

# Anti-dumping Duties and its Impact on Exporters: Firm Level Evidence from China

Piyush Chandra<sup>1</sup>

Cheryl Long

Department of Economics

Department of Economics

Colgate University

Colgate University

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<sup>1</sup>Department of Economics, Colgate University, Hamilton, NY 13346. Corresponding author. (email: pchandra@mail.colgate.edu). We would like to thank Ning Chen for excellent research assistance.

## **Abstract**

Despite a dramatic rise in the instances of anti-dumping (AD) duties, the impact of AD duties on targeted firms is not clear. In this paper we provide the first piece of firm level evidence that AD duties can lead to a dramatic decrease in targeted firms' productivity. We match detailed firm level data on the U.S. AD duties with the corresponding firm level information on China, and find that imposition of AD duty by the United States led to as much as thirty percent decrease in labor productivity of the Chinese firms that are specifically named in the AD duties. The industry-wide AD duties, on the other hand, have much smaller lagged effects. These differential effects on heterogenous firms highlight the importance of firm level studies. We also show that decrease in labor productivity is not due to the scale effects or due to capital deepening, indicating a pure productivity effect.

JEL Classification: F13; F14; F53

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# 1 Introduction

Anti-dumping duties (AD) are duties levied on imported products that are considered to be sold at “less than fair value.” These duties are levied “in order to offset“ the potential injury to the domestic industry. While AD has been used for more than a century, there has been a dramatic growth in the number of AD investigations in recent years (Prusa (2001), Blonigen & Prusa (2008)). But despite the proliferation in anti-dumping duties and the consequent voluminous literature searching for causes and impact of AD use, there are very few empirical papers that look at the impact of AD duties from the perspective of foreign targeted firms, as pointed out in Blonigen & Prusa (2003) and Bown (Forthcoming).

In this paper, we attempt to fill the gap in the literature by exploring the impact of AD duties on targeted firms at the firm level. Specifically, we investigate the impact of U.S. AD duties on Chinese firms that were specifically named in the duties. To preview our results, we find that the U.S. AD duties led to a significant drop in productivity of those firms that were named in the duties. Our results are both statistically and economically significant, with the most conservative estimates implying about 18% decrease in labor productivity in Chinese firms that faced a specific AD duty from the U.S. These estimates are robust to a large set of robustness checks.

In contrast, we see no significant drop in labor productivity of Chinese exporters in targeted industries on which industry-wide AD duties are imposed.

As the industry-wide AD duties are often higher in rates than specific duties targeting specifically named firms, this finding is somewhat surprising. We interpret this to be evidence that the actual implementation of industry-wide AD duties is not as effective as specific firm AD duties.

Among the flurry of AD investigations initiated and duties imposed in recent years, China has become one of the most frequently targeted country. Among the countries that initiate AD investigations and impose AD duties against China, the U.S. ranks Number Two in both the number of investigations and the number of AD duties imposed.<sup>1</sup> What impact does the frequent imposition of AD duties by its largest trading partner have on the targeted Chinese exporters? The answer to this question has important implications for both exporting firms in China and around the world as well as policy makers in all major trading countries.

Our study relates to at least two strands of literature in economics. The first is that on anti-dumping. Most studies on AD protection look at the impact of AD protection on the import competing firms in the same country (see, for instance, Konings & Vandebussche (2009)). A few papers look at the impact of AD duties on foreign countries but study the impact of AD at the product or the industry level (for instance, Blonigen & Feenstra (1997), Bown & Crowley (2006), Bown & Crowley (2007)).

To the best of our knowledge, the only other empirical paper that looks

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<sup>1</sup>India is the number one user of AD duty actions against China both in terms of the number of investigations and the number of actual AD measures taken.

at the impact of AD duty on the target country at a disaggregated level is Brambilla, Porto, & Tarozzi (2008). Two differences distinguish our paper from theirs: First, Brambilla, Porto, & Tarozzi (2008) look at a specific sector, Vietnamese catfish industry, to look at the impact of a particular U.S. AD imposed in 2003 on Vietnamese catfish, whereas the current paper looks at all Chinese industries that were targeted by the U.S. AD duties during 2000-2006. Second, Brambilla, Porto, & Tarozzi (2008) study the impact of AD duty on household income for individuals, whereas we are interested in the impact of AD duty on targeted foreign firms' performance.

Our study also relates to the general literature linking trade with productivity. One strand of the literature documents the gains in aggregate productivity due to trade liberalization as the least efficient firms drop out of the market (Hillman (1982), Melitz (2003)). Another strand focuses on firm level investigations of how firm productivity responds to trade. For example, Trefler (2004) shows that a decrease in U.S. trade barriers associated with CUSFTA led to a dramatic increase in labor productivity for Canadian firms.

Several mechanisms have been proposed to explain the positive trade-productivity link. De Loecker (2007) highlights the productivity gains at the firm level due to an increase in market access through learning by doing, while Ederington & McCalman (2008) explains the trade-productivity link by the channel of new technology adoption. In addition, exporting firms may increase their size in response to increased market access and, hence,

increase measured productivity of the firm in presence of economies of scale. Similarly, productivity might increase as a result of capital deepening.

In contrast to earlier work that studies how an increase in market access affects firm productivity, we explore the issue from a new angle: What happens when the access to foreign market is reduced due to AD duty imposition? Thus, in contrast to prior studies, we study whether and how these mechanisms work in reverse - in the case of rising trade protection and reduced market access.

The rest of the paper is as follows. Section 2 provides some background information on the U.S. AD process, which motivates our empirical strategy. Section 3 describes the data, followed by results in section 4. And Section 5 concludes.

## **2 Institutional Background and Empirical Specification**

As mentioned in the introduction, there has been a dramatic rise in the use of AD duties in recent years, with China being particularly targeted. Figure 1 shows the number of AD duty investigations filed against the top three target countries (China, Korea and the U.S.) and other major economies between 1995-2008. We can see that China stands out as being on the receiving end of AD duties.

This is unlikely due to retaliation against China's own AD duty investiga-

tions. While China has also increased the number of AD investigations and AD duties against other countries recently, the number of AD duty actions it takes is much in line with the other countries and is in fact on the lower end once we take its trade volume into account. Figure 2 shows the number of AD duty investigations carried out by the top four AD users among WTO members and China. While India has recently emerged as one of the top users of AD actions, China has not drastically increased its use of AD investigations.

Furthermore, we can see that not all sectors are targeted similarly in the AD investigations. As is evident from Figure 3 and Table A1, some sectors such as chemicals, steel, and textiles have been targeted much more frequently than others. Figure 3 also shows that the same pattern holds when we look specifically at China as the target country during this period.

The patterns above point to the increasing importance of AD duties in world trade. Given the large number of AD cases it has been involved in, China will be a good case to focus on when exploring the effects of AD duties. The specific goal in this paper is to study the impact of AD duties on foreign firms that were targeted by the duties, and a straightforward approach is to conduct the following estimation:

$$y_{ijt} = \alpha_j + \alpha_t + \beta_1 AD_{jt} + \beta_2 X_{ijt} + \varepsilon_{ijt} \quad (1)$$

where  $y_{ijt}$  is the firm performance measure for firm  $j$  in industry  $i$  in year  $t$ ,

$AD_{jt}$  is the anti-dumping duty measure for firm  $j$  in that given year,  $X_{ijt}$  is a set of firm characteristics, while  $\alpha_j$  and  $\alpha_t$  are firm and year fixed effects, respectively. Hence, our coefficient of interest is  $\beta_1$ .

The concern of endogeneity, however, cautions against a simple application of the above method. Specifically, the variable  $AD_{jt}$  may be endogenous. Firstly, there may be some omitted (unobservable) variables that affect both firm performance as well as whether they have AD duties imposed on them. In addition, foreign firms may self select into being named in the AD duties, i.e., we may have reverse causality. To better understand these concerns and to produce research designs to address these issues, we now turn to the underlying institutional framework related to anti-dumping duties in the United States.

In the U.S., there are two separate agencies that handle anti-dumping investigations: the International Trade Administration (ITA) of the U.S. Department of Commerce (DOC) and the International Trade Commission (ITC). The DOC determines whether the alleged dumping exist and then determines the final dumping margin, whereas the ITC determines whether the alleged dumping has threatened or caused injury to the domestic import competing industry. In order for the AD duty to be imposed, both DOC and ITC should come to affirmative findings in their respective final decisions.

A typical anti-dumping case is filed by a representative from the domestic import competing industry (either a group of firms or a trade union) who believes that the foreign firms are selling in the domestic U.S. market at “less



than fair value.” The petitioner files its case with both the DOC and the ITC with the names of the foreign firms alleged to be dumping and provides supporting evidence, which prompts an AD investigation. After about a month and a half of the filing, the DOC sends out questionnaires to all respondents (exporting firms) in the country named in the petition and requires compliance within about two months.<sup>2</sup> The questionnaires are very detailed and hence the legal and administrative costs in responding could be high. In cases where the firms do not respond to the questionnaires of the DOC, or if the DOC determines the foreign firms to have not been cooperative, it can base its dumping margin decision on “adverse facts available,” which tend to result in very high margins determined. Despite the possibility of a higher AD duty, foreign firms may rationally choose not to cooperate if they find the compliance costs too high (Fox & Moore (Forthcoming)).

Note that, even if foreign firms respond to the questionnaires, the DOC conducts its own assessment and decides whether the foreign firm has been cooperative. In determining the dumping margin the DOC may use surrogate values from third countries, especially in cases of non-market economies like China.<sup>3</sup>

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<sup>2</sup>The requests “are usually issued a few days after the ITC’s preliminary injury determination, which occurs 45 days after the date on which the petition is filed.”- source: Antidumping Manual page 4, ch4 DOC website. “Typically, for investigations and reviews, respondents are given 21 days from the issuance of the questionnaire to complete Section A and 37 days from the issuance for the remainder. Extensions are usually granted for no more than 14 days. For supplemental questionnaires, our [DOC’s] deadline will depend on the time remaining before a preliminary determination or verification. Generally, we try to grant no more than 14 days.”-page 17, ch4 Anti-dumping Manual.

<sup>3</sup>Note that the procedure for issuance of separate rates for firms from NME (non-market economies) such as China is more stringent. In order to qualify for the separate

Both the DOC and the ITC conduct two separate rounds of independent investigations - a preliminary one and a final one. If there is a final affirmative decision by both the DOC and the ITC, the final AD duty equal to the dumping margin is imposed. Results of both preliminary and final findings of both the DOC and the ITC are published in the *Federal Register*. These reports contain information on the firm specific duties for the cooperative firms and a common “all others rate” for all other exporters from the target country, which typically tends to be higher. These reports are the important source of information in compiling our list of targeted firms.

It is important to note that the Department of Commerce almost always finds an affirmative decision for dumping (Blonigen (2006)). Hence, whether or not a final duty is imposed rests mainly on the DOC’s decision on whether the dumping margin falls below a certain threshold, *de minimus*, and the ITC’s decision on whether the alleged dumping has threatened or caused injury to the domestic import competing industry.

The discussion above shows that both the filing and the outcome of an AD investigation are largely beyond the control of the target firms. But it is still possible that firms specifically named in the final AD duties have different characteristics compared to other exporters. In the case filing stage, it is

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rate status firms have to show that they are free from government control both de jure and de facto. Note, however, that “The Department’s separate rates test is not concerned, in general, with macroeconomic border-type controls (e.g., export licenses, quotas, and minimum export prices). Rather, the test focuses on controls over the decision-making process on export-related investment, pricing, and output decisions at the individual firm level.” source: Import Administration Policy Bulletin Number: 05.1 ).

likely that the petitioner (i.e. import competing firms in the AD imposing country) would like to name their biggest rivals (thus the more productive exporters) in the foreign country. However, to the extent that being specifically named gives the possibility of lower specific AD duties, domestic import competing firms may prefer to name the less productive exporters. Similarly, in the investigation stage, the relatively weak firms may have more incentives to participate in the investigation to secure specific and lower AD duties. But on the other hand, the stronger firms have more resources available to bear legal and accounting costs related to participating in the investigations. Thus, there is the concern of endogeneity, although a priori it is not clear whether it is the weaker firms or the stronger firms that will be named in either the AD investigations or the AD duties.

Nevertheless, being specifically named in an AD duty is the clearest indication that a foreign firms faces AD duties from the U.S. Thus we adjust Equation (1) as follows to highlight this point:

$$y_{ijt} = \alpha_j + \alpha_t + \beta_1 ADnamed_{jt} + \beta_2 X_{ijt} + \varepsilon_{ijt} \quad (2)$$

where  $y_{ijt}$  is the firm performance measure for firm  $j$  in industry  $i$  at time  $t$ , while  $ADnamed_{jt}$  is a dummy indicating whether firm  $i$  was specifically named in an AD duty in year  $t$ .

The above discussion also suggests several strategies we can take to address the potential issue of endogeneity. First, we can use the firms named in

the AD duties themselves (the named AD duty firms) as the control group. In other words, we study how firm performance changes in the years when a firm is imposed with AD duties, relative to the years when it was not. This helps alleviate the endogeneity concerns discussed above to some extent.

A remaining concern is that more AD duties may be imposed in times with lower average firm productivity. To control for such potential common trends across firms over time, we will also rely on two different groups of firms as controls: firms that were named in AD investigations (the AD investigated firms), and firms that exported during our sample period 2000-2006 (the exporters). As will be shown in Section 4, the results from studying only the named AD duty firms remain largely unchanged when using these different samples. Reassuringly, this implies that the main source of variation for our results is the over-time within firm changes in AD duty status.

Between the two control groups, firms that are closest in their features to the AD duty firms are likely the Chinese firms that were also investigated in an AD case during the sample period but for whom the AD duties were not imposed. Hence, we use this group of AD investigated firms as our first set of control group. A number of other papers also use firms/industries where the AD was initiated but where no final AD duty was imposed as a control group for identification. The paper closest to our econometric methodology is Konings & Vandenbussche (2009), where the authors use termination cases as a control group to study the heterogeneous responses of domestic firms in terms of sales and exports, when the country imposed AD duties on foreign

exporters.

In comparison to the AD investigated firms, the exporters as a group may be more different from the named AD duty firms. But they will allow us to address a closely related issue: How does being specifically named in AD duties affect the firm performance relative to facing an industry wide AD duty? As mentioned before, conditional on the industry being targeted with an AD duty, firms that are explicitly named in the investigations are charged a lower AD duty on average relative to all other firms in the industry which were not named. On the other hand, when actually implemented, de facto, AD duties may deviate from the stipulated, de jure rates, being specifically named in the AD duties may imply a higher AD rate. Thus, what effect being specifically named in the AD duties has on firm performance is an empirical question.

To answer this question, we use an equation similar to that in Equation (2), using all other exporters in the four-digit industry that were not explicitly named in the AD duties as the control group. To study the effect of the industry-wide AD duties on exporters, we include a dummy variable,  $AD_{it}$ , indicating whether industry  $i$  is targeted by an AD duty in year  $t$ . In addition, since we want to see whether there is a differential impact of being named in the AD duties, we include an interaction term between the industry AD dummy and the firm level AD duty dummy.

Hence, the new estimation equation is given by,

$$y_{ijt} = \alpha_i + \alpha_t + \beta_1 AD_{it} + \beta_2 AD_{it} * AD_{named_{jt}} + \beta_3 X_{ijt} + \varepsilon_{ijt} \quad (3)$$

where  $y_{ijt}$  is the firm performance measure for firm  $j$  in industry  $i$  at time  $t$ , as earlier. However,  $AD_{it}$  indicates whether the industry  $i$  has been targeted in an anti-dumping case in year  $t$ , whereas  $AD_{named_{jt}}$  is an indicator variable showing whether the firm  $j$  was named in the investigations.

### 3 Data

The firm level anti-dumping data comes from the Global Anti-dumping Database (v.5.0) by Bown (2009), while data on other variables are from a large and comprehensive dataset on industrial firms published by the National Bureau of Statistics of China (NBS) -the Annual Survey of Chinese Industrial Firms. The NBS dataset includes all SOEs and firms of other ownership types with a turnover of more than 5 million RMBs. Typically the firms included in the dataset account for roughly 90% of the total industrial output (Demetriades et. al. (2008)).

The Global AD Database has information on AD duties imposed by around twenty five countries between 1980-2008.<sup>4</sup> The database also has information on the names of the foreign firms targeted in the AD investi-

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<sup>4</sup>Note that, while the sample period varies across countries, the AD data for the US is available for this entire period.

gations for several countries including the U.S. For this paper, we focus on the AD measures initiated against China by U.S. firms. We match firms in the Global AD Database with our firm level data on Chinese firms using names of the firms. We verified the information from the respective original *Federal Register* notices, which published the corresponding AD information and updated firm names if they were missing from the Global AD Database.

Out of around 1378 Chinese firms that were specifically named in AD duties by the U.S. between 1980-2008, we are able to match 687 firms with our China firm database. One explanation for why we cannot match all the firms is that we only have firm level information for the 2000-2006 period. Note that, in our analysis below we only include those firms which had an AD duty imposed between 2000-2006, so potentially our data coverage is better for this more recent time period. An additional plausible reason explains why we could not find matches for all the firms. As firm names given in the AD lists may be incorrect, the corresponding Chinese firms cannot be matched in our Chinese firm level data. This may be worrisome because it implies that some firms targeted by the U.S. AD duties are lumped together with firms not subject to the duties. However, this will bias against our finding effects of AD duties on Chinese exporters.

Note that, we carefully matched the firms using names to avoid problem due to errors in spelling etc. In cases of confusion we verified the names using outside information such as the company's website or using the information from National Administration for Code Allocation to Firms (NACAO)). The

NACAO is the agency responsible for assigning unique identifiers to firms in China which are also used in our dataset from China National Statistical Bureau. Moreover, the NACAO website also provides information on the location of the firm, the products of the firm, the names of their affiliated/subsidiary plants, and so on. We also use such information to double check our matching.<sup>5</sup>

The firm performance measure we focus on is the logarithm of labor productivity, which is a widely used measure in the literature (for instance, see Treffer (2004) and Van Biesebroeck (2005)). Specifically, it is computed as the ratio between value added and employment (in logs). Using the alternative measure of value added divided by wages (in logs) does not change our results.

The summary statistics of the key variables are given in Table A2, where the top panel compares the named AD duty firm sample with the AD investigated firm sample, while the bottom panel compares the named AD duty firm sample with the exporting firm sample. As shown in the tables, the named AD duty firm sample is very similar compared to the AD investigated firms in all the variables. In contrast, there are detectable differences between the named AD duty firms and the other exporting firms. The firms specifically named in AD duties tend to be larger, older, more productive,

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<sup>5</sup>Another potential explanation for why we could not match some firms that were named in the AD investigations is that these Chinese exporters are not included in the China firm dataset because they do not satisfy the size criterion for inclusion. Note, however, that as exporters tend to be bigger in size this explanation is probably not as important.



and have higher exports. This clearly shows that the firms targeted with specific AD duties are not representative of the whole population of Chinese exporters and the AD investigated firms are a much more suitable control group for the named AD duty firms.

## 4 Results

As discussed previously, we intend to study the effects of two kinds of AD duties, the AD duties on specifically named firms and the industry-wide AD duties. We estimate Equation 2 to explore the impact of AD duties on specifically named firms, while for the effects of industry-wide AD duties, we resort to Equation 3.

### 4.1 Effects of specifically named AD duties

Tables 1 and 2 give results from estimating Equation 2, where Table 1 studies named AD duty firms only, whereas Table 2 also includes the AD investigated firms as the control group. Column 1 in Table 1 gives our baseline results, where the capital intensity and age of the firm are controlled for as well as firm fixed effects and year fixed effects. Being named specifically for an AD duty is shown to have a significantly negative impact on the firm's labor productivity, and the magnitude is large—18% drop in labor productivity.<sup>6</sup>

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<sup>6</sup>The percentage reduction is given by  $(exp(b) - 1) * 100$  using the standard transformation, where  $b$  is the coefficient estimate. As argued in Krautmann & Ciecka (2006), one could also interpret the coefficients directly as proportional change in the dependent

This result is consistent with one of the main insights from the recent theoretical literature that an increase in trade barriers will lead to a decrease in firm productivity. It is important to note that these losses in productivity are at the firm-level and thus are not due to a switch in market share towards less productive firms.

As only named AD duty firms are included in the sample, the source of variation comes from the AD duty status change over time for the same firms. In addition, both firm fixed effects and year fixed effects are controlled for in the estimation. Thus, the concern for sample selection is mitigated. To strengthen this argument, we rerun the regressions using the lagged value and the leading value of AD duty indicator, respectively, instead of the contemporaneous value. As shown in Columns 2 and 3, the negative AD duty effects disappear, implying that whatever happened to firm labor productivity in the year of AD duty imposition is not persistent in time. This is contrary to the sample selection explanation of the results, i.e., the named AD duty firms being different from the control group to begin with.

Theoretically, AD investigations and duties should target only exporting firms. But our sample of AD duty firms and that of AD investigated firms both include a small number of firms that did not export in any of the years between 2000-2006. This could be due to mistakes on the part of the U.S. petitioners. It could also be that these Chinese firms had exported previously

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variable. Using the coefficients directly suggests an even bigger impact, 21% drop in labor productivity.

but have stopped exporting by 2000. We refer to these firms as the exporter-no-more firms. If our result is just an artifact of sample selection, then the performance of these exporter-no-more firms should still be correlated with the AD duty indicator in both cases above. But if it is the reduced market access due to AD duties, then the performance of these firms should not be correlated with the AD duty dummy. Column 5 gives results for these firms. For comparison, Column 4 offers results for those named AD duty firms that exported at least once between 2000 and 2006. The estimates again support the argument that AD duties have indeed led to a drop in the targeted firms' labor productivity.

How long do these effects last in time? In Column 6 we include both the contemporaneous value and the lagged value of AD duty indicator to study the possibility of persistent effects. The results show that the effects of being specifically named in an AD duty are limited to one year. The average time between the filing and the conclusion of an AD investigation is about a year. Thus to study the possibility that the negative impact of AD duties starts as soon as the filing of the case, we include the one-year leading value of AD duty indicator in Column 7, which show no such effects in advance of the final decision. Thus, the negative effect on labor productivity of being named in an AD duty is largely a contemporaneous effect.

In order to control for common time trend across firms, we include the AD investigated firms as the control group in Table 2, which has the same structure as Table 1. The results are similar to those in Table 1, except

for a slightly larger effect of AD duties. This suggests that the negative impact of AD duties observed is not completely due to sample selection, i.e., less productive firms are imposed AD duties thus the observed negative correlation between AD duties and labor productivity. Furthermore, the negative effects of AD duties are not just due to a downward movement in labor productivity and an increase in the number of AD duties that coincided over time.

To test the robustness of the above findings, we conduct additional tests, as shown in Tables A3 and A4. We exclude several industries one at a time from the sample, drop outliers, focus on firms that are domestically owned, and include an export indicator as additional explanatory variables. Estimates from all these specifications confirm the significant and negative effects of being named in an AD duty on firm labor productivity, with domestically owned firms suffering a larger impact.

## **4.2 Effects of industry-wide AD duties**

We now turn to the results studying the effects of industry-wide AD duties. The sample includes both the specifically named AD duty firms and all firms that exported at least once during 2000-2006. For exporting firms not specifically named, they still face a common industry-wide AD duty rate if they are in the targeted industry. Table 3 gives estimation results based on Equation 3, which allows us to distinguish the effect due to being explicitly named in an AD duty from that of belonging to the industry against which

the U.S. imposed an AD duty.

Specifically, the industry-wide AD duty indicator,  $AD_{it}$ , takes a value of one for all firms in the four digit industry  $i$  where the U.S. had reached at least one affirmative AD decision against any firm belonging to the same industry in year  $t$ . As the  $AD_{named_{jt}}$  dummy is defined the same as before, it takes a value of zero for two types of firms: (1) all firms that are in industries not targeted by AD duties; and, (2) all firms that are not named specifically in the AD duties but belong to those four-digit industries that are targeted by AD duties.

As discussed previously, a priori we do not know what the effect of  $AD_{it}$  will be on firms' labor productivity. On the one hand, the industry-wide AD duties tend to be higher. On the other hand, the de facto rate may be lower for firms not specifically named in the duties.

Table 3 shows that in fact, the contemporaneous effects on exporting firms facing industry-wide AD duties are not significantly different from zero (Column 1). But the interaction between  $AD_{it}$  and  $AD_{named_{jt}}$  has a negative and significant effect, again confirming the negative impact of being specifically named in the AD duties (Column 2). Column 3 and Column 4 add the one year lagged values and the one year leading values of AD duty indicators, respectively. The results show that while specifically named AD duties mainly have contemporaneous effects, the small industry-wide AD effects are lagged by one year. We also conduct multiple robustness tests, with results all confirming the findings summarized above (see Table A5).

### 4.3 Mechanisms of AD duty effects

The above results are consistent with the insight from the theoretical models that being named in the AD duties leads to a significant drop in labor productivity. Several mechanisms have been suggested in the literature as to why trade liberalization and the consequent increased market access lead to increased productivity. We study below whether these mechanisms have worked (in reverse) to explain the drop in productivity after AD duty imposition. One possibility is the scale effect, where reduced output in the targeted firms leads to lower productivity due to economy of scale. Another potential channel is the opposite of capital deepening, i.e., a reduction in capital intensity. In Table 4 and Table 5, we explore whether these mechanisms were at work for the negative effects of specific AD duties on Chinese exporters, using other AD investigated firms as the control group.

Surprisingly, Column 1 in Table 4 shows that the operating revenue (in logs) of firms specifically named in AD duties are actually greater than other firms who were also investigated for AD. Though, the effects become insignificant when firms that did not export (the export-no-more group) are excluded from the sample. Hence, these results suggest that the scale mechanism is probably not the explanation for the negative effects of AD duties.

Why do specific AD duty firms have higher revenues? Columns 3 and 4 in Table 4 suggest that this may be an artifact of the named AD duty firms being different from the other investigated firms to begin with. To study this possibility, in Column 3, we replace the contemporaneous value

of specific AD duty with its one year lagged value; while in Column 4, we use the one year leading value. These two values are both significantly and positively correlated with the firm's operating revenue, and the coefficients have similar magnitudes to that of the contemporaneous AD duty indicator. In other words, the positive correlation between revenue and specific AD duty firms may be due to sample selection in revenue.

Table 5 studies the possibility of reverse capital deepening as the mechanism for the negative AD duty effects, with the same structure as Table 4. Although the coefficients for the specific AD duty indicators are negative, suggesting a decrease in capital intensity, none of these estimates are statistically significant. Thus the evidence is not strong that reverse capital deepening is the mechanism to explain the negative productivity effects of AD duty in China. Other mechanisms will have to be explored in future studies.

## 5 Conclusion

In this paper we study the impact of anti-dumping duties imposed by the United States on Chinese exporters. We find that being hit with specific AD duties led to substantial decrease in the productivity of Chinese exporting firms, while other exporters in industries targeted by industry-wide AD duties only suffer a small drop in labor productivity after a one year lag. Furthermore, we find that the impact of AD duties on productivity is neither

due to a decrease in the size of the firm nor a result of decrease in capital at the firm level, thus implying a pure productivity effect.

These results are an important first step in the study of anti-dumping duties, because the U.S. is China's largest trade partner and one of the top users of AD duties. It would be interesting to see whether our results can be extended to include other major users of AD duties (such as the EU and India). A second potential extension of the research is to study at the firm level export diversion towards other markets as a result of AD duties. Yet another direction for future research is on other possible mechanisms through which market access affects firm performance, such as product switching.



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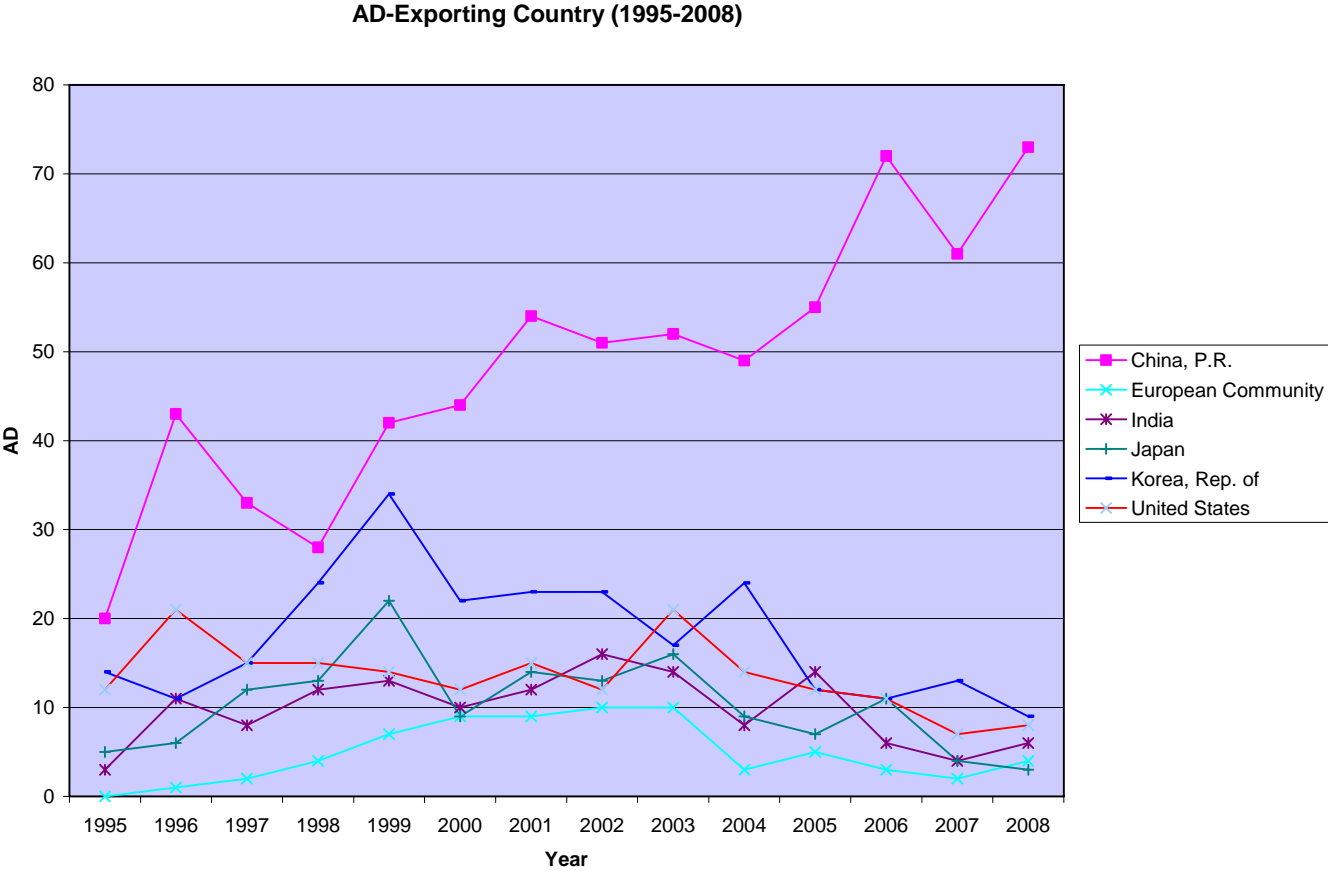
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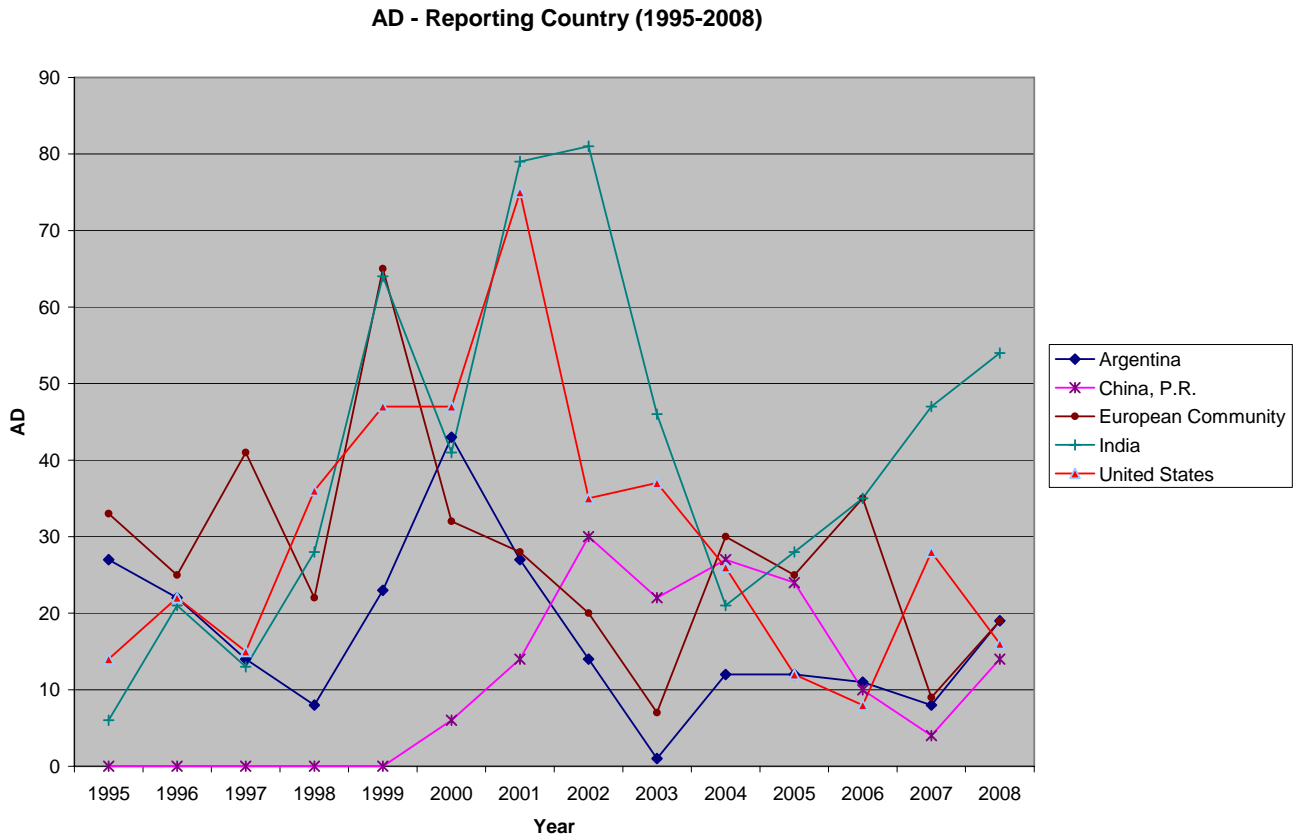
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**Figure 1: Top Targets of Anti-dumping Duty Investigations (1995-2008)**



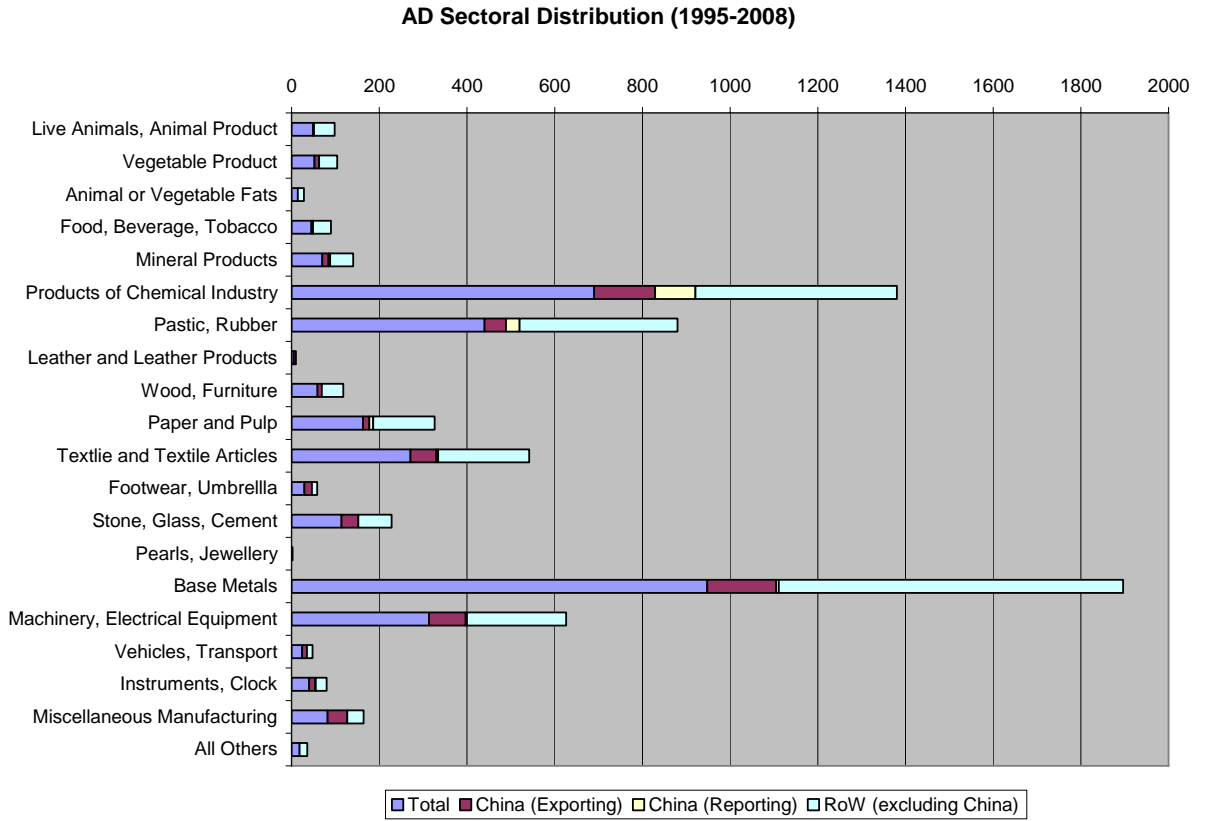
Source: Authors calculation based on data from [www.wto.org](http://www.wto.org)

**Figure 2: Top Users of Anti-dumping Duty Investigations (1995-2008)**



Source: Authors calculation based on data from [www.wto.org](http://www.wto.org)

**Figure 3: Sectoral Distribution of AD Investigations (1995-2008)**



Source: Authors calculation based on data from [www.wto.org](http://www.wto.org)



**Table 1: Impact of Specific Anti-dumping Duties on Labor Productivity  
(Using Time Variation Only)**

Dependent Variable = ln(Labor Productivity)	(OLS)	(OLS)	(OLS)	(OLS) <sup>1</sup>	(OLS) <sup>2</sup>	(OLS)	(OLS)
AD	-0.2070* (0.0823)			-0.2164* (0.0930)	0.1091 (0.2557)	-0.1963* (0.0973)	-0.1928 (0.1023)
Capital-Labor Ratio (K/L)	0.0014*** (0.0003)	0.0016*** (0.0003)	0.0015*** (0.0003)	0.0015*** (0.0003)	0.0010* (0.0004)	0.0016*** (0.0003)	0.0015*** (0.0003)
Age	0.0894*** (0.0238)	0.0738* (0.0304)	0.058 (0.0306)	0.0832** (0.0270)	0.1424* (0.0557)	0.1012** (0.0332)	0.0825* (0.0332)
Age <sup>2</sup>	-0.0001 (0.0004)	-0.0001 (0.0005)	0.0005 (0.0005)	0.0001 (0.0004)	-0.0025* (0.0012)	-0.0002 (0.0005)	0.0004 (0.0005)
AD (t-1)		-0.0066 (0.0983)				0.0423 (0.1011)	
AD (t+1)			-0.0923 (0.0972)				-0.0487 (0.0997)
Constant	2.8433*** (0.2416)	2.8174*** (0.3226)	2.9119*** (0.3001)	2.8816*** (0.2706)	2.5642*** (0.6313)	2.5864*** (0.3417)	2.7246*** (0.3155)
Adj R <sup>2</sup>	0.58	0.60	0.59	0.55	0.69	0.60	0.59
Observations	1150	909	898	970	180	909	898
Number of Firms	241	228	230	194	46	228	230
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

1. Sample restricted to only those firms that exported at least once between the periods 2000-2006.

2. Sample restricted to only those firms that never exported even once between the periods 2000-2006.

**Table 2: Impact of Specific Anti-dumping Duties on Labor Productivity  
(Using Investigated Firms as Control Group)**

Dependent Variable = ln(Labor Productivity)	(OLS)	(OLS)	(OLS)	(OLS) <sup>1</sup>	(OLS) <sup>2</sup>	(OLS)	(OLS)
AD	-0.2873*** (0.0735)			-0.3015*** (0.0791)	-0.0286 (0.2538)	-0.2522** (0.0890)	-0.2611** (0.0945)
Capital-Labor Ratio (K/L)	0.0009*** (0.0002)	0.0011*** (0.0002)	0.0013*** (0.0002)	0.0007*** (0.0002)	0.0012** (0.0004)	0.0011*** (0.0002)	0.0013*** (0.0002)
Age	0.1051*** (0.0191)	0.0874*** (0.0236)	0.0747** (0.0242)	0.0991*** (0.0207)	0.1465** (0.0511)	0.1088*** (0.0247)	0.0937*** (0.0251)
Age <sup>2</sup>	0.0000 (0.0003)	0.0006 (0.0004)	0.0008 (0.0004)	0.0002 (0.0004)	-0.0011 (0.0010)	0.0005 (0.0004)	0.0006 (0.0004)
AD (t-1)		-0.1239 (0.0842)				-0.0283 (0.0904)	
AD (t+1)			-0.1737* (0.0868)				-0.076 (0.0935)
Constant	2.6115*** (0.2061)	2.4104*** (0.2619)	2.5807*** (0.2510)	2.6638*** (0.2216)	2.1327*** (0.6085)	2.2293*** (0.2686)	2.4325*** (0.2558)
Adj R <sup>2</sup>	0.59	0.62	0.60	0.56	0.74	0.63	0.60
Observations	1610	1277	1260	1404	206	1277	1260
Number of Firms	336	317	320	284	51	317	320
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

1. Sample restricted to only those firms that exported at least once between the periods 2000-2006.

2. Sample restricted to only those firms that never exported even once between the periods 2000-2006.

**Table 3: Impact of Industry-wide Anti-dumping Duties on Labor Productivity**

Dependent Variable = ln(Labor Productivity)	(OLS)	(OLS)	(OLS)	(OLS)
AD_Industry	-0.0022 (0.0066)	0.0001 (0.0066)	0.0005 (0.0076)	-0.0066 (0.0084)
AD_Industry*FirmsNamed		-0.2894*** (0.0596)	-0.2576** (0.0825)	-0.2221** (0.0849)
Capital-Labor Ratio (K/L)	0.0005*** (0.0000)	0.0005*** (0.0000)	0.0006*** (0.0000)	0.0005*** (0.0000)
Age	0.1131*** (0.0024)	0.1135*** (0.0024)	0.1085*** (0.0031)	0.1055*** (0.0032)
Age <sup>2</sup>	0.0002*** (0.0001)	0.0002*** (0.0001)	0.0005*** (0.0001)	0.0005*** (0.0001)
AD_Industry (t-1)			-0.0149* (0.0075)	
AD_Industry (t+1)				-0.0052 (0.0080)
AD_Industry(t-1)*FirmsNamed			0.059 (0.0801)	
AD_Industry(t+1)*FirmsNamed				-0.0848 (0.0883)
Constant	2.5495*** (0.0207)	2.5459*** (0.0207)	2.4601*** (0.0273)	2.5193*** (0.0259)
Adj R <sup>2</sup>	0.59	0.59	0.63	0.60
Observations	167267	167267	122724	117659
Number of Firms	55925	55925	45794	45978
Year Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table 4: Impact of Specific Anti-dumping Duties on Firm Size  
(Using Investigated Firms as Control Group)**

Dependent Variable = ln(Operating Revenue)	(OLS)	(OLS) <sup>1</sup>	(OLS)	(OLS)
AD	0.1061* (0.0433)	0.0826 (0.0446)		
Capital-Labor Ratio (K/L)	-0.0001 (0.0001)	-0.0003** (0.0001)	-0.0001 (0.0001)	0.000 (0.0001)
Age	0.1810*** (0.0113)	0.1829*** (0.0117)	0.1595*** (0.0132)	0.2043*** (0.0136)
Age <sup>2</sup>	-0.0011*** (0.0002)	-0.0009*** (0.0002)	-0.0003 (0.0002)	-0.0012*** (0.0003)
AD (t-1)			0.1031* (0.0476)	
AD (t+1)				0.0897 (0.0485)
Constant	9.5226*** (0.1207)	9.6797*** (0.1226)	9.4933*** (0.1448)	9.3091*** (0.1387)
Adj R <sup>2</sup>	0.94	0.94	0.95	0.95
Observations	1734	1517	1370	1364
Number of Firms	338	286	324	321
Year Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

1. Sample restricted to only those firms that exported at least once between the periods 2000-2006.

**Table 5: Impact of Specific Anti-dumping Duties on Firm Capital-Intensity  
(Using Investigated Firms as Control Group)**

Dependent Variable = Capital-Labor Ratio (K/L)	(OLS)	(OLS) <sup>1</sup>	(OLS)	(OLS)
AD	-13.175 (14.8563)	-13.1192 (15.9400)		
Age	-0.7858 (3.8577)	-2.6196 (4.1629)	2.2169 (3.2068)	7.5010* (3.4284)
Age <sup>2</sup>	0.2200** (0.0694)	0.2524*** (0.0744)	-0.0066 (0.0596)	0.0888 (0.0646)
AD (t-1)			-11.8025 (11.5217)	
AD (t+1)				-17.4683 (12.2892)
Constant	93.5384* (41.1766)	96.1907* (43.6771)	143.3994** (34.7864)	30.079 (35.0949)
Adj R <sup>2</sup>	0.85	0.85	0.93	0.93
Observations	1738	1520	1370	1368
Number of Firms	338	286	324	324
Year Fixed Effects	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

1. Sample restricted to only those firms that exported at least once between the periods 2000-2006.

**Table A1: Sectoral Distribution of Anti-dumping Investigations (1995-2008)**

**AD - Sectoral Distribution (1995-2008)**

<i>Category</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>2000</i>	<i>2001</i>	<i>2002</i>	<i>2003</i>	<i>2004</i>	<i>2005</i>	<i>2006</i>	<i>2007</i>	<i>2008</i>	<i>Totals:</i>
<i>Live Animals, Animal Product</i>	1	2	2	6	8	3	2	11	2	10	0	0	1	1	<b>49</b>
<i>Vegetable Product</i>	0	5	2	4	1	7	8	3	1	6	4	5	1	5	<b>52</b>
<i>Animal or Vegetable Fats</i>	0	0	0	0	0	0	4	2	2	1	2	3	0	0	<b>14</b>
<i>Food, Beverage, Tobacco</i>	13	6	4	8	2	3	0	3	0	1	1	4	0	0	<b>45</b>
<i>Mineral Products</i>	1	4	3	4	9	9	16	8	9	1	0	2	4	0	<b>70</b>
<i>Products of Chemical Industry</i>	31	38	21	24	75	62	66	94	69	49	37	38	53	33	<b>690</b>
<i>Pastic, Rubber</i>	20	25	36	33	39	21	55	42	25	44	37	27	16	20	<b>440</b>
<i>Leather and Leather Products</i>	0	3	0	0	0	0	0	0	0	0	2	0	0	0	<b>5</b>
<i>Wood, Furniture</i>	1	4	10	3	0	5	3	1	10	9	2	2	0	9	<b>59</b>
<i>Paper and Pulp</i>	3	14	34	4	18	4	7	7	20	8	6	17	19	2	<b>163</b>
<i>Textile and Textile Articles</i>	1	23	8	28	34	17	26	6	14	21	27	16	11	39	<b>271</b>
<i>Footwear, Umbrella</i>	6	1	0	4	2	3	2	3	0	0	4	3	0	1	<b>29</b>
<i>Stone, Glass, Cement</i>	3	11	11	12	8	6	6	11	11	8	10	11	2	4	<b>114</b>
<i>Pearls, Jewellery</i>	0	0	0	0	0	0	1	0	0	0	0	0	0	0	<b>1</b>
<i>Base Metals</i>	43	39	63	105	110	108	138	96	52	36	37	33	24	64	<b>948</b>
<i>Machinery, Electrical Equipment</i>	24	34	34	10	30	30	23	9	14	14	18	28	29	16	<b>313</b>
<i>Vehicles, Transport</i>	3	2	1	0	4	5	0	2	0	2	1	2	0	2	<b>24</b>
<i>Instruments, Clock</i>	1	4	9	5	2	0	3	3	0	1	1	5	0	6	<b>40</b>
<i>Miscellaneous Manufacturing</i>	6	5	4	5	13	7	5	11	3	3	8	6	1	5	<b>82</b>
<i>All Others</i>	0	5	1	2	1	2	1	0	0	0	3	0	2	1	<b>18</b>
<b>Totals for 01/01/95 - 31/12/08</b>	<b>157</b>	<b>225</b>	<b>243</b>	<b>257</b>	<b>356</b>	<b>292</b>	<b>366</b>	<b>312</b>	<b>232</b>	<b>214</b>	<b>200</b>	<b>202</b>	<b>163</b>	<b>208</b>	<b>3427</b>

Source: [www.wto.org](http://www.wto.org)

**Table A2: Summary Statistics of Key Variables**

Variables	No AD duty			AD duty			Total		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
ln(Value Added)	860	10.110	2.115	754	10.077	2.196	1614	10.094	2.152
ln(Labor Productivity)	859	3.971	1.180	753	3.988	1.189	1612	3.979	1.184
ln(Operating Revenue)	943	11.555	1.921	796	11.538	2.034	1739	11.547	1.973
ln(Employment)	944	6.105	1.597	797	6.060	1.769	1741	6.084	1.678
Capital Intensity (K/L)	944	182.797	507.831	797	135.449	256.229	1741	161.122	412.743
ln(Exports)	945	8.800	4.501	798	8.341	5.256	1743	8.589	4.865
Age	944	13.184	14.620	796	13.549	14.968	1740	13.351	14.777

Variables	Exporter-No AD			AD duty			Total		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
ln(Value Added)	399597	8.855	1.543	754	10.077	2.196	400351	8.857	1.545
ln(Labor Productivity)	399497	3.711	1.200	753	3.988	1.189	400250	3.712	1.200
ln(Operating Revenue)	434288	10.336	1.377	796	11.538	2.034	435084	10.339	1.379
ln(Employment)	434888	5.138	1.187	797	6.060	1.769	435685	5.140	1.189
Capital Intensity (K/L)	434888	98.953	612.128	797	135.449	256.229	435685	99.020	611.668
ln(Exports)	435800	6.913	4.357	798	8.341	5.256	436598	6.916	4.359
Age	434978	11.114	11.436	796	13.549	14.968	435774	11.118	11.443

The top panel reports summary statistics for the sample of specific AD duty firms and the sample of firms investigated for AD. The bottom panel reports summary statistics for the sample of specific AD duty firms and the sample of firms that exported at least once between periods 2000-2006.

**Table A3: Robustness Exercises for Impact of Specific Anti-dumping Duties on Labor Productivity  
(Using Time Variation Only)**

Dependent Variable = ln(Labor Productivity)	W/O Furniture	W/O Plastic	W/O Telecommu nication	W/O Chemical	W/O Steel	W/O Chemical and Steel	BottomTop 1Percentile	Domestic- Ownership- Firms	ExportDum my
AD	-0.2175* (0.0931)	-0.1998* (0.0824)	-0.2164** (0.0817)	-0.2655** (0.0903)	-0.1822* (0.0847)	-0.2362* (0.0934)	-0.1768* (0.0737)	-0.2513* (0.1122)	-0.2086* (0.0824)
Capital-Labor Ratio (K/L)	0.0012*** (0.0003)	0.0014*** (0.0003)	0.0014*** (0.0003)	0.0013*** (0.0003)	0.0014*** (0.0003)	0.0013*** (0.0003)	0.0014*** (0.0002)	0.0018*** (0.0003)	0.0014*** (0.0003)
Age	0.1213*** (0.0275)	0.0860*** (0.0240)	0.0953*** (0.0237)	0.0974*** (0.0255)	0.0858*** (0.0250)	0.0958*** (0.0271)	0.0794*** (0.0214)	0.0930** (0.0322)	0.0883*** (0.0239)
Age <sup>2</sup>	-0.0004 (0.0004)	-0.0001 (0.0004)	-0.0003 (0.0004)	-0.0003 (0.0005)	-0.0003 (0.0005)	-0.0006 (0.0006)	0.0004 (0.0004)	-0.0001 (0.0004)	-0.0001 (0.0004)
ExporterDummy									0.0578 (0.1052)
Constant	2.5313*** (0.3189)	2.8083*** (0.2497)	2.8081*** (0.2359)	2.8644*** (0.2445)	2.9793*** (0.2415)	3.0124*** (0.2438)	2.7877*** (0.2173)	2.3783*** (0.4260)	2.8093*** (0.2494)
Adj R <sup>2</sup>	0.62	0.60	0.57	0.59	0.57	0.57	0.61	0.63	0.58
Observations	799	1083	1108	1036	1110	996	1129	541	1150
Number of Firms	173	231	234	227	234	220	240	127	241
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%



**Table A4: Robustness Exercises for Impact of Specific Anti-dumping Duties on Labor Productivity  
(Using Investigated Firms as Control Group)**

Dependent Variable = ln(Labor Productivity)	W/O Furniture	W/O Plastic	W/O Telecommu nication	W/O Chemical	W/O Steel	W/O Chemical and Steel	BottomTop 1Percentile	Domestic- Ownership- Firms	ExportDum my
AD	-0.2479** (0.0851)	-0.2877*** (0.0747)	-0.2959*** (0.0739)	-0.3372*** (0.0788)	-0.2526*** (0.0737)	-0.2985*** (0.0791)	-0.2240*** (0.0668)	-0.3341** (0.1078)	-0.2900*** (0.0736)
Capital-Labor Ratio (K/L)	0.0008*** (0.0002)	0.0009*** (0.0002)	0.0009*** (0.0002)	0.0008*** (0.0002)	0.0017*** (0.0003)	0.0017*** (0.0003)	0.0009*** (0.0002)	0.0008*** (0.0002)	0.0009*** (0.0002)
Age	0.1225*** (0.0209)	0.1037*** (0.0192)	0.1090*** (0.0191)	0.1089*** (0.0199)	0.0942*** (0.0199)	0.0980*** (0.0209)	0.0937*** (0.0175)	0.1207*** (0.0262)	0.1038*** (0.0192)
Age <sup>2</sup>	-0.0002 (0.0003)	0 (0.0003)	-0.0001 (0.0003)	0 (0.0004)	0.0001 (0.0004)	0 (0.0004)	0 (0.0003)	-0.0001 (0.0004)	0 (0.0003)
ExporterDummy									0.0812 (0.0950)
Constant	2.3737*** (0.2492)	2.5734*** (0.2115)	2.5844*** (0.2035)	2.6248*** (0.2081)	2.6801*** (0.2005)	2.7038*** (0.2019)	2.7281*** (0.1876)	1.9288*** (0.3639)	2.5599*** (0.2148)
Adj R <sup>2</sup>	0.62	0.60	0.58	0.60	0.57	0.58	0.59	0.63	0.59
Observations	1259	1543	1568	1496	1528	1414	1579	804	1610
Number of Firms	268	326	329	322	321	307	334	186	336
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

**Table A5: Robustness Exercises for Impact of Industry-wide Anti-dumping Duties on Labor Productivity**

Dependent Variable = ln(Labor Productivity)	W/O Furniture	W/O Plastic	W/O Telecommu nication	W/O Chemical	W/O Steel	W/O Chemical and Steel	BottomTop 1Percentile	Domestic- Ownership- Firms
AD_Industry	0.0008 (0.0067)	0.0071 (0.0070)	0.0004 (0.0066)	0 (0.0069)	-0.0017 (0.0067)	-0.002 (0.0070)	0.0017 (0.0060)	0.0069 (0.0084)
AD_Industry*FirmsNamed	-0.2355** (0.0759)	-0.3273*** (0.0630)	-0.3021*** (0.0615)	-0.2879*** (0.0625)	-0.2819*** (0.0595)	-0.2791*** (0.0624)	-0.2295*** (0.0544)	-0.3921*** (0.0996)
Capital-Labor Ratio (K/L)	0.0005*** (0.0000)	0.0006*** (0.0000)	0.0005*** (0.0000)	0.0006*** (0.0000)	0.0005*** (0.0000)	0.0006*** (0.0000)	0.0006*** (0.0000)	0.0007*** (0.0000)
Age	0.1145*** (0.0025)	0.1175*** (0.0026)	0.1135*** (0.0024)	0.1090*** (0.0025)	0.1119*** (0.0025)	0.1072*** (0.0026)	0.1065*** (0.0022)	0.1443*** (0.0032)
Age <sup>2</sup>	0.0002*** (0.0001)	0.0002*** (0.0001)	0.0002*** (0.0001)	0.0003*** (0.0001)	0.0002** (0.0001)	0.0002*** (0.0001)	0.0002*** (0.0001)	0 (0.0001)
Constant	2.5326*** (0.0214)	2.4793*** (0.0227)	2.5398*** (0.0210)	2.5592*** (0.0214)	2.5642*** (0.0209)	2.5788*** (0.0216)	2.6132*** (0.0190)	1.8984*** (0.0314)
Adj R <sup>2</sup>	0.60	0.60	0.59	0.59	0.59	0.58	0.60	0.58
Observations	159662	148102	164140	153234	162795	148762	164467	101840
Number of Firms	53626	50152	54728	51679	54757	50498	55563	35221
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%