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

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Summary. — Despite a dramatic rise in the instances of anti-dumping (AD) duties, their impact on the targeted firms is not clear. Using detailed firm level data we find robust evidence that the US AD duty led to over 12 (or five) percent decrease in labor productivity (or TFP) of targeted Chinese firms. We also find that firms with high initial export intensity experience both a higher decrease in exports (and total sales) and a bigger drop in productivity due to the US AD duties. Our results suggest reduced economies of scale as a possible mechanism for the drop in firm productivity.

Key words — antidumping duties, trade restrictions, productivity, heterogeneous firms, Asia, China

1. INTRODUCTION

Anti-dumping duties (AD) are duties levied on imported products considered to be sold at "less than fair value." These duties are imposed "in order to offset" the potential injury to the domestic industry. Although some countries have used AD for more than a century, there has been a dramatic growth in AD investigations in recent years both in terms of the number of countries as well as the number of products involved (Blonigen & Prusa, 2008; Prusa, 2001).

Despite the proliferation in anti-dumping duties in recent years and the consequent voluminous literature searching for causes and effects of AD use, there are very few empirical studies that look at the impact of AD duties from the perspective of foreign targeted firms (see Bown, 2010a; Lu, Tao, & Zhang, 2012). In this paper, we attempt to fill this gap in the literature by exploring the influence of AD duties on Chinese firms that were hit with an US AD order.

In the flurry of AD investigations initiated and duties imposed in recent years, China has become one of the most frequently targeted countries, while the United States ranks number two in both the number of investigations and the number of AD duties imposed. [1] The study of how US AD duties affect Chinese exporters is thus not only of importance to policy makers in China and the United States, but it also provides a good opportunity for scholars to explore the impact of anti-dumping duties in the context of the world's two largest economies and trading countries.

To preview our results, we find that the US AD duties led to a significant drop in both labor productivity and total factor productivity (TFP) of Chinese firms. Our results are statistically and economically significant, with estimates implying that US AD duties decrease the labor productivity of targeted Chinese firms by over 12%. The decrease is up to 5% if one uses TFP measured by the Olley–Pakes method. These estimates are robust to a large set of robustness checks. In addition, we find that firms with high export intensity experience lower export volumes in response to the AD duties. As a result, firms with high export intensity experience a decline in total sales and a greater drop in productivity. The source for the productivity decline due to AD duties thus seems to stem from the reduced benefit from economy of scale when access to the export market is restricted.

To address the potential issue of endogeneity, where firms targeted by AD duties are different in productivity to begin with, we compare three sets of treatment *versus* control groups. In the first comparison, we study how firms that are specifically named in the AD duty orders differ from those that were investigated for antidumping but did not face any AD duty. To construct the sample of firms that are specifically named in the antidumping investigations, we manually collect the information from various issues of the *Federal Register*. Next, we compare all exporting firms from industries on which AD duties are imposed with exporters from industries that were investigated for anti-dumping but ended up not getting AD duties. Finally, as a third comparison, we adopt the Konings and Vandenbussche (2008) approach to construct an alternative control group for the exporters from industries

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faced with AD duties, i.e., firms from those industries that have a high enough probability of getting AD duties based on the first-stage estimation. Estimations based on each of these three sets of samples provide similar results, showing significant negative effects of AD duties on firm productivity, measured by labor productivity or TFP.

Another major finding of our study is that the antidumping duties can have different effects on firms within the same industry. First of all, although the imposition of the antidumping duty has small or negligible effects on the labor productivity and TFP of an average firm in the industry, the productivity of the firms that have been specifically named in the AD duty order decreases by substantially more (up to 12% for labor productivity and 5% for TFP). In addition, firm heterogeneity in export intensity influences the AD duty effects. Compared with new exporters, firms with higher initial export intensity are found to experience larger negative effects on productivity, exports, and total sales due to the imposition of AD duties. Finally, firm ownership also influences the effects of AD duties. While foreign invested firms suffer greater loss in productivity, state owned firms tend to experience less negative effects. These differences are due to the firm-specific nature of the antidumping duties. Studies that treat all firms within a given industry similarly would thus grossly underestimate the adverse impacts of AD duty.

Our study contributes to two related areas of economic research. The first is the research on anti-dumping, where most studies look at the impact of AD protection on the import competing firms (see, for instance, Konings & Vandenbussche, 2005, 2008; Pierce, 2011). A few papers look at the impact of AD duties on foreign countries, but they study the impact of AD at the product or the industry level (for instance, Blonigen & Feenstra, 1997; Bown & Crowley, 2006, 2007). [2] By identifying and exploring the effect of AD on Chinese firms affected by the US AD duty, we attempt to fill in the gap in firm level studies exploring the AD effects on targeted exporting firms.

To the best of our knowledge, the only other empirical papers that look at the impact of AD duty on the target country at a disaggregated level are Brambilla, Porto, and Tarozzi (2012) and Lu *et al.* (2012). Our paper differs from these studies as follows: Compared to Brambilla *et al.* (2012), which looks at a specific sector—Vietnamese catfish industry—to explore the impact of a particular US AD imposed in 2003, the current paper looks at all Chinese industries that were targeted by the US AD duties during 2000–2006. In addition, they 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.

In contrast to Lu *et al.* (2012), which uses transaction level Chinese customs data, we utilize firm level data from the Chinese manufacturing surveys to study firm productivity in addition to export performance. Furthermore, we collected our own data on firms that were investigated but did not face any AD duties from various issues of the *Federal Register*. Thus we can use firms investigated for anti-dumping as one of the control groups, which is arguably the closest to the treatment group (Konings & Vandenbussche, 2008). [3] We will further discuss the complementarities between their findings and ours in the results section.

The current study also relates to the general literature linking trade with productivity. One strand of 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. Trefler (2004) shows that a decrease in US trade barriers associated with CUSFTA led to a dramatic increase in labor productivity for Canadian firms. Mechanisms proposed to explain the positive trade-productivity link include returns to scale (Cox & Harris, 1985; Van Biesebroeck, 2005), self-selection of more productive firms into exporting (Bernard & Jensen, 1999; Clerides, Lach, & Tybout, 1998), and "learning-by-exporting", through which exporting behavior itself might lead to an increase in productivity (De Loecker, 2007; Park *et al.*, 2010).

In contrast to earlier work that studies how an increase in market access affects the productivity of exporting firms, we explore the issue from a new angle: What happens when the access to foreign market is reduced due to the imposition of AD duty? In addition to finding a negative impact on firm productivity, we also discover negative effects on firm export volume and sales, suggesting that trade restrictions can influence productivity through reducing exporters' benefit from economies of scale.

The rest of the paper is structured as follows. Section 2(a) provides some background information on the US AD process, which motivates our empirical strategy in Section 2(b). Section 3 describes the data, followed by empirical results in Section 4. Section 5 concludes.

2. INSTITUTIONAL BACKGROUND AND EMPIRICAL STRATEGY

(a) *Institutional background*

In recent years there has been a dramatic rise in the use of AD duties, with China being particularly targeted. Given the large number of AD cases it has been involved in, China is 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 firms that were targeted by the duties, and a straightforward approach is to conduct the following estimation:

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

where y_{ijt} is the firm performance measure for firm j in industry i in year t, $ADijt$ is the anti-dumping duty measure for firm j in that given year, and $Xijt$ is a set of firm characteristics. Hence, our coefficient of interest is $\beta 1$.

The concern of sample selection, however, cautions against a simple application of the above method. Specifically, firms that are investigated for antidumping or imposed AD duties may be different from the other exporters. For example, the firms involved in AD investigations may have higher or lower productivity as compared to the other firms.

To address this issue, we will choose as our treatment and control groups the samples of firms that are most comparable in the observables. We now turn to the underlying institutional framework related to anti-dumping duties in the United States to better understand the concern of sample selection and to choose the proper treatment and control groups. Later in the data section, we will present empirical evidence that our treatment and control groups of firms do look similar in the observable characteristics.

In the United States, there are two separate agencies that handle anti-dumping investigations: the International Trade Administration (ITA) of the US Department of Commerce (DOC) and the International Trade Commission (ITC). The DOC determines whether the alleged dumping exists 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 reach 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 US market at "less than fair value." The petitioners file their case with both the DOC and the ITC with the names of the foreign firms alleged to be dumping and provide supporting evidence. This prompts an AD investigation. Within about a month and a half of the filing, the DOC sends out questionnaires to all respondents (both exporters and producers of the product in question) in the country named in the petition and requires compliance within about two months. [4]

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 AD duty rates. 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, 2010). 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. [5]

The DOC and the ITC each 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, a final AD duty equal to the dumping margin is imposed. Results of both the preliminary and final findings of the DOC and the ITC are published in the *Federal Register*. These reports contain information on duties that apply specifically to the cooperative firms and a common "all others rate" for all other exporters producing the relevant product from the target country, which typically tends to be higher. The exporters that have been judged as non-cooperative by the DOC are specifically named in the AD order and receive the higher industry-wide AD duty rate.

Various issues of the *Federal Register* are thus the important sources of information in compiling our list of targeted firms. [6] Ultimately, three different types of firms are specifically named in these reports: the exporters found to have not dumped and thus get no AD duties, those ruled to be cooperative during the investigation but found to have dumped and imposed lower firm-specific AD duties, and those ruled as non-cooperative and thus receiving industry-wide duties that tend to be higher.

(b) *Estimation strategy and specifications*

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 investigated for anti-dumping have different characteristics compared to other exporters. In the case filing stage, it is 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. Similarly, in the investigation stage, the relatively strong foreign exporters have more resources available to bear the legal and accounting costs related to participating in the investigations. On the other hand, the weaker foreign exporters may have more incentives to participate in the investigation to secure the lower firm-specific AD duties. Thus, there is the concern of sample selection, although a priori it is not clear whether it is the weaker firms or the stronger firms that will participate in the AD investigations and end up being specifically named in the AD duties.

Yet the discussion of AD procedures also suggests a strategy to address the potential issue of sample selection. Among the three types of firms specifically named in the *Federal Register*, those getting firm-specific or industry-wide rates will clearly be subject to AD duties. We will therefore use these firms as our baseline treatment group to study the impact of anti-dumping duties. Moreover, we will use the firms named in the AD investigations that resulted in no AD duty (the AD investigated firms) as our first control group. Note that, both of these two groups of exporters have been selected by the domestic petitioners in the United States. Furthermore, firms in the control group were also found to have dumped in the United States in most cases. Yet, an antidumping duty was not imposed on the control group because ITC did not find that the US industry was hurt. Since this final antidumping decision is based on industry conditions in the United States and both groups of firms are identical otherwise, the concern with sample selection is minimized.

We begin our empirical study by adjusting Eqn. (1) as follows to estimate the impact of AD duties, using the sample of all firms specifically mentioned in the *Federal Register*:

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

where y_{ijt} is the firm performance measure for firm j in industry i at time t, while $ADnamed_{ijt}$ is a dummy indicating whether firm j was specifically named in an AD duty order published in the *Federal Register* in year t (and thus is imposed an AD duty). [7] Finally, the α_j and α_t are the firm and the year fixed effects, respectively.

The above methodology gives us the sharpest effects of anti-dumping duties by focusing on firms that were specifically named in the duties, and we refer the firm sample thus constructed as *Sample I*. However, all other Chinese firms that export the same product to the United States also face an antidumping duty even if they are not specifically named. Hence, we extend the above analysis to all exporting firms in the industry. Specifically, we follow Konings and Vandenbussche (2008) in constructing two different control groups—*Sample II* and *Sample III*—to explore the impact of antidumping duties on all firms in the affected industry.

Sample II is constructed using the same logic as in selecting the sample for estimation (2) above but include all firms that exported at least once during our sample period of 2000–2006 (the exporters). The treatment group consists of all exporters in the four-digit industries that have been imposed AD duties by the United States, while the control group includes all exporters in the industries that were investigated but where a duty was not imposed. Hence, the new estimation equation is given by,

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

where y_{ijt} is the firm performance measure for firm j in industry i at time t. AD_{it} indicates whether the industry i has been targeted in an anti-dumping case in year t, whereas $ADnamed_{ijt}$ is an indicator variable showing whether the firm j was specifically named in an AD duty order (either with firm specific rate or mentioned specifically in the industry wide AD duty rates). Note that the above estimation can address a related question: What impact does an AD duty have on all the exporting firms in the same industry?

In addition, the methods in Konings and Vandenbussche (2008) suggest a third data sample, which compares an

alternative set of treatment *versus* control groups (*Sample III* henceforth). In particular, we conduct a multinomial logit estimation at the 4-digit industry level to estimate the probability of a Chinese industry getting hit by a US antidumping duty during our sample 2000–2006. Next, following Konings and Vandenbussche (2008), we use industries as the control group that were never investigated but had a predicted probability above the 75th percentile of the predicted probability of industries with an antidumping duty imposed during our sample period. More details on the underlying estimations and the results are reported in Section 3.

In summary, we construct three different pairs of treatment *versus* control groups to address the potential issue of sample selection. Finally, we explore firm heterogeneity along several dimensions, by conducting the following estimation:

$$Y_{ijt} = \alpha_i + \alpha_t + \beta_1 AD_{it} + \beta_2 AD_{it} * ADnamed_{ijt} + \beta_2 AD_{it} * Firm\,type_{ijt} + \beta_3 X_{ijt} + \varepsilon_{ijt} \quad (4)$$

where $Firm\,type_{ijt}$ is the characteristics of firm j in industry i at time t, along which we explore the impact of firm heterogeneity. In particular, we study how ownership type and export intensity of firms affect the impact of AD duties.

3. DATA

The anti-dumping data come from the Temporary Trade Barriers Database (earlier known as the Global Antidumping Database) of the World Bank developed by Bown (2010b), and we supplement the database using relevant *Federal Register* publications. Data on other firm level variables are from the Annual Survey of Chinese Industrial Firms, published by the National Bureau of Statistics of China (NBS) for the period of 2000–2006. The NBS dataset includes all state owned enterprises (SOEs) and firms of other ownership types with turnovers of more than five million RMBs. The firms included in the dataset account for roughly 90% of the total industrial output in China (Demetriades *et al*., 2008), and the dataset has firm level information such as sales, value added, number of employees, year of establishment, etc.

The Global AD Database has information on AD duties imposed by 25 countries during 1980–2010, [8] as well as the names of foreign firms that had a firm-specific AD duty imposed by several countries, including the United States. For this paper, we focus on AD measures initiated against China by US firms. According to the database, there have been a total of 157 separate AD investigations initiated by the United States against China during 1980–2010, of which 92 separate AD cases were either active at some point or were initiated during our sample period (2000–2006). [9] Out of these 92 cases, 9 were terminated before they reached the DOC's preliminary dumping finding stage, leaving us with 83 separate cases, for which affirmative rulings were reached by both the ITC and the DOC.

Although the Global AD database includes information on all the AD investigations ever initiated, it only provides firm names for those receiving firm specific AD duties. The *Federal Register* notices, on the other hand, also list two additional types of firms, those receiving industry-wide duty rates, as well as those investigated but ultimately not imposed AD duties. We thus updated the Global AD database using the *Federal Register* notices.

We then merge firms in the updated Global AD database with the NBS dataset using firm names. The resulted firm sample thus makes up our *Sample I*, where the treatment group includes firms specifically named in the AD orders (either receiving firm specific duties or industry-wide duties) and the control group includes firms investigated but not imposed AD duties.

Out of a total of 1404 case-firm pairs, we were able to merge 610, i.e., a match rate of 43%. If we look at the cases initiated during our sample period, the match rate is higher at 51% (529 out of 1036). [10] One explanation for why we cannot find in the NBS dataset all the Chinese firms named in the AD cases is that some of these firms had exited by 2000, either because they had gone bankrupt or because they had fallen below the output threshold for inclusion into the NBS dataset. However, the most important reason for why we do not have a higher match rate is because many of the firms specifically named in the antidumping investigations are trading firms, whereas the NBS data set does not cover intermediary firms.

A third explanation for our failure to find firm matches for all the AD cases is the potential difference in firm names between the two data sets. To mitigate this problem, we carefully checked all firm names for errors and differences in spelling, etc. Whenever in doubt, we verified the names using outside sources such as company websites and information from the National Administration for Code Allocation to Firms (NACAO). The NACAO is the government agency responsible for assigning unique identifiers to firms in China, which are also used in the NBS dataset. Moreover, the NACAO website provides information on firms' location, products, as well as names of their affiliated plants and so on. We use this additional information to double check our matching.

Of the three cases above, only the third case is of concern, as it implies that some firms targeted by the US AD duties might be lumped together with firms not subject to the duties. This, however, will bias against our finding effects of AD duties on Chinese exporters. Our results thus should be interpreted as providing a lower bound of the true effects.

In addition to examining the impact of antidumping duties on the firms that were specifically named in the duty order, we also study the impact of the US antidumping duties using two other samples. To construct *Sample II*, we look at the most disaggregated industry category available in our dataset (4-digit Chinese industrial classification) to classify whether a firm faces an AD duty. The antidumping duty is usually imposed at the product level and hence is more likely to affect the firms that produce and export that product. Unfortunately, NBS dataset does not include consistent product level information for included firms to conduct our tests directly.

Hence, as the next best alternative, we map 6-digit harmonized product codes affected by the AD duty into 4-digit Chinese industry categories. We treat the industry as being involved in an AD investigation in a given year if at least one of the 6-digit products belonging to that industry is affected by the AD investigations. In order to ensure that we only compare firms that are most similar in terms of their characteristics as well as are most likely to be affected by AD duties, we chose to focus only on exporters in the industry. We Define exporters to be the firms with positive exports in at least one of the years during our sample period. Thus, our treatment group includes all exporting firms in the four-digit industries affected by AD duties during our sample period, while exporting firms from those four-digit industries that were investigated but were not imposed any AD duties serve as our control group.

While the above approach has the advantage of being the most "natural" comparison group, it might lead to incorrect inference if the industries affected by AD duties are different from those that were investigated but not imposed AD duties. Thus, in order to test the robustness of our findings we

construct *Sample III* by matching the treatment group (all exporters in the industries affected by US antidumping duties) with an appropriate control group based on observables. Based on Konings and Vandenbussche (2008), we construct the third control group as follows: A multinomial logit estimation is conducted at the 4-digit industry level to estimate the probability of a Chinese industry getting hit by a US antidumping duty during our sample, 2000–2006. Our dependent variable takes one of the three values, 1 if the industry faced no antidumping investigations during 2000–2006, 2 for investigated but no antidumping duties imposed, and 3 for industries that were investigated and where an antidumping duty was imposed at any point during the sample period.. Following Blonigen and Park (2004) and Konings and Vandenbussche (2008), we use information on the antidumping duty investigations and outcomes for 2000–2006 to construct our dependent variable and use lagged explanatory variables (prior to the beginning of our sample) to minimize any concerns for endogeneity as well as to capture any pre-policy trends. [11] Our main explanatory variables include Chinese exports to the United States, growth in Chinese exports to the United States, as well as the number of employees and the number of firms in the Chinese industry.

We report these results in Table 10. Our baseline group is the group of industries that were not involved in any AD investigations during our sample period. The main explanatory variable of being involved in an antidumping investigation as well as of having an AD duty imposed seems to be the size of Chinese exports to the United States in that industry. As expected, an increase in Chinese exports to the United States increases both the odds of being investigated for dumping as well as that of having an AD duty imposed. Interestingly, while an increase in the number of firms lowers the likelihood of being involved in an antidumping investigation, it increases the odds of an antidumping duty being imposed conditional on being involved in antidumping investigations. Including additional controls such as the total Chinese exports to the world, total output of the industry, or lagged labor productivity does not affect the results above.

Given the robustness of these results, we are confident in making a counterfactual control group based on these estimations. Following Konings and Vandenbussche (2008), we use firms in industries that were never investigated but had a predicted probability above 75th percentile of the predicted probability of industries that had an AD duty imposed during our sample period. Due to space limitations, we only report results using the predicted probability based on column 1 of Table 10 below. However, all of our results remain unchanged if we instead use predicted probabilities based on other columns of Table 10. Similarly, while we follow Konings and Vandenbussche (2008) and Pierce (2011) in choosing the 75th percentile as our cutoff, our results remain unchanged if we instead use a different threshold (90th percentile). [12]

To measure firm performance, we focus on firm's productivity, using both labor productivity as well as total factor productivity (TFP). Specifically, we compute labor productivity as the ratio between value added and employment. [13] On the other hand, we use the Olley–Pakes (OP) methodology to compute TFP as it controls for both the sample selection bias and the simultaneity bias (Olley & Pakes, 1996). Since the OP methodology has become standard in the literature, we leave the details of the underlying issues for the Appendix; however, we note two important points related to our estimates. First, in estimating our production functions we ran separate regressions for each two-digit Chinese industries, thus allowing heterogeneity across industries by permitting different estimated coefficients while ensuring a sufficient number of observations to conduct the relevant estimation at the same time. Second, in calculating TFP we use a slightly modified version of the OP method by including firm's exporting status as an additional state variable following De Loecker (2007) and Van Biesebroeck (2005). The basic idea is that an exporting firm might face a different market condition in its export market and hence may make different decisions about the level of investment and/or whether to exit even after controlling for productivity and the current stock of capital, as compared to a non-exporting firm. [14]

Table 8 reports the summary statistics of the key variables used in our sample. In order to compare firms prior to the AD duty being imposed, we report here the summary statistics for firms in 2000—the first year of our sample, excluding firms that already had an AD duty in 2000. The top panel (panel a) compares firms that were specifically named in AD investigations at some point during the sample period 2000–2006 with all other firms in the NBS data set. As expected, the specifically named firms are not representative of the entire sample. These firms tend to have higher levels of exports compared to the average firm. They also tend to be bigger in size in terms of sales, value added, and employment. This reaffirms our earlier concern about sample selection.

Panel b in the table compares firms named in AD duty orders at some point during 2001–2006 with those that were investigated for AD but had no duties imposed (i.e., Sample I). Panel c provides a similar comparison between exporting firms belonging to industries targeted with AD duties *versus* exporters from industries with AD investigations but with no AD duties (i.e., Sample II), while panel d compares the treatment group *versus* the control group constructed following the Konings and Vandenbussche (2008) method (i.e., Sample III). Reassuringly, the treatment and the control groups in these three comparisons look much more similar in terms of the observables relative to panel a.

The contrast between the different subsamples of firms is more clearly illustrated in Table 9, which reports coefficients from the following regression

$$Z_{ij} = \alpha_i + \beta_1 AD_{ij} + \varepsilon_{ij} \tag{5}$$

where z_{ij} corresponds to various firm characteristics summarized in Table 9 for firm j in industry i in 2000, while the dummy variable, AD_{ij}, indicates whether the firm has ever faced an AD duty during 2000–2006. Each column in Table 9 compares a different pair of treatment and control groups, while each row gives results using a certain firm characteristic as the dependent variable. Thus, each cell in Table 9 presents coefficients from separate regressions, where each regression controls for industry fixed effects. Robust standard errors clustered at the four digit industry level are reported. The first column reports results for the entire sample, while columns 2–4 use Sample I, Sample II, and Sample III, respectively.

Table 9 shows that firms named in the AD duty orders are not typical of firms in the whole sample. They tend to be larger (in terms of sales, employment, and value added), more capital intensive, and more productive. They also tend to export more. In contrast, when comparing the treatment group with the control group in the three constructed samples, we find no statistically significant differences, except that firms in the treatment group in Sample II tend to have slightly higher TFP. Thus, we can be more assured that these three samples provide suitable treatment and control groups.

4. RESULTS

As discussed previously, we intend to study the effects of AD duties both on firms specifically targeted as well as on all exporters in the affected industry. We estimate Eqn. (2) to explore the impact of AD duties on specifically named firms; while for the effects of industry-wide AD duties, we resort to Eqn. (3). Among the three firm samples we construct, Sample I can be used for studying the effects on specifically targeted firms, while Sample II and Sample III are fit for exploring the impact on all firms in the targeted industries.

(a) *Effects of AD duties on productivity*

Table 1 reports results on how AD duties affect firm productivity using Sample I. The dependent variable is labor productivity in columns 1–3, while TFP is the dependent variable in columns 4–6. All regressions include both firm fixed effects and year fixed effects and report standard errors clustered at the firm level.

Column 1 gives our baseline result. To avoid the attenuation bias, we exclude from the treatment group, but include in the control group, those firms for which the effective AD duty rate (de facto) is zero or *de minimus* (i.e., less than 1%), since these firms are effectively exempted from the AD duty. The results show that an AD duty has a negative and significant impact on the firm's labor productivity. Moreover, the negative effect is economically important with the estimate implying a 12% drop in labor productivity due to the imposition of an AD duty. [15]

This result is consistent with one main insight 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 the observed loss in productivity is at the firm-level and thus is not due to a switch in market share toward less productive firms.

In column 2, we repeat the analysis of column 1, but drop the *de minimus* firms altogether from our sample. As one can see, our qualitative results remain unchanged. While not reported to conserve space, our results remain unchanged if we include the *de minimus* firms in the treatment group.

The impact of AD duty might be different for firms that export directly *versus* indirect exporters, i.e., those who sell abroad through intermediaries and thus may be less affected since the AD duties may not be fully passed onto the ultimate producers. Hence, in column 3 we restrict our sample to only exporters that report direct exports, i.e., only those firms that have exported directly at least once during our sample period (2000–2006). [16] As expected, an AD duty affects this group of firms more severely. [17] The drop in labor productivity remains significant and is substantially larger—accounting for about 18% drop.

As an alternative measure of firm productivity, we construct firms' total factor productivity (TFP) following Olley and Pakes (1996). [18] The OP approach corrects for the two potential biases in calculating TFP: the selection bias, i.e., the least productive firms are most likely to exit (Wedervang, 1965), as well as the bias due to simultaneity between the choice of inputs and productivity (Marschak & Andrews, 1944). [19]

Columns 4–6 have similar structures as columns 1–3, but use TFP as the dependent variable. As shown in the table, we observe consistently negative and significant effects of AD duties on the TFP of Chinese firms specifically named in the AD orders.

In Table 2, we turn to the other two samples to study the effects of AD duties on all exporters in the affected industries. Sample II is used in columns 1 and 3 and Sample III is used in columns 2 and 4.The dependent variable in columns 1–2 is labor productivity and in columns 3–4 is TFP.

Columns 1 and 2 provide additional evidence for how AD duties affect targeted firms' labor productivity. The coefficient for AD_{it} is negative but not always significant. The other variable of interest, $AD_{it} * ADnamed_{ijt}$, however, is consistently negative and significant, and is quite similar in size compared to the estimated effect in column 1 of Table 1. Put together, these results show a strong negative impact of AD duties on specifically targeted firms' labor productivity, while the effect on exporters in the same industry tends to be weak.

Table 1. *Effects of AD duties on productivity*

Dependent variable	ln (labor productivity)			ln (total factor productivity)		
$ADnamed_{jt}$	-0.1326*	-0.1379*	-0.1830**	-0.0522**	-0.0541**	-0.0491**
	(0.0743)	(0.0750)	(0.0755)	-0.024	(0.0245)	-0.0226
Capital-labor ratio	0.3815***	0.3742***	0.3833***			
	(0.0533)	(0.0541)	(0.0625)			
Age	0.0826***	0.0815***	0.0868***	0.0313***	0.0262***	0.0273***
	(0.0209)	(0.0216)	(0.0220)	-0.0085	(0.0076)	-0.0082
Age^2	0.0002	0.0003	0.0003	-0.0003*	-0.0002*	-0.0003
	(0.0005)	(0.0005)	(0.0006)	-0.0002	(0.0001)	-0.0002
Constant	1.2416***	1.2584***	1.1942***	0.6769***	0.6765***	0.7024***
	(0.2917)	(0.2945)	(0.3282)	-0.0756	(0.0764)	-0.0714
Adj R^2	0.61	0.60	0.59	0.61	0.60	0.66
Observations	2239	2176	1942	2424	2356	2107
Number of firms	459	449	385	463	453	388
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Robust SE clustered at the firm level reported in parentheses; $ADnamed_{jt}$ is an indicator that takes the value 1 if the Chinese firm *j* is specifically named in the US AD order in a given year *t*. In columns 1 and 4, firms with de minimus AD duties are not included in the treatment group but included in the control group; in columns 2 and 5, firms with de minimus AD duties are dropped from the sample; while in columns 3 and 6, sample is restricted to only those firms that exported at least once between the periods 2000–2006.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

Table 2. *Effects of AD duties on productivity: All exporters in the industry*

Dependent variable	ln (labor productivity)		ln (TFP)	
AD_{it}	-0.0198**	-0.0026	0.0004	0.0034
	(0.0088)	(0.0105)	(0.0034)	(0.0042)
$AD_{it} * ADnamed_{jt}$	-0.1650**	-0.1581**	-0.0487**	-0.0472**
	(0.0732)	(0.0738)	(0.0204)	(0.0202)
Capital–labor ratio (K/L)	0.2564***	0.2464***		
	(0.0064)	(0.0049)		
Age	0.1003***	0.0868***	0.0272***	0.0194***
	(0.0032)	(0.0024)	(0.0012)	(0.0009)
Age^2	0.0000	0.0001	-0.0001	0.0000
	(0.0001)	(0.0001)	(0.0000)	(0.0000)
Constant	1.8140***	1.9364***	0.7572***	0.8756***
	(0.0343)	(0.0235)	(0.0092)	(0.0066)
Adj R^2	0.60	0.60	0.52	0.49
Observations	184497	281751	200393	303726
Number of firms	58969	91384	60840	94097
Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes

Robust SE clustered at the firm level reported in parentheses; AD_{it} is an indicator that takes the value 1 if the Chinese firm is in industry i that received an AD duty imposed by the United States in a given year t; $ADnamed_{jt}$ is an indicator that takes the value 1 if the Chinese firm j is specifically named in the US AD order in a given year t. In columns 1 and 3, Sample II is used, while in columns 2 and 4, Sample III is used.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

When TFP is used as the productivity measure, again we see from columns 3–4 that the imposition of an AD duty leads to a negative and significant reduction in the total factor productivity of firms that are specifically targeted by an AD duty relative to those that were investigated but with no AD duty imposed. Moreover, the size of the effect is substantial with the estimates suggesting around 4% drop in TFP.

Note that the above results are based on revenue measures of productivity. Although, in the absence of any information on firm specific quantities, we have used an industry specific producer price deflator to deflate the nominal variables used in calculating our productivity measure. This certainly is not the ideal solution, especially because firms may be changing prices to influence the dumping margin during AD investigations. [20]

Table 3. *Robustness tests: controlling for AD filings by other countries*

Dependent variable	ln (labor productivity)		ln (TFP)	
AD_{it}	-0.0297***	-0.0064	-0.0031	-0.0043
	(0.0097)	(0.0106)	(0.0038)	(0.0042)
$AD_{it} * ADnamed_{jt}$	-0.1638**	-0.1726**	-0.0482**	-0.0525**
	(0.0732)	(0.0754)	(0.0201)	(0.0204)
Capital–labor ratio (K/L)	0.2564***	0.2464***		
	(0.0064)	(0.0049)		
Age	0.1004***	0.0868***	0.0272***	0.0195***
	(0.0032)	(0.0024)	(0.0012)	(0.0009)
Age^2	0.0000	0.0001	-0.0001	0.0000
	(0.0001)	(0.0001)	(0.0000)	(0.0000)
AD_{it} other countries	0.0286**	0.0316***	0.0098**	0.0618***
	(0.0122)	(0.0118)	(0.0049)	(0.0046)
Constant	1.7990***	1.9122***	0.7520***	0.8285***
	(0.0348)	(0.0252)	(0.0096)	(0.0074)
Adj R^2	0.60	0.60	0.52	0.49
Observations	184497	281751	200393	303726
Number of firms	58969	91384	60840	94097
Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes

Robust SE clustered at the firm level reported in parentheses; AD_{it} is an indicator that takes the value 1 if the Chinese firm is in industry i that received an AD duty imposed by the United States in a given year t; $ADnamed_{jt}$ is an indicator that takes the value 1 if the Chinese firm j is specifically named in the US AD order in a given year t, while *AD Other Countries*$_{it}$ is an indicator that takes the value 1 if the Chinese firm is in industry i that received an AD duty from some country other than the United States in a given year t; In columns 1 and 3, Sample II is used, while in columns 2 and 4, Sample III is used.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

However, the above issue is less of a concern for the findings in this paper, as our estimates indicate a lower bound of the true effect. First, theoretically, an AD duty margin is calculated as the difference between the price in the domestic market and that in the foreign market. Thus, Chinese firms can manipulate the calculated AD duty margin by either raising the price they charge in the United States or by lowering the price in the Chinese domestic market. Between the two options, the former one is more lucrative to firms facing an AD duty, and there is some evidence of foreign firms engaging in this behavior and thus leading to an effective transfer of tariff revenue toward rents for the foreign firms (Blonigen & Prusa, 2003). Such an increase in the foreign prices, however, will lead to an upward bias in the calculated revenue based productivity measure and hence, would lead to a bias against finding the main results in the paper.

Alternatively, firms can manipulate their duty margin by lowering their domestic price. However, for non-market economies such as China, the domestic price is irrelevant to the calculation of dumping margin—instead the costs from a surrogate country are used. Thus, there is no incentive for Chinese firms to alter their domestic prices in response to the imposition of AD duties. In fact, Lu *et al*. (2012) find that Chinese exporters do not adjust their product prices in response to the AD duties. [21]

Hence, the above results provide evidence that the imposition of an AD duty by the United States leads to a decline in the productivity of Chinese firms affected by the AD duty.

Table 4. *Additional results I: dynamics*

Dependent variable	ln (labor productivity)		ln (TFP)	
$AD_{it} * Year\ 1$	-0.0497***	-0.0347***	-0.0059*	-0.0057
	(0.0094)	(0.0109)	(0.0036)	(0.0043)
$AD_{it} * ADnamed_{jt} * Year\ 1$	-0.1297	-0.1699	0.0227	-0.0005
	(0.1804)	(0.1773)	(0.0511)	(0.0518)
$AD_{it} * Year\ 2$	0.0061	0.0382***	0.0024	0.0156***
	(0.0104)	(0.0116)	(0.0040)	(0.0047)
$AD_{it} * ADnamed_{jt} * Year\ 2$	-0.2846**	-0.3172**	-0.0589**	-0.0748**
	(0.1288)	(0.1291)	(0.0297)	(0.0302)
$AD_{it} * Year\ 3$	0.0022	0.0552***	0.0033	0.0312***
	(0.0125)	(0.0129)	(0.0049)	(0.0052)
$AD_{it} * ADnamed_{jt} * Year\ 3$	-0.2458**	-0.2659**	-0.0482*	-0.0631**
	(0.1045)	(0.1043)	(0.0250)	(0.0273)
$AD_{it} * Year\ 4$	-0.0162	0.0546***	-0.0034	0.0373***
	(0.0169)	(0.0151)	(0.0066)	(0.0060)
$AD_{it} * ADnamed_{jt} * Year\ 4$	-0.1686**	-0.1902**	-0.0595**	-0.0725***
	(0.0840)	(0.0875)	(0.0270)	(0.0273)
$AD_{it} * Year\ 5$	-0.0599***	0.0226	-0.0217***	0.0302***
	(0.0216)	(0.0183)	(0.0080)	(0.0069)
$AD_{it} * ADnamed_{jt} * Year\ 5$	-0.1232	-0.129	-0.0308	-0.0373
	(0.1141)	(0.1161)	(0.0285)	(0.0298)
$AD_{it} * Year\ 6$	-0.1239***	-0.0234	-0.0392***	0.0253***
	(0.0269)	(0.0221)	(0.0102)	(0.0085)
$AD_{it} * ADnamed_{jt} * Year\ 6$	0.0666	0.0612	-0.081	-0.0883
	(0.1719)	(0.1736)	(0.0701)	(0.0672)
$AD_{it} * Year\ 7$	-0.1249***	-0.0091	-0.0282*	0.0456***
	(0.0418)	(0.0372)	(0.0166)	(0.0149)
$AD_{it} * ADnamed_{jt} * Year\ 7$	0.0974	0.0794	-0.0537	-0.0675
	(0.2145)	(0.2157)	(0.0500)	(0.0481)
Capital–labor ratio (K/L)	0.2549***	0.2454***		
	(0.0064)	(0.0049)		
Age	0.0966***	0.0779***	0.0278***	0.0149***
	(0.0043)	(0.0027)	(0.0016)	(0.0010)
Age^2	0.0001	0.0002**	0.0000	0.0000
	(0.0001)	(0.0001)	(0.0000)	(0.0000)
Constant	1.8431***	2.0086***	0.7484***	0.9128***
	(0.0435)	(0.0253)	(0.0138)	(0.0074)
Adj R^2	0.60	0.60	0.52	0.49
Observations	184497	281751	200393	303726
Number of firms	58969	91384	60840	94097
Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes

Robust SE clustered at the firm level reported in parentheses; AD_{it} is an indicator that takes the value 1 if the Chinese firm is in industry j that received an AD duty in a given year t; $ADnamed_{jt}$ is an indicator that takes the value 1 if the Chinese firm j is specifically named in the US AD order in a given year t. *Year 1* is a dummy variable indicating that it is the 1st year since the AD duty is imposed, *Year 2* is a dummy variable indicating that it is the 2nd year since the AD duty is imposed, and so on. In columns 1 and 3, Sample II is used, while in columns 2 and 4, Sample III is used.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

(b) *Robustness checks and additional results*

To test the robustness of the above findings, we conduct additional tests and provide additional results in this section.

In Table 3, we control for whether the industry has faced an AD duty imposed by other countries. In particular, during our sample period 2000–2006 twenty economies besides the United States had an active antidumping investigation against exports from China.[22] Of which 18 economies had imposed an antidumping duty against exports of at least one product at some point during this period. Since we do not have the list of firms that were specifically named in the AD investigations for these countries, we add this control only when using the two larger samples that include all exporting firms from industries imposed with AD duties *versus* their respective control groups. Thus, in Table 3 we include a dummy variable indicating whether there was an active antidumping duty by at least one of these countries against China in that industry-year. As we can see, the inclusion of the additional control does not alter the estimated effects of AD duties on firm productivity.

The positive sign of the estimated coefficient for AD duties from other countries merits some discussion. Although we expect AD duties from different countries to have similar dampening effects on firm productivity, we cannot address the sample selection issue for AD investigations involving other countries, as it is beyond the scope of the current study to construct suitable treatment *versus* control groups for these AD actions. The positive correlation between AD duties imposed by other countries and productivity of Chinese exporters most likely reflect the fact that more productive exporters are more likely to be named in AD cases by their domestic competitors in these countries. It is reassuring to see that neither the sign nor the magnitude of our main explanatory variables change as a result of including the above controls.

We also conduct additional robustness tests, as shown in Tables 11 and 12. For instance, since steel and chemicals industries are two of the leading targets of antidumping duty we exclude them from the sample, to see if our results are being driven by one of these industries. We also drop the top and bottom 1% of observations in terms of our dependent variables to minimize the impact of potential outliers. Table 11 reports the results corresponding to Sample I, whereas Table 12 reports results from Sample II and Sample III. Estimates from all these specifications confirm the significant and negative effects of being named in an AD duty on the Chinese firm's productivity.

Next, we provide two sets of additional results regarding the dynamics of AD duty effects of firm productivity and the role of firm ownership in influencing AD duty effects. Table 4 presents results on how the effects of AD duty imposition evolve over time, using Sample II and Sample III. Specifically, instead of including a single indicator for all periods in which a firm was affected by AD duty, we include separate dummies for the first year, the second year, up to the seventh year since the AD duty was imposed. According to the WTO sunset clause, AD duty is typically imposed for five years, although it can be renewed at the end of the five years. The results based

Table 5. *Additional results II: role of firm ownership*

Dependent variable	Sample II				Sample III			
	ln (labor productivity)		ln (TFP)		ln (labor productivity)		ln (TFP)	
AD_{it}	0.0147	-0.0062	0.0074*	0.0003	0.0474***	0.0280*	0.0208***	0.0176***
	(0.0115)	(0.0140)	(0.0043)	(0.0052)	(0.0142)	(0.0164)	(0.0054)	(0.0062)
$AD_{it} * ADnamed_{jt}$	-0.1593**	-0.2463**	-0.0474**	-0.0637*	-0.1653**	-0.2366*	-0.0484**	-0.0793**
	(0.0734)	(0.1233)	(0.0201)	(0.0374)	(0.0755)	(0.1363)	(0.0205)	(0.0387)
Capital–labor ratio	0.2558***	0.2421***			0.2460***	0.2335***		
	(0.0064)	(0.0082)			(0.0049)	(0.0065)		
$AD_{it} * Foreign_{jt}$	-0.0731***		-0.0150**		-0.0968***		-0.0341***	
	(0.0162)		(0.0059)		(0.0191)		(0.0074)	
$Foreign_{jt}$	0.0877**		0.0133		0.0936***		0.0347***	
	(0.0347)		(0.0123)		(0.0255)		(0.0087)	
$AD_{it} * State_{jt}$		0.0158		-0.0120		0.0068		0.0004
		(0.0223)		(0.0095)		(0.0244)		(0.0093)
$State_{jt}$		-0.0191		0.0150*		-0.0306		-0.0072
		(0.0242)		(0.0087)		(0.0212)		(0.0072)
Age	0.1008***	0.1179***	0.0272***	0.0303***	0.0869***	0.1003***	0.0194***	0.0207***
	(0.0032)	(0.0043)	(0.0012)	(0.0016)	(0.0024)	(0.0035)	(0.0009)	(0.0013)
Age^2	0.0000	-0.0001	-0.0001	0.0000	0.0001	0.0001	0.0000	0.0000
	(0.0001)	(0.0001)	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(0.0000)	(0.0000)
Constant	1.7745***	1.4046***	0.7508***	0.6571***	1.8903***	1.6482***	0.8585***	0.7889***
	(0.0371)	(0.0485)	(0.0103)	(0.0158)	(0.0262)	(0.0357)	(0.0076)	(0.0117)
Adj R^2	0.60	0.57	0.52	0.51	0.60	0.58	0.49	0.49
Observations	184202	108294	200073	118191	281361	151966	303301	164761
Number of firms	58920	36281	60790	37526	91310	52603	94021	54463
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust SE clustered at the firm level reported in parentheses; AD_{it} is an indicator that takes the value 1 if the Chinese firm is in industry i that received an AD duty imposed by the United States in a given year t; $ADnamed_{jt}$ is an indicator that takes the value 1 if the Chinese firm j is specifically named in the US AD order in a given year t, $Foreign_{jt}$ is an indicator that takes the value 1 if the Chinese firm has foreign ownership in a given year t; while $State_{jt}$ is an indicator that takes the value 1 if the Chinese firm has state owned in a given year t.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

on the two samples have some differences, but both show immediate negative impacts on firm productivity for all firms in the affected 4-digit level industry. In addition, the negative effects on specifically targeted firms can last up to four years.

We next explore the role of firm ownership on the effects of AD duties. We first compare foreign invested firms with domestic firms and then turn to the comparison between state owned enterprises (SOEs) and domestic private firms in China. Table 5 provides results for such exercises. We observe that foreign invested firms tend to experience greater negative effects of AD duties on their productivity than domestic exporters.[23] On the other hand, there is no significant difference in

Table 6. *Mechanism: export, sales, and value added.*

Dependent variable	ln (export)		ln (sales)		ln (value added)	
AD_{it}	0.3037***	0.6270***	0.0083	0.0572***	0.0025	0.0583***
	(0.0763)	(0.1339)	(0.0094)	(0.0149)	(0.0144)	(0.0192)
$AD_{it} * InitialExportIntensity_j$	-0.6402***	-0.9252***	-0.0451***	-0.0503**	-0.0560***	-0.0701***
	(0.1244)	(0.2386)	(0.0114)	(0.0207)	(0.0181)	(0.0234)
$AD_{it} * ADnamed_{jt}$	0.1579	0.5613**	0.1298**	0.2412***	0.0802	0.1195
	(0.2188)	(0.2375)	(0.0577)	(0.0644)	(0.0928)	(0.0995)
Capital–labor ratio (K/L)	-0.0773**	-0.0885***	-0.0352***	-0.0387***	-0.0238**	-0.0369***
	(0.0318)	(0.0246)	(0.0077)	(0.0060)	(0.0097)	(0.0075)
Age	0.2323***	0.1726***	0.1206***	0.0991***	0.1347***	0.1178***
	(0.0154)	(0.0121)	(0.0031)	(0.0025)	(0.0043)	(0.0033)
Age^2	-0.0036***	-0.0032***	-0.0009***	-0.0008***	-0.0008***	-0.0007***
	(0.0004)	(0.0003)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Constant	5.2329***	6.3825***	9.2654***	9.4301***	7.5321***	7.7023***
	(0.1922)	(0.1345)	(0.0435)	(0.0308)	(0.0558)	(0.0390)
Adj R^2	0.58	0.55	0.89	0.86	0.78	0.75
Observations	88151	127916	87991	127744	79889	116533
Number of firms	21092	31210	21081	31208	20250	29938
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Robust SE clustered at the firm level reported in parentheses; AD_{it} is an indicator that takes the value 1 if the Chinese firm is in industry i that received an AD duty imposed by the United States in a given year t; $ADnamed_{jt}$ is an indicator that takes the value 1 if the Chinese firm j is specifically named in the US AD order in a given year t, while $InitialExportIntensity_j$ is the export/sales ratio for firm j in year 2000. In columns 1, 3, and 5, Sample II is used; while in columns 2, 4, and 6, Sample III is used.

* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Table 7. *Mechanism: export intensity and AD effects on productivity*

Dependent variable	Sample II		Sample III	
	ln (labor productivity)	ln (TFP)	ln (labor productivity)	ln (TFP)
AD_{it}	-0.0027	0.0085	0.0316*	0.0050
	(0.0135)	(0.0059)	(0.0170)	(0.0097)
$AD_{it} * InitialExportIntensity_j$	-0.0349**	-0.0147*	-0.0433**	0.0052
	(0.0167)	(0.0079)	(0.0194)	(0.0160)
$AD_{it} * ADnamed_{jt}$	-0.1338	-0.0468**	-0.1494*	-0.0576***
	(0.0833)	(0.0213)	(0.0847)	(0.0202)
Capital–labor ratio (K/L)	0.2686***		0.2511***	
	(0.0104)		(0.0078)	
Age	0.0756***	0.0198***	0.0659***	0.0139***
	(0.0038)	(0.0014)	(0.0029)	(0.0011)
Age^2	0.0004***	0.0001*	0.0005***	0.0001***
	(0.0001)	(0.0000)	(0.0001)	(0.0000)
Constant	1.4777***	0.7001***	1.6297***	0.8179***
	(0.0536)	(0.0132)	(0.0368)	(0.0093)
Adj R^2	0.63	0.57	0.62	0.53
Observations	79889	87832	116533	127591
Number of firms	20250	21074	29938	31202
Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes

Robust SE clustered at the firm level reported in parentheses; AD_{it} is an indicator that takes the value 1 if the Chinese firm is in industry i that received an AD duty imposed by the United States in a given year t; $ADnamed_{jt}$ is an indicator that takes the value 1 if the Chinese firm j is specifically named in the US AD order in a given year t, while $InitialExportIntensity_j$ is the export/sales ratio for firm j in year 2000.

* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

how AD duties affect domestic firms of different ownership types (SOEs *versus* private firms). However, the negative impact of AD duties on the specifically targeted firms remains significant in all of these estimations.

In summary, the finding of anti-dumping duties negatively impacting productivity of the targeted firm is shown to be robust across many specifications.

(c) *Export, sales, and potential mechanism of AD effects*

The evidence presented above suggests that the imposition of an AD duty leads to a within-firm productivity decline for the affected firms, and it would be interesting to find out through what mechanisms AD duties have led to lower firm productivity. As the AD duty is directly aimed at reducing exports from affected foreign firms, we begin with export volume to search for channels of the negative productivity impact.

While the impact of AD duties on an average firm in our sample is insignificant, we do find negative and significant effects on firms with higher export intensity.[24] Specifically, in order to understand how AD duty affects firms with different export intensity, we interact the AD duty indicator with the initial export intensity of the firms i.e., export intensity in year 2000—the first year of our sample. Columns 1 and 2 in Table 6 report the effects of AD duties on firm exports when firm heterogeneity in terms of export intensity is allowed, with column 1 using Sample I and column 2 using Sample II. Both samples give very similar results, where firms with higher export intensity experience significant and negative effects of AD duties on their export level.

This is consistent with the goal of anti-dumping duties effectively reducing imports of large exporters and is in line with the findings in Lu *et al.* (2012), which shows significantly negative effects of AD duties on Chinese exports using product level data. Specifically, they find that most adjustment in export volume in response to the AD duty is along the extensive margin, not the intensive margin, meaning that the main effect is the exiting of previous exporters rather than the reduction in export volume of continuing exporters.

The results from Lu *et al.* (2012) help explain the lack of significant effects of AD duties on the export volume of the average firm in our sample. As the NBS data set mainly includes large and medium-sized firms but not the small exporters that are more likely to stop exporting due to AD duties, what we observe is mostly the intensive margin effects. But once the firms with higher export intensity are focused upon, the negative impact of AD duties is highlighted.

Another finding that needs explaining is the positive coefficient on AD duties. Since initial export intensity is included in the estimation, we should interpret the coefficient on AD duty as the impact of AD duties on firms with zero exports in 2000. Given that we restrict the sample to firms that had exported at least once during 2000–2006, part of the positive effect could purely be due to the fact that these firms would have positive exports in later period by definition. However, there are perhaps two other possible explanations. First, as firms with high initial export intensity will reduce their exports in response to AD duties and turn to the domestic market, the increased domestic competition might force some non-exporters to start exporting the same or a different product in a third market such as Vietnam. Second, Lu *et al.* (2012) find that some firms actually start exporting the same products affected by the AD duties. Unfortunately, we are unable to distinguish between these competing explanations in the absence of data on products and/or export destinations, and leave it for future studies.

We next look at the impact of AD on total sales. As shown in columns 3 and 4 in Table 6, it is also firms with higher export intensity that experience a drop in total sales when facing AD duties. We obtain similar results for value added, as shown in columns 5 and 6 in Table 6.

Combined together, results from Table 6 depict the following picture of how AD duties imposed by the US government affect Chinese firms. The AD duties raise trade barriers for existing exporters, causing firms with high export intensity to reduce their export volumes. But, at the same time of these firms lowering their export level, new exporters enter into the product line affected by the AD duties, viewing the market change as opening up new business opportunities. Thus, we observe the negative export impact of AD duties on firms with initial high export intensity but positive export impact on new exporters. As a result, we observe firms with initial high export intensity to experience lower total sales, whereas the new exporters experience no increase in total sales, presumably because they have to switch their production capacity from domestic sales to support new exports.

These results suggest a possible link between firms' export volume reduction and productivity decline. By reducing access to the foreign market, trade restrictions deprive exporting firms of the opportunity to benefit from the economy of scale by producing at a higher level. Consistent with the prediction, Table 7 shows that for both Sample II and Sample III, firms with higher export intensity are also the ones experiencing negative effects on their labor productivity as well as total factor productivity, and the results are robust in three out of the four specifications.

To summarize, we find negative effects of AD duties on firm exports, value added, sales, and productivity. Thus, our findings suggest the following mechanism through which AD duties negatively affect foreign exporters' productivity: Trade restrictions lower output level and thus reduce firms' productivity due to less benefit from economy of scale. And these effects are most pronounced for firms that had higher initial export intensity before the imposition of the AD duty.

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 AD duties led to a substantial decrease in the productivity of Chinese exporting firms. The resulting drop in productivity is evident whether we use labor productivity or total factor productivity. A similar drop in productivity is observed for all other exporting firms in the industries targeted by AD duties, although the effect is much smaller in size.

These results are an important first step in the study of anti-dumping duties, because the United States 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 European union and India). A second potential extension of the research is to study firm level export diversion toward other markets as a result of AD duties. As many firms produce multiple products, it would also be interesting to study whether there are any reallocations across products within the firm as a result of AD duty. Yet another direction for future research is finding other possible mechanisms through which market access affects firm performance, such as product switching. Finally, while the evidence presented here suggests reduced economies of scale resulting from AD duties as one channel through which targeted firms' productivity is reduced, there could be other channels as well. For instance, firms might decrease their R&D investment as a result of antidumping duties. These additional explorations, however, will require access to more detailed data.

NOTES

1. India has emerged as 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.

2. In a recent working paper, Li and Whalley (2010) explore the impact of AD imposed on China. However, their analysis is at the two digit industry level.

3. In evaluating the effects of antidumping duty on firms in European Union, Konings and Vandenbussche (2008, p. 375) write "A first natural candidate control group for the protection cases is clearly the termination cases. Termination cases involve firms in sectors that filed for AD protection but did not get it."

4. 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. In reality, the DOC sends the questionnaires to a representative government body asking for help in locating all potential respondents. It also often sends courtesy copies to the foreign firms it thinks to be the relevant respondents.

5. 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 rate status firms have to show that they are free from government control both de jure and de facto. "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).

6. As the Department of Commerce almost always finds an affirmative decision for dumping (Blonigen, 2006), whether or not a final duty is imposed rests mainly on (1) the DOC's decision on whether the dumping margin falls below a certain threshold, *de minimus*, and (2)the ITC's decision on whether the alleged dumping has threatened or caused injury to the domestic import competing industry.

7. We used an indicator for the AD duty rather than the level of AD duty, as our prior discussion suggests targeted firms are more likely to be able to influence the level of AD duties by influencing the dumping margin, for example by lowering the price in the home country, which leads to a lower duty rate. On the other hand, the firm is less able to influence whether the AD duty is imposed, as whether or not a duty is imposed is an industry wide decision based in part on whether the corresponding U.S. import competing industry is being injured. Note, however, being a non-market economy Chinese firms have no incentive to manipulate the domestic price.

8. While the sample period varies across countries, the AD data for the United States are available for the entire period.

9. Among the 92 cases, 48 are new AD investigations initiated sometime during our sample period 2000–2006. The rest were AD orders from earlier years that continued to be in effect at the beginning of our sample period. The earliest such AD duties are on "Greige Polyester Cotton Cloth" and "Cotton shop towels" that were initiated in 1981.

10. There are several firms that were involved in more than one AD case. Out of the total of 572 AD cases, 386 cases were unique firms, i.e., involved in just one case whereas others had more than one AD case. For example, a single firm, Shanghai Pudong Baosteel corp., was involved in as many as 7 separate cases. In our analysis below, we classify the firm as facing an AD duty if it faces at least one active AD duty during a given year.

11. Note that, both Blonigen and Park (2004) and Konings and Vandenbussche (2008) were interested in the probability of imposition of antidumping duty from the perspective of the importing country, whereas, in this paper we are interested in the probability of having an antidumping duty imposed on industries in the exporting country.

12. All the robustness results as well as results using control samples based on alternative definitions are available from the authors on demand.

13. Using the ratio between value added and wage (in logs) does not change our results.

14. We deflate all nominal variables using an industry specific ex factory producer price index, with the exception of capital, which is deflated using a fixed investment price index. While it would be ideal to use a firm specific deflator, the lack of data availability prevents us from doing so.

15. In column 1 the impact of imposition of antidumping duty on the productivity of firms is $100 * [\exp(-0.1326) - 1]\% = 12.4\%$.

16. Ahn, Khandelwal, and Wei (2010) find that Chinese firms using intermediaries to sell abroad accounted for about 20% of China's total exports in 2005.

17. Lu et al. (2012) also find a larger impact of duty on direct exporters than on intermediary firms.

18. See Van Beveren (2012) for a recent survey.

19. We conduct the estimations for TFP using the user written command opreg in STATA by Yasar, Raciborski, and Poi (2008). Compared to the standard Olley–Pakes model, an additional variable indicating whether the firm is an exporter is also included in our productivity equation, as exporters are likely to face different market conditions than non-exporters when making their investment decisions (Olley & Pakes, 1996). But our results remain qualitatively unchanged even if we ignore the export status.

20. For example, Pierce (2011) shows how revenue based productivity measures might lead to very different results compared to quantity based measures.

21. Chinese firms could also increase the price of their goods in third country markets (e.g., European Union) to avoid getting hit by the AD duty in those markets. This again will bias against our main findings in the paper.

22. Note that, we count the European Union as one economy. The countries with an active antidumping investigation against at least one of the products exported from China during 2000-2006 include: Argentina, Australia, Brazil, Canada, Columbia, European Union, Indonesia, India, Israel, South Korea, Mexico, New Zealand, Pakistan, Peru, Philippines, Thailand, Trinidad and Tobago, Turkey, Taiwan, and South Africa.

23. We suspect that the greater negative impact of AD duties on foreign invested firms in China is due to their higher initial export intensity. See more detailed discussion on mechanism in the next section.

24. Results for the effect on average firms are not reported to conserve space but are available on demand from the authors.

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APPENDIX A:. TOTAL FACTOR PRODUCTIVITY (TFP) ESTIMATIONS

As is well known, estimating the parameters of a production function to calculate a measure of productivity suffers from both selection bias, i.e., the least productive firms are more likely to exit (Wedervang, 1965), as well as the bias due to simultaneity between choice of input and productivity (Marschak & Andrews, 1944). In order to correct for these problems we follow the procedure outlined by Olley and Pakes (1996).[1]

The basic idea behind the procedure is the following. The production function can be assumed to be the standard Cobb-Douglas production function, which can be written in logs as:

$$y_{jt} = \beta_0 + \beta_a a_{jt} + \beta_k k_{jt} + \beta_l l_{jt} + \beta_m m_{jt} + \omega_{jt} + \eta_{jt}$$

where, y_{jt} is the log of output for firm j at time t, a_{jt} is the firm's age, and k_{jt}, l_{jt}, and m_{jt} are the logs of capital, labor, and material input, respectively. The productivity, $\omega_{jt} = \alpha_0 + \mu_{jt}$ is the firm level productivity observed by the firm but not by the econometrician, whereas, η_{jt} is the random shock. Additionally, the productivity is assumed to follow a Markov process.

Olley and Pakes (1996) use a semi-parametric algorithm to estimate the above parameters. Essentially, the idea is to use firm's investment decision as a proxy for unobserved productivity shock to solve the simultaneity problem. Assuming log investment (i_{jt}) to be strictly increasing in productivity, productivity can be written as $\omega_{jt} = \varphi(i_{jt}, a_{jt}, k_{jt})$. Substituting this in the equation above, we can write the production function as:

$$y_{jt} = \beta_l l_{jt} + \beta_m m_{jt} + \phi(i_{jt}, a_{jt}, k_{jt}) + \eta_{jt}$$

where, $\phi(i_{jt}, a_{jt}, k_{jt}) = \beta_0 + \beta_a a_{jt} + \beta_k k_{jt} + \varphi(i_{jt}, a_{jt}, k_{jt})$.

Following De Loecker (2007) and Van Biesebroeck (2005), we also include an additional variable indicating whether the firm is an exporter in the above productivity equation as exporters are likely to face different market conditions than non-exporters when making their investment decisions. Hence, our productivity function can be written as $\omega_{jt} = \varphi(i_{jt}, a_{jt}, k_{jt}, e_{jt})$ where e_{jt} is an export dummy.[1]

We use real firm sales as our dependent variable by using the industry-level producer price index obtained from various issues of China Statistical Yearbook as deflator. Similarly, we use ex-factory price index obtained from various issues of China Statistical Yearbook to deflate capital. Importantly, instead of having to rely on an arbitrary rate of depreciation we use the depreciation allowance that varies at the firm and year level from the NBS dataset. Hence, the law of motion for capital can be written as $K_{jt+1} = (1 - \delta_{jt})K_{jt} + I_{jt}$ where, K_{jt} is the real capital for firm j at time t, I_{jt} is firm j 's investment, and δ_{jt} the firm and time specific rate of depreciation.

We carry out the estimations for TFP using the user written command *opreg* in STATA by Yasar *et al.* (2008). Briefly, the estimation procedure involves three stages. In the first stage, to estimate the above equation we follow Olley–Pakes and use a third order polynomial to approximate $\varphi(i_{jt}, a_{jt}, k_{jt}, e_{jt})$. Note that, as described by Olley–Pakes, estimating the above equation with OLS does not control for the selection bias described above. Hence, firm's exit decision is estimated in the second stage using a Probit model; followed by a non-linear estimation in the third stage to recover the model parameters. The standard errors are calculated using the (clustered) bootstrap method treating all observations for a given firm as a single cluster.[1]

Note that, in order to allow the parameters to differ across industries, we follow Amiti and Konings (2007) and estimate the production function separately for each industry. As robustness checks, we also experimented with (a) estimating a common production function for the entire economy, and (b) excluding the export term from the productivity function while calculating industry specific production functions. Our results remain qualitatively unchanged with either of the two modifications.

Table 8. *Summary statistics of key variables (2000)*

(a). Comparison between firms named in AD investigations and all other firms

Variables	All firms in the NBS database that were not specifically named in any AD investigations			All Chinese firms that were specifically named in any US AD duty investigations		
	N	Mean	SD	*N*	Mean	SD
ln(Labor Productivity)	126353	3.10	1.35	181	3.87	1.14
ln(Total Factor Productivity)	147010	0.88	0.59	193	0.95	0.47
ln(Value Added)	126520	8.06	1.68	181	10.20	2.33
ln(Sales)	149955	9.42	1.60	196	11.53	2.14
ln(Capital Intensity (K/L))	151269	3.52	1.36	196	4.24	1.22
ln(Exports)	156150	2.10	3.96	198	8.62	4.60
Export Intensity	150406	0.17	3.32	197	0.39	0.84
Age	155176	15.52	14.37	196	14.81	17.23
ln(Employment)	153350	4.92	1.25	198	6.29	1.84

(b). Comparison between treatment and control groups in Eqn. (2)—Sample I

	All firms that were named in AD investigations but where no AD duty was imposed			All firms that were named in the AD investigations and where a final AD duty was imposed		
	N	Mean	SD	N	Mean	SD
ln(Labor Productivity)	60	3.76	1.19	121	3.93	1.12
ln(Total Factor Productivity)	66	0.98	0.53	127	0.94	0.44
ln(Value Added)	60	10.57	2.20	121	10.01	2.37
ln(Sales)	66	12.03	1.90	130	11.28	2.22
ln(Capital Intensity (K/L))	67	4.67	1.23	129	4.01	1.16
ln(Exports)	67	8.89	4.26	131	8.48	4.78
Export Intensity	67	0.21	1.29	130	0.49	0.43
Age	67	19.70	18.41	129	12.27	16.08
ln(Employment)	67	6.80	1.82	131	6.02	1.80

(c). Comparison between treatment and control groups for Eqn. (3)—Sample II

	All exporters in industries that were investigated but where No AD Duty was imposed			All exporters in industries that were investigated and where a final AD duty was imposed		
	N	Mean	SD	N	Mean	SD
ln(Labor Productivity)	4825	3.21	1.28	10275	3.08	1.31
ln(Total Factor Productivity)	5612	0.83	0.51	11741	0.78	0.52

ln(Value Added)	4828	8.17	1.60	10282	7.87	1.74
ln(Sales)	5712	9.64	1.51	11969	9.19	1.72
ln(Capital Intensity (K/L))	5710	3.65	1.35	12059	3.55	1.29
ln(Exports)	5904	1.89	3.89	12517	1.33	3.28
Export Intensity	5712	0.13	0.37	11969	0.09	0.29
Age	5851	12.49	12.27	12398	16.51	15.37
ln(Employment)	5797	4.94	1.16	12249	4.74	1.27

(d) Comparison between treatment and control groups for Eqn. (3)—Sample III

	All exporters in industries that were investigated but where No AD Duty was imposed			All exporters in industries that were investigated and where a final AD duty was imposed		
	N	Mean	SD	N	Mean	SD
ln(Labor Productivity)	57687	3.03	1.38	10275	3.08	1.31
ln(Total Factor Productivity)	67998	0.80	0.59	11741	0.78	0.52
ln(Value Added)	57773	8.04	1.69	10282	7.87	1.74
ln(Sales)	69441	9.39	1.63	11969	9.19	1.72
ln(Capital Intensity (K/L))	70390	3.49	1.32	12059	3.55	1.29
ln(Exports)	72558	1.73	3.68	12517	1.33	3.28
Export Intensity	69871	0.11	0.35	11969	0.09	0.29
Age	72338	16.55	15.02	12398	16.51	15.37
ln(Employment)	71370	4.96	1.28	12249	4.74	1.27

The table reports summary statistics for 2000—the first year of our sample. In order to compare the treatment and control groups prior to imposition of AD duty, we exclude firms that already had AD duty in year 2000 from this table. Panel (a) reports the summary statistics for all firms in our sample *versus* the summary statistics for those firms that were specifically named in an AD investigations during our sample period (2000–2006). Panel (b) provides comparison for the treatment and control groups in our Sample I.
Panel (c) provides comparison for the treatment and control groups in our Sample II. Panel (d) provides comparison for the treatment and control groups in our Sample III. All the nominal variables were deflated using industry specific ex-factory producer price index various issues of the China Statistical Yearbook. Capital is deflated using fixed investment price index. The TFP is calculated using Olley–Pakes methodology.

Table 9. *Summary statistics of key variables (2000), controlling for industry fixed effects*

Variables	(OLS)	(OLS)	(OLS)	(OLS)
ln(Labor Productivity)	0.6275***	0.1805	0.0493	0.0467
	(0.1117)	(0.4600)	(0.0870)	(0.0980)
ln(Total Factor Productivity)	0.1598***	0.0105	0.0456**	0.0111
	(0.0318)	(0.1766)	(0.0194)	(0.0126)
ln(Value Added)	1.9207***	-0.1923	0.2930	0.1269
	(0.2887)	(0.8501)	(0.2081)	(0.1540)
ln(Sales)	1.7719***	-0.3784	0.1790	0.0729
	(0.2823)	(0.7712)	(0.1817)	(0.1400)
ln(Capital Intensity (K/L))	0.4358***	-0.2334	-0.0189	-0.0083
	(0.1048)	(0.2825)	(0.2349)	(0.1317)
ln(Exports)	5.7293***	-1.2791	-0.7068	-0.0999
	(0.5726)	(2.2236)	(0.9051)	(0.3748)
Export Intensity	0.2827***	0.1914	-0.1441	-0.0109
	(0.0633)	(0.3638)	(0.0916)	(0.0515)
Age	-0.8452	0.6325	2.3337	-0.5118
	(2.1134)	(6.0433)	(1.4064)	(0.9847)
ln(Employment)	1.3010***	-0.2793	0.2305	0.0677
	(0.2302)	(0.6503)	(0.1691)	(0.1494)

Robust standard errors clustered at the four-digit industry level are reported in parentheses.
Each cell presents coefficients from a separate regression using data from 2000—the first year of our sample. The dependent variables are in the left column. Each of these dependent variables was regressed on a dummy indicating whether an AD duty was ever imposed on the firm during 2001–2006. Each regression also included industry fixed effects. The first two columns include industry-fixed effects at the four digit level whereas the third and fourth columns include industry fixed effects at two digit level, as in the third and fourth columns AD indicator varies at the four-digit industry level. Column 1 compares the firms specifically named in the AD duty order with the entire sample of firms. Column 2 compares the treatment group and control group in Sample I, column 3 compares the treatment group and control group in Sample II, and column 4 compares the treatment group and control group in Sample III.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Table 10. *Multinomial logit regressions for estimating the probability of AD investigations and AD duty imposition*

Dependent variable = "1 if the industry had no antidumping investigations, " "2 if investigated but no antidumping duties imposed, " and "3 if investigated and an antidumping duty was imposed"						
Determinants of terminations given AD investigation						
Lagged Exports to US_i	0.4441***	0.5457***	0.4425***	0.4010**	0.4270***	0.3809**
	(0.1078)	(0.1249)	(0.1631)	(0.1644)	(0.1057)	(0.1641)
gr(Exports to $US)_i$	0.1969	0.6253	0.5893	0.5681	0.1535	0.5097
	(0.4669)	(0.6133)	(0.6151)	(0.6243)	(0.4670)	(0.6148)
Lagged $Employment_i$	0.4150*	0.3119	0.3529	-0.1892	0.3716	-0.1206
	(0.2325)	(0.2343)	(0.2379)	(0.3838)	(0.2350)	(0.6872)
Lagged Number of $Firms_i$	-0.6654**	-0.5651**	-0.5835**	-0.6152**	-0.6114**	-0.6046**
	(0.2788)	(0.2784)	(0.2788)	(0.2775)	(0.2841)	(0.2890)
gr(Exports to the $World)_i$		-2.2987**	-2.4167**	-2.2881**		-2.2654**
		(1.1202)	(1.1170)	(1.1116)		(1.0986)
Lagged Total $Output_i$				0.5728*		0.4948
				(0.3076)		(0.7027)
Share of Exports to US relative to $World_i$			2.2660	2.7562		2.9138
			(2.3260)	(2.3772)		(2.4011)
Lagged Labor $Productivity_i$					0.0024*	-0.0002
					(0.0013)	(0.0031)
Determinants of AD duty imposition given AD investigation						
Lagged Exports to US_i	0.3294***	0.3691***	0.4268***	0.4031***	0.3272***	0.3965***
	(0.0528)	(0.0567)	(0.0774)	(0.0780)	(0.0529)	(0.0792)
gr(Exports to $US)_i$	-0.1756	-0.0788	-0.0732	-0.0993	-0.1807	-0.1199
	(0.2013)	(0.2178)	(0.2190)	(0.2221)	(0.2022)	(0.2284)
Lagged $Employment_i$	-0.5250***	-0.5547***	-0.5799***	-0.9501***	-0.5169***	-2.6348***
	(0.1690)	(0.1676)	(0.1695)	(0.2398)	(0.1679)	(0.6068)
Lagged Number of $Firms_i$	0.6800***	0.7031***	0.7095***	0.6392***	0.6721***	0.4474**
	(0.1982)	(0.1960)	(0.1964)	(0.1967)	(0.1972)	(0.1988)
gr(Exports to the $World)_i$		-1.1574**	-1.0524**	-0.9214*		-0.8956*
		(0.5212)	(0.5322)	(0.5353)		(0.5437)
Lagged Total $Output_i$				0.4336**		2.2667***
				(0.1931)		(0.6205)
Share of Exports to US relative to $World_i$			-1.4163	-1.0844		-0.7313
			(1.2925)	(1.3008)		(1.3169)
Lagged Labor $Productivity_i$					0.0012	-0.0109***
					(0.0010)	(0.0036)
Observations	522	522	522	522	522	522
Pseudo R^2	0.10	0.11	0.11	0.12	0.10	0.13
Chi-Square Statistics	81.18	89.20	92.11	99.13	84.67	111.70
P value	0.00	0.00	0.00	0.00	0.00	0.00

The table reports results of multinomial logit regressions used to estimate the probability that a four-digit Chinese industry is involved in an antidumping investigation by the United States as well as the probability that an antidumping duty was ever imposed during 2000–2006. The dependent variable takes one of the three values: 1 if the industry faced no antidumping investigations during 2000–2006, 2 for investigated but no antidumping duties imposed, and 3 for industries that were investigated and where an antidumping duty was imposed at any point during the sample period. The industry level control variables are from year 1999. We construct our control group in Sample III using industries that were never investigated but had a predicted probability above 75th percentile of the predicted probability of industries that had an AD duty imposed during our sample period. Results reported in the paper are based on the predicted probability from column 1 above. However, all of our results remain unchanged if we instead use predicted probabilities based on other columns of this Table.

* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Table 11. *Robustness tests (Investigated control group)*

Dependent variable	ln (labor productivity)				ln (total factor productivity)			
	Excludes chemical and steel	Excludes plastics and rubber	Excludes telecomm-unications	Excludes top bottom 1 percentile	Excludes chemical and steel	Excludes plastics and rubber	Excludes telecomm-unications	Excludes top bottom 1 percentile
$ADnamed_{jt}$	-0.1675**	-0.1454*	-0.1549**	-0.1074*	-0.0603**	-0.0569**	-0.0553**	-0.0409**
	(0.0825)	(0.0809)	(0.0742)	(0.0632)	(0.0252)	(0.0263)	(0.0241)	(0.0190)
Capital–labor ratio (K/L)	0.3815***	0.3862***	0.3925***	0.3392***				
	(0.0590)	(0.0547)	(0.0518)	(0.0481)				
Age	0.0917***	0.0840***	0.0897***	0.0673***	0.0337***	0.0329***	0.0340***	0.0204***
	(0.0226)	(0.0222)	(0.0208)	(0.0187)	(0.0118)	(0.0090)	(0.0086)	(0.0059)
Age^2	-0.0004	0.0002	0.0001	0.0004	-0.0006	-0.0004*	-0.0004*	0.0000
	(0.0006)	(0.0005)	(0.0005)	(0.0004)	(0.0004)	(0.0002)	(0.0002)	(0.0001)
Constant	1.5294***	1.1766***	1.1238***	1.5241***	0.7425***	0.6502***	0.6380***	0.7027***
	(0.3081)	(0.3044)	(0.2741)	(0.2630)	(0.0692)	(0.0817)	(0.0737)	(0.0635)
Adj R^2	0.59	0.61	0.60	0.61	0.59	0.61	0.60	0.70
Observations	1871	2134	2192	2196	2044	2316	2372	2376
Number of firms	402	445	452	455	405	449	456	463
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust SE clustered at the firm level reported in parentheses.
$ADnamed_{jt}$ is an indicator that takes the value 1 if the Chinese firm j is specifically named in the US AD order in a given year t.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Table 12. *Robustness tests (Industry level samples)*

Dependent variable	Sample II				Sample III			
	Excludes chemical and steel	Excludes top bottom 1 percentile	Excludes chemical and steel	Excludes top bottom 1 percentile	Excludes chemical and steel	Excludes top bottom 1 percentile	Excludes chemical and steel	Excludes top bottom 1 percentile
	ln(Labor Productivity)		ln(TFP)		ln(Labor Productivity)		ln(TFP)	
AD_{it}	-0.0160*	-0.0234**	-0.0022	0.0044	-0.0015	-0.0169	0.0014	-0.0028
	(0.0094)	(0.0099)	(0.0035)	(0.0028)	(0.0107)	(0.0127)	(0.0042)	(0.0038)
$AD_{it} * ADnamed_{jt}$	-0.1866**	-0.1044	-0.0554***	-0.0339*	-0.1818**	-0.1042	-0.0520**	-0.0406**
	(0.0812)	(0.0672)	(0.0209)	(0.0179)	(0.0822)	(0.0715)	(0.0218)	(0.0178)
Capital–labor ratio (K/L)	0.2548***	0.2390***			0.2449***	0.2359***		
	(0.0069)	(0.0074)			(0.0050)	(0.0067)		
Age	0.0973***	0.0961***	0.0266***	0.0228***	0.0845***	0.0906***	0.0187***	0.0223***
	(0.0035)	(0.0036)	(0.0013)	(0.0010)	(0.0026)	(0.0034)	(0.0010)	(0.0010)
Age^2	0.0000	-0.0001	-0.0001	-0.0001**	0.0001	0.0000	0.0000	-0.0001**
	(0.0001)	(0.0001)	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(0.0000)	(0.0000)
Constant	1.8452***	1.9698***	0.7591***	0.7667***	1.9600***	2.0398***	0.8861***	0.8187***
	(0.0366)	(0.0392)	(0.0099)	(0.0080)	(0.0240)	(0.0355)	(0.0067)	(0.0075)
Adj R^2	0.59	0.60	0.52	0.71	0.59	0.60	0.49	0.69
Observations	158585	126133	172006	137570	258628	146786	278462	159013
Number of firms	51909	42156	53564	43580	84766	52105	87259	53934
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust SE clustered at the firm level reported in parentheses.
$ADnamed_{jt}$ is an indicator that takes the value 1 if the Chinese firm j is specifically named in the US AD order in a given year t, whereas, AD_{it} is indicator for the industry-wide AD duty and takes the value 1 for all firms belonging to any industry i that is targeted with a US AD order in a given year t.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.