 and the definitive duties were first levied in 1998. Two countries subject to the measures were India and Ukraine whose duties were 5.6 % and 36.2 % respectively. Where we focus the observation regarding Ukraine, taking into account only non-named countries is misleading because India, despite being subject to AD, also benefits from the duty imposed on Ukraine as the duty imposed on India is far smaller.

4.2 Econometric Technique

As far as econometric estimation is concerned, we perform regressions using two techniques, OLS and robust regression. The existence of outliers in our sample raises some concern regarding classic assumptions of OLS. When the assumption of normality does not hold, t-tests and F-tests may not be reliable. In such a case, it is better to use an alternative.

In Konings et al. (2001), they use OLS, robust regression, and the Heckman selection model. The qualitative results are not sensitive to the technique chosen. However, the scope of Konings et al. (2001), the time span, and the way model specification is set out are different from this study. Besides, our sample possesses the evidence of outliers which seems to be serious as seen from the descriptive statistics above. We suspect that OLS and robust regression would provide somewhat different results.

Hamilton (1991) argues that if the error terms are influenced by explanatory variables, then the problem of heteroskedasticity is present; however, if the residuals are mainly influenced by the dependent variable, performing a robust regression would be a remedy.

The main intuitive distinction between robust regression and OLS is that, while OLS gives the same weight to all observations, robust regression assigns high weight to the observations that produce small residuals and lower weight to those with larger residuals. There are many types of robust techniques and different types employ different ways of assigning weight to each observation. As our regressions are run in STATA 7, we follow the methodology developed by Hamilton (1991) since it is the process employed in the software.

The first step of the process is that STATA estimates OLS and recognises the error term obtained from each observation. Taking into account the error terms, it assigns different weights to different observations. Note that the magnitude of error term itself is not the weight but the weight is calculated using the error term. Now every observation has its own weight. The software then computes the maximum difference in weight and considers whether the maximum difference is below the threshold level. If not, it performs OLS again assigning different weights to different observations.

This process is iteratively repeated until the maximum difference in weight is smaller than a default level. Once this stage has been reached, STATA reports the result.

To assign weights, there are two weight functions. These are Huber Weighting and Biweight. The two weight functions have different advan-

tages and drawbacks. To compromise different features of the two, STATA starts with Huber Weighting until the maximum weight difference is below 0.05, then finishes with the biweight when the maximum difference becomes less than 0.01.

Technically, Huber Weighting and Biweight work as follows.

Huber Weighting: Suppose e_i is the i^{th} observation residual and MAD is the absolute deviation from the residual median

$$MAD = med(|e_i - med\{e_i\}|).$$

For each observation, the scaled residual u_i is

$$u_i = e_i/s \text{ where } s = MAD/0.6745.$$

Then case weight w_i is derived as

$$w_i = \begin{cases} 1 & \text{if } |u_i| \leq c \\ c/|u_i| & \text{otherwise} \end{cases}$$

where $c = 1.345$.

Therefore, observations with relatively small residuals receive weight of 1 and downweighting begins with those those absolute residuals exceed about $2 \cdot |MAD|$.

Biweight: With the biweight function, all cases with non-zero errors are downweighted.

$$w_i = \begin{cases} [1 - (u_i/c)^2]^2 & \text{if } |u_i| \leq c \\ 0 & \text{otherwise} \end{cases}$$

where $c = 0.4685$.

This means extreme cases with absolute residuals equal to or greater than $7 \cdot |MAD|$ are dropped from the sample.

As seen from the biweight function, the expense of robust regression is that severe outliers could be dropped. If there were many extreme outliers in the sample and they were dropped, this would imply that we were trying to improve the results by excluding the observations that do not behave in the expected way. Nonetheless, it can be believed that this issue is not a serious

problem as far as our study is concerned. This is because, as shown later, no observations in our sample are dropped as compared to OLS.

Hamilton (1991) compares the efficiency of OLS and robust estimation using Monte Carlo experiments. He performs OLS and robust regression on two samples. The first is that with normal *i.i.d.* error terms. The second is that when non-normal but *i.i.d.* residuals are present (which is the case where larger residuals are not very likely to coincide with extreme values of explanatory variables). His results suggest that when error terms follow a normal distribution, the efficiency of robust regression is about 95% of the OLS counterpart. When the distribution is not normal, robust regression significantly outperforms OLS; its efficiency is almost twice that of OLS.

This experiment suggests that the cost of applying robust technique when OLS is more appropriate is low. However, in case where some extreme residuals skew the distribution, the cost of applying OLS when robust regression is a better option is very high. Therefore, based on the efficiency of estimators and the presence of outliers in our data set, robust regression seems to be appropriate to apply here. However, we run both types of estimation so that we can compare and contrast the results.

5 Results and Discussion

Where the results from OLS and robust regressions are concerned, they significantly differ from each other. This is not consistent with the results found elsewhere but, as mentioned earlier, this study is different from others in some respects and if the outliers do not play a crucial role, this obvious distinction should not have been observed.

The overall performance of OLS is poor. In addition, when the variables are defined differently, the OLS results change a great deal. For example, the magnitude of the same coefficient differs greatly across equations. Most coefficients are also not consistent with our expectation and many of them lack significance.

Robust regression improves the results considerably. Most coefficients have the expected sign: furthermore, their signs and magnitudes from different equations are consistent with one another. This evidence confirms our prior belief that robust technique is more appropriate as far as our study is concerned. Therefore, we do not report the results from OLS and base our

discussion only on those obtained from robust regressions.

Table 7: Result from Full Sample

Variables	<i>rv</i>	<i>rv</i>	<i>rq</i>	<i>rq</i>
<i>duty</i>	-0.41***	-0.41**	-0.45***	-0.41**
<i>countrysize</i>	0.01**		0.01**	
<i>marketsize</i>		-0.04**		-0.01**
<i>trans</i>	0.17*	0.09	0.14**	0.14**
<i>ne</i>	0.05***	0.05***	0.03*	0.03*
<i>propv</i>	1.10***	1.18***		
<i>propq</i>			0.22***	0.20***
t_0	-0.16*	-0.15	-0.18**	-0.21**
t_1	-0.19**	-0.18**	-0.28***	-0.28***
t_2	-0.20**	-0.20*	-0.28***	-0.28***
t_3	-0.13	-0.14	-0.15	-0.15
t_4	-0.08	-0.14	-0.16	-0.21*
t_5	-0.14	-0.22*	-0.17	-0.22*
<i>constant</i>	0.36***	0.98***	0.59***	0.98***
Observations	613	523	613	523
F-Stat	11.57	9.19	8.48	6.53
Prob > F	0.00	0.00	0.00	0.00

The significance level at 1%, 5%, and 10% are indicated by ***, **, and * respectively.

Table 7 reports results for the full sample. The first two columns are those for value equations whereas the last two are for quantity equations. For each AD case, trade volumes from $t = -1$ to $t = 5$ are considered; this means we take into account trade data for 6 years. There are 190 AD cases in our sample. Hence, when the data is complete, there should be 1,140 (6 times 190) observations in the sample. Where the regressions are performed, however, the number of observation reduces to 613 and 523 when *size* is measured as *countrysize* and *marketsize* respectively. These numbers are identical to the number of observations in OLS. That is, no observations are dropped by the iterative process.

In general, most variables are significant and have the expected sign. In both value and quantity equations, the magnitudes of coefficients are quite consistent with one another except for the variable *prop*.

Regarding *duty*, this variable produces a negative coefficient with at least 5% significance level. This is in line with our hypothesis. If the duty is high, the producer will export less to the EU due to increasing trade costs. Interestingly, the magnitudes of coefficients from the value and quantity equations are almost identical. This points out that the extent to which AD duties could reduce trade is rather similar in value and quantity term, holding other things constant.

The high significance of the duty strengthens our hypothesis that the duty size is important in determining volumes of trade. Nonetheless, the role of duty is not clear-cut in the literature. Prusa (1997) argues that low duty has very little impact on trade. Brenton (2001) even finds that duty is not significant. Given these mixed results, this factor deserves more investigation.

Before moving on, it is worth discussing duty further. As antidumping action is selective and duty is firm specific, the best one could do is to choose an appropriate duty to apply to each country. Even if this is done properly, one also has to keep in mind that not all firms in a named country are dumping, but when we use trade data at a country level, trade from all firms are taken into account. Therefore, it is not surprising why the results in some papers appear to be different. We can suspect that the significance of this variable is sensitive to the way it is defined.

As concerns non-market economies, the coefficient of *trans* is positive and significant from most equations except equation (3). This is again in line with our hypothesis. The positive sign of coefficient suggests that, once subject to AD action, producers from countries in transition do not reduce their exports to the EU as much as those from market economies.

Nevertheless, the effect of being a country in transition seems to be more significant on EU import quantities than on import values, as seen from the significance level. From value regressions, this factor is significant only at the 10% level in one equation and insignificant in the other. This casts a little doubt on the effect of this factor. We will report the results when the two groups of countries are split later.

For *ne*, we always obtain a positive sign of coefficient as expected. The coefficient is significant at the 1% level when y is expressed in value terms, and at the 10% level when measured in quantity terms. This results suggests that the impact of AD measure on a country's trade is mitigated if there are many countries named in the same filing. To think about the intuition, one could follow this example.

Suppose there is only one firm named in a petition. All other firms would benefit from this dumping firm being subject to AD as the dumping firm is the only one who has cost disadvantage due to AD measure. The other firms can then take this opportunity to export more aggressively. On the contrary, if all firms are named, the degree of cost asymmetry would be softened and those who can benefit most are only EU producers.

As for *prop*, our hypothesis on this variable is that the sign of coefficient is uncertain. It turns out that it generates a positive coefficient which is always significant at the 1% level. That is, if a named country has a large market share in EU imports, the impact of AD action on that country would be weaker. One possible explanation is that, given a large market share in EU imports, that country may have viewed the EU as its important market. Where this is the case, even though the duties are levied, the producers from that country would be more reluctant to divert trade to elsewhere. In other words, if they are big suppliers to the EU, they may want to keep exporting to the EU market.

Considering the coefficient magnitudes, the magnitudes of this variable when expressed in value (*propv*) are much larger than those when expressed in quantity (*propq*) and this is interesting. It could be that, from the viewpoint of the dumping firm, the share in quantity term may not be as important as that in value term. However, it is out of the scope of this work to explore this further.

Regarding *size*, the coefficient is always significant at the 5% level, but the sign of coefficient is positive when measured as *countrysize* whereas it is negative when measured as *marketsize*. Our hypothesis is based on our theoretical model where AD measure is determined by the sizes of two markets. However, the assumption imposed on the model are quite restricted as far as the EU antidumping practice is concerned. One implication drawn from our theory is that a producer from a country with a large market size dumps onto the country with a smaller market. The market size of the EU for any particular product is the summation of that from all member countries, so its market size is clearly larger than that of most countries dumping in the EU. It is then not appropriate to discuss the results from a theoretical point of view as some assumptions are violated.

In addition, the market size in the theoretical model refers to that of a particular product while what we measure are industry and country size, because of data limitation. Considering these two measures, the size of industry, though crude, could reflect the size of a specific market to some extent, but

it is not reasonable to think of the size of economy as a good proxy. As a result, these two measures may not be expected to influence the volumes of dumped imports in the same way and this is why the signs of coefficient from the two are significant but opposite.

The negative coefficient of *marketsize* (production + imports - exports) suggests that if the size of industry in a dumping firm's country is large, the reduction in its exports to the EU would be large too. The explanation is that, when subject to AD in the EU, the named firms would find it more attractive to sell less in the EU and sell more at home. Not only does dumping firm's sales divert to other countries, they can also shift back to the firm's domestic country if the local market size is sufficiently large.

The coefficient of *countrysize*, by contrast, is positive. This factor has not been analysed in other papers regarding trade effects of AD. The significance of this variable in both value and quantity as well as the stability of coefficient magnitude implies that the characteristics of named countries are important in influencing their trade volumes of dumped exports. The positive coefficient suggests that producers located in a larger country are less sensitive to EU antidumping activity. One possible explanation is that producers in a richer country may be larger and more willing to bear the cost of duty than those in a poorer country.

As concerns time dummies, they are by and large negative and significant as expected from year 0 to 2. From year 3 to 5, however, they are mostly insignificant but still have the expected sign. Our base year ($t = -1$) is the year in which the petition is filed. The negative coefficient confirms the intuition that the effect of AD threat is not as strong as the real action. Considering the evidence found elsewhere, it is not surprising why dummies from year 3 to 5 are not always significant.

The reason is that the market structure and the restrictions on each dumping firm have been much changed by that time due to revision. As time changes, many firms face lower duties than the initial levels and some of them raise the price to eliminate material injury. In addition, some evidence suggests that after year 2, imports from named countries to the EU, as well as to the US, rebound and exceed the level prior to the AD action.

With respect to the magnitudes of these dummies, those of year 1 and 2 tend to be the greatest. Our result says that the impact of AD practice is strongest in the first and second year after the definitive duties were first collected. This strengthens the analyses of other authors.

We also experiment by putting industry dummies into the regressions

but the results are not reported here. We begin by using the dummies that capture different industries as categorised by ISIC 2 digit. Those variables appear to be insignificant and do not improve the overall result. Then we experiment further by dividing industries into three main groups, say, chemicals, metals and others. This is due to the reason that EU chemical and steel industry are those who are relatively aggressive in initiating AD petitions. Defined broadly like this, the dummies are still insignificant. This suggests that the behaviour of dumping countries does not systematically differ across industries.

Concerning regressions for market and non-market economies, we split the sample and run regressions for two groups of countries. Table 8 tabulates the results for the former while table 9 reports the results for the latter.

Table 8: Result for Non-Market Economies

Variables	<i>rv</i>	<i>rv</i>	<i>rq</i>	<i>rq</i>
<i>duty</i>	-0.79**	-0.44	-0.81***	-0.47
<i>countrysize</i>	-0.01		-0.01	
<i>marketsize</i>		-0.04		-0.04
<i>ne</i>	0.11***	0.11***	0.11***	0.10***
<i>propv</i>	1.08***	1.25***		
<i>propq</i>			1.08***	1.24***
t_0	-0.11	-0.20	-0.04	-0.13
t_1	-0.18	-0.25	-0.11	-0.19
t_2	-0.19	-0.24	-0.11	-0.19
t_3	-0.12	-0.22	-0.03	-0.13
t_4	0.14	-0.07	0.10	-0.06
t_5	0.13	0.03	0.23	0.15
<i>constant</i>	0.78***	0.95**	0.70***	0.81**
Observations	226	194	226	194
F-Stat	6.24	5.01	9.59	7.81
Prob > F	0.00	0.00	0.00	0.00

The significance level at 1%, 5%, and 10% are indicated by ***, **, and * respectively.

Where the sample is split, the overall results become poorer. Some coefficients lose their significance and the lower F-stats imply that the explanatory

variables as a whole explain changes in the left-hand-side variable less well than when the full sample is run. However, this may not be worrisome since the number of observations in each equation drops sharply and this should be the reason why the overall outcome is worse than before. What is intriguing is the results on some individual variables.

Table 9: Result for Market Economies

Variables	<i>rv</i>	<i>rv</i>	<i>rq</i>	<i>rq</i>
<i>duty</i>	-0.09	-0.30	-0.29*	-0.48**
<i>countrysize</i>	0.02***		0.01**	
<i>marketsize</i>		-0.04*		-0.03
<i>ne</i>	0.00	0.01	0.00	0.02
<i>propv</i>	1.12***	1.45***		
<i>propq</i>			0.18***	0.15***
t_0	-0.23**	-0.17*	-0.20*	-0.16***
t_1	-0.24**	-0.18	-0.27**	-0.19
t_2	-0.26**	-0.20*	-0.26**	-0.19
t_3	-0.18	-1.24	-0.14	-0.07
t_4	-0.22	-0.19	-0.20	-0.16
t_5	-0.25	-0.30**	-0.24*	-0.23*
<i>constant</i>	0.34**	1.01***	0.56***	1.08***
Observations	387	329	387	329
F-Stat	8.27	5.51	4.88	4.10
Prob > F	0.00	0.00	0.00	0.00

The significance level at 1%, 5%, and 10% are indicated by ***, **, and * respectively.

To begin with, let us consider time dummies. The sign and magnitude of these dummies for market economies are rather similar to those for the whole sample. As for non-market economies, the dummies still have negative coefficients most of the time but none of them are significant. This suggests that during the period of 5-year AD action, imports from non-market economies do not systematically evolve over time. One reason could be due to the government's interference. Another possible reason could be that the producers from those countries hardly ever ask the European Commission to revise the case. To understand this matter more clearly, one has to compare the frequency of revision for countries in transition to that of other countries. Our

data set does not allow us to do that. This is another possible direction for future research.

Regarding size, the sign of *countrysize* for countries in transition changes to be negative but is not significant. The coefficient on *marketsize* for this group of countries is not significant either. As for market economies, the results are consistent with those reported earlier. The size of economy has a positive impact on exports to the EU whereas the size of domestic industry has a negative impact.

As for *prop*, the results from the full sample as well as the split samples reveal that import penetration may be the most significant factor that influences the changes in EU imports from the named countries. The coefficients from all regressions are positive and significant at the 1% level. In value term, the sizes of this coefficient from all equations are rather close to one another. In quantity, this factor seems to be more important to non-market economies than to others, as seen from far larger magnitudes. The coefficient sizes of *propv* and *propq* for non-market economies are almost the same. This suggests that import penetration in quantity term is as important as in value terms for this group of countries.

Surprisingly *ne* is significant at the 1% level as far as countries in transition are concerned, but it is not significant for the other sample. This suggests that, for market economies, the number of countries named in the same petition does not significantly influence the reduction in EU imports from a named country. This type of result is unexpected. Let us recall that Prusa (1997) and Brenton (2001) also find a peculiar result that trade diversion is stronger when there are more countries named. Combining our finding with theirs, once again this factor deserves more investigation.

In contrast to market economies, this factor positively affects imports from emerging countries. It is also seen that the coefficient sizes from different regressions are almost identical. Where more countries are subject to AD, the cost disadvantage arising from duties is spread across producers, so imports from a non-market economy does not reduce as much as when only a single or a few countries are named.

The most striking finding is on *duty*. When the sample is split, this factor loses its significance in some regressions, but is still negative. Moreover, the coefficient magnitudes are larger for countries in transition than for market economies. This implies that the prior belief that duties matter less to non-market economies arises in part because of some outliers' behaviour. The technique we use here controls for this problem and the finding suggests that

if outliers are given less weight, it should be the case that EU antidumping duties have more impact on producers in non-market economies and this may also be the reason why those countries are the main target of EU antidumping practice.

We look into the raw data again to investigate this result further. It is found that the maximum duty in our whole sample is 104% which is applied to Russia in an AD case on ammonium nitrate. This ammonium nitrate case is an extreme example given in section 2 of this study, and by coincidence it is the case with the highest duty. This particular example can raise one concern that a few extreme observations in a specific group of countries could be able to distort the broader picture of trade patterns. There has not been another paper that formally compares the response of non-market and market economies to the EU measures. Therefore, based on our results, at the same level of duty, the decrease in EU imports from emerging countries are greater than from market economies, other things being equal.

Before proceeding to the next regression, a few comments are worth mentioning. First, the number of observations in the split samples are relatively low. If the data is more complete, the regressions may perform better especially for time dummies. Second, as seen from the different results for the whole and split samples, countries may respond to an AD action differently in a systematic way. The result found for a specific group may not be easily generalised. Third, as emphasised before, AD duty is a tricky issue. The improvement in micro-level data will clearly provide more accurate results and better understanding of AD in general.

The last set of regressions we perform checks whether, when a specific country is subject to an AD measure, other countries benefit from that AD action. The next table reports the results.

Note again that we are not interested in the strength of trade diversion, but we verify how other countries respond to an AD duty imposed on a dumping country. The positive and significant coefficient for *duty* confirms that if the duty levied on a country is high, producers from elsewhere will benefit more from such a duty. These countries also include other countries named in the same petition but subject to different duties.

The coefficients of *propv* and *propq* are significant and negative as expected. If the import penetration for a named country is high, that country may view EU as its main market and would not reduce its export to the EU much despite the duty being levied. It is then difficult for other firms to export more aggressively.

Table 10: Result for Other Countries

Variables	<i>rv</i>	<i>rq</i>
<i>duty</i>	0.42**	0.17**
<i>ne</i>	0.02**	0.04***
<i>propv</i>	-1.15***	
<i>propq</i>		-0.94***
t_0	-0.15***	-0.10*
t_1	-0.05	-0.04
t_2	-0.13	0.09
t_3	0.06	0.16**
t_4	0.07	0.19***
t_5	0.14	0.20***
<i>constant</i>	0.97	0.89***
Observations	783	783
F-Stat	33.31	132.85
Prob > F	0.00	0.00

The significance level at 1%, 5%, and 10% are indicated by ***, **, and * respectively.

The variable *ne* has a positive and significant coefficient. This seems strange at first glance. However, it is explicable since this type of result reflects the fact that where trade diversion takes place, trade diverts more to other named countries than to non-named countries. This strengthens the result found in other papers that the trade diversion effect in the EU is weaker than in the US. The result also reveals that when the EU producers file an AD case, they tend to target imports that are responsible for a large market share. The issue of trade diversion among named countries is still left unaddressed in the literature and our results suggests that it is worth exploring. When a particular country is subject to AD, not only non-named countries, but also other named countries, benefit from it.

6 Conclusion

This paper investigates the trade effects of EU antidumping duties on imports from named countries. Unlike other studies, we treat different countries

named in the same petition separately in order to examine how each country responds to EU antidumping action. The AD cases ending up with definitive duties first imposed from 1989 to 1998 are taken into account. By analysing raw data, it is suspected that some outliers have a crucial, so we use robust regression technique to control for this problem.

Our results from econometric models give some new evidence to the literature. The main focus of this work is on the role of AD duty and we find that, in contrast to some existing evidence, the size of duty is important in reducing trade from a named country. It should be noted, however, that this paper is concerned only with AD cases with definitive duties whereas others take account of those with a negative decision and price undertakings as well. Strikingly, when we split the sample between market and non-market economies, producers from the latter tend to export less to the EU given the same duty size.

Although the results from the split sample suggests this, a dummy on countries in transition from the full sample points out that, other things being equal, emerging economies are less sensitive to the AD action. This can be viewed in the way that it is not duty but some unobservable characteristics of those countries that make them less sensitive to the EU measures.

Import penetration seems to be the most important factor that determines trade volumes from named countries. It positively affects EU imports from named countries. Other factors that have a positive impact on import volumes are country size and the number of countries named in a petition. While the result on the former is new, the latter has been studied in the literature but what we find here is different as far as all dumping countries are concerned. However, as for market economies only, the number of named countries are not significant. Combining this with the results found elsewhere, this is a puzzle left unaddressed.

It is also find that producers from a country in which the domestic industry is larger tends to export less to the EU once subject to AD. This implies that, in addition to a third country, trade could be shifted back to the domestic country if the market size is sufficiently large.

We check whether other countries benefit from AD duty faced by a particular named country. These countries include both non-named and other named countries. It turns out that they benefit from an AD measure imposed on a particular country. Other named countries benefit from it since the level of duty varies across countries though named in the same filing. We also have an interesting result in that EU trade diversion among named

countries is strong and this issue has been overlooked hitherto.

7 Data Appendix

This appendix presents sources the data. We are concerned with antidumping cases ending up with definitive duties where the first year of duties being imposed is from 1990 to 1998. The primary source of information regarding EU antidumping petition and antidumping actions are annual reports of Commission of the European Communities on the Community's anti-dumping and anti-countervailing activities, and various issues of Official Journal of the European Communities. The former summarises EU antidumping activities over a specific year whereas the latter contains details concerning each antidumping case.

As regards our work, each Official Journal contains information on the sizes of duties and number of dumping exporters in the same petition. The sizes of duties are used directly in our regressions and they are expressed in percentage terms. However, there are many AD cases where duties are not ad valorem but fixed in absolute terms. Where this is the case, we overcome the problem by using provisional duties or dumping margins where appropriate. As for the number of dumping exporters, we count the number of countries in which the dumping firms are located instead of the number of named firms because trade data is not available at the firm level.

Our trade data is obtained from EUROSTAT, Comext CD-Rom, Intra- and Extra-EU trade. The data used is as categorised in Combined Nomenclature (8 digit). In some rare cases where dumped products are classified at 6 digit level, we use trade data at 6 digit as well. EUROSTAT contains the data in both quantity and value terms and both are used in our analysis. The data is available only until 1998. Therefore, there are many AD cases where we are unable to observe the trade volumes of dumping firms for the whole 5 years after the duties were first levied.

To measure market size, we collect the data from World Bank Trade and Production Database. The market size of each dumping country is roughly calculated as domestic production (total outputs) plus imports minus exports. The data on market size is crude because it actually measures the size of industry, not a market for a specific product. The reason is that the level of disaggregation here is 3 digit (ISIC revision 2) whereas that of trade data

from EUROSTAT is at 8 digit HS. As two sources are in different systems, concordance tables are required to convert one to another. In doing this, some error are inevitable. The relevant tables are available online at Jon Haveman's Industry Concordances web page.

The country size is measured by GDP in US dollars deflated to the year 1995. The International Financial Statistics Yearbook, provided by the IMF, gives all information needed to calculate the country size.

Where economies in transition are concerned, we put a dummy into our regressions in order to capture their characteristics. The list of these countries is the same as in Miranda (1998) and Zanardi (2004). These are Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, China, Czech Republic, Cuba, Estonia, Georgia, Hungary, Latvia, Kazakhstan, Kyrgyzstan, Lithuania, Republic of Macedonia, Moldova, Poland, Romania, Russia, Serbia and Montenegro, Slovak Republic, Slovenia, Tajekistan, Turkmenistan, Ukraine, Uzbekistan and Yugoslavia.

References

- [1] Baldwin, R.E. and J.W. Steagall (1994), "An Analysis of ITC Decisions in Antidumping, Countervailing and Safeguard Cases", *Wirtschaftliches Archiv*, 130, pp. 290-38.
- [2] Brenton, P.(2001), "Anti-Dumping Policies in the EU and Trade Diversion", *The European Journal of Political Economy*, 17, pp. 593-607.
- [3] Falvey, R. E. and S. Wittayarungruangsi (2004), "Market Size and Antidumping in Duopolistic Competition", unpublished.
- [4] Finger, J.M., H.K. Hall and D. Nelson (1982), "Political Economy of Administered Protection", *American Economic Review*, 72, pp. 452-66.
- [5] Hamilton, L.C. (1991), "How Robust is Robust Regression?", *Stata Technical Bulletin*, 2, pp. 21-6.
- [6] Hansen, W.L. and T.J. Prusa (1996), "Cumulation and ITC Decision Making: The Sum of the Parts is Greater than the Whole", *Economic Inquiry*, 34, pp. 746-69.
- [7] Irwin, D. (2002), *Free Trade Under Fire*, Princeton University Press, Princeton.

- [8] Konings, J., H. Vandenbussche and L. Springael (2001), "Import Diversion under European Antidumping Policy", *Journal of Industry, Competition and Trade*, 1,3, pp. 283-99.
- [9] Messerlin, P. and G. Reed (1995), "The US and EC Antidumping Policies", *The Economic Journal*, 105, pp. 1565-75.
- [10] Miranda, J., R.A. Torres and M. Ruiz (1998), "The International Use of Antidumping: 1987-1997", *Journal of World Trade*, 32, 5, pp. 5-71.
- [11] Moore, M. (1992), "Rules or Politics? An Empirical Analysis of ITC Antidumping Decisions", *Economic Inquiry*, 30, pp. 449-66.
- [12] Prusa, T.J. (1997), "The Trade Effects of US Antidumping Actions", in R.C. Feenstra (ed.), *The Effects of US Trade Protection and Promotion Policies*, University of Chicago Press, Chicago.
- [13] Prusa, T.J. (1998), "Cumulation and Anti-Dumping: A Challenge to Competition", *The World Economy*, 21, pp. 1021-33.
- [14] Staiger, R.W. and F.A. Wolak (1994), "Measuring Industry-Specific Protection: Antidumping in the United States", *Brookings Papers on Economic Activity: Microeconomics*, pp. 51-118
- [15] Tharakan, P.K.M. and J. Waelbroeck (1994), "Antidumping and Countervailing Duty Decisions in the EC and in the US: An Experiment in Comparative Political Economy", *European Economic Review*, 38, pp. 171-193.
- [16] Tharakan, P.K.M., D. Greenaway and J. Tharakan (1998), "Cumulation and Injury Determination of the European Community in Antidumping Cases", *Weltwirtschaftliches Archiv*, 134, pp. 320-39.
- [17] Zanardi, M. (2004), "Anti-Dumping: What are the numbers to Discuss at Doha?", *The World Economy*, 27, 3, 403-33.