Eastern Econ J
https://doi.org/10.1057/s41302-018-0118-5

ORIGINAL ARTICLE

# Retaliatory Antidumping by China: A New Look at the Evidence

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**Abstract** China is the most frequent target of antidumping (AD) filings and the sixth most frequent user of antidumping duties. In this paper, we investigate the factors that influence China's decision to retaliate using AD filings from 1995 to 2015. We consider an AD filing by China to be retaliatory if it occurs within 1 year of an initial AD filing against them and determine the factors that explain retaliatory antidumping filings. We find that higher levels of China's country-specific imports, lower growth rates of Chinese GDP, and China's WTO membership increase the likelihood of retaliation. In contrast, higher import growth reduces AD retaliation.

**Keywords** Antidumping · Retaliation · Trade · China · WTO

**JEL Classification** F1 · F13 · F14

## Introduction

Although the rules of the World Trade Organization (WTO) generally promote free trade, there are noticeable exceptions including the allowance of antidumping (AD) duties. Antidumping duties are a policy response to "dumping," which refers to one of two situations. First, dumping can refer to a firm selling a product at a

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Published online: 27 September 2018

lower price in a foreign market than its domestic market. Alternatively, dumping can refer to a firm exporting a good below cost. If a domestic producer suspects dumping, they have the ability to file an antidumping (AD) petition. If the government finds evidence of both dumping and harm to the domestic industry, the government can impose a duty equal to the difference between a foreign exporter's price in the domestic market and the price in the exporter's home market (Blonigen and Prusa 2015).

Analysis of China's antidumping activity is especially interesting for several reasons. First, China is the most frequent target of antidumping (AD) filings, yet only the sixth most frequent user of antidumping duties (Blonigen and Prusa 2015). Second, China passed a law in 1997 that explicitly allows for retaliation in the case of "discriminative anti-dumping measures," even though the WTO prohibits trade retaliation (Bao and Qiu 2011).[1] As of 2017, the law is still in place (Ministry of Commerce 2017).

Additionally, China has a high proportion of state-owned enterprises (SOEs). More than 150,000 Chinese businesses are owned by the government, and these SOEs account for 38% of China's industrial assets (Curran 2015). Because the Chinese government has both the potential to benefit from and ability to approve AD duties, there is a potential conflict of interest in Chinese AD cases since the regulatory oversight of the government is compromised. This also serves as a possible explanation for China's relatively high frequency of AD filings.

Finally, there is a dearth of the literature on China's antidumping behavior, especially in regard to retaliatory antidumping. The first major study of China's AD filings was performed by Bao and Qiu in (2011). Among many factors, the study found that retaliation affects China's AD filing behavior, but that China is no more retaliatory than the USA. Bao and Qiu also found that an increase in real GDP growth reduces China's AD filing frequency, while an increase in import penetration ratio and a decrease in geographical distance both increase frequency. In contrast, changes in exchange rates and the level of China's GDP do not significantly affect the country's AD filings (Bao and Qiu 2011).

Importantly, Bao and Qiu's paper analyzes the number of antidumping filings by China as a response variable, rather than analyzing case-specific retaliation. Thus, the paper evaluates when China initiates an AD filing, rather than analyzing the circumstances under which China retaliates against AD action—the topic of this paper.

Moreover, Bao and Qiu's analysis focused on the period of 1995–2005. Given that Bao and Qiu acknowledge that AD filings increased after the advent of the WTO, and given that China joined the WTO in 2001, it is of interest to evaluate whether China's antidumping retaliation behavior has significantly changed since WTO entrance using an updated dataset.

[1] Article 56. Where any country (region) takes discriminative antidumping measures on the products exported from the People's Republic of China, the People's Republic of China may, upon the actual circumstances, take corresponding measures against the country (region). (Ministry of Commerce 2017).

In 2015, Blonigen and Prusa wrote that "little has been done to formally examine the AD response to this natural experiment—the opening of the world to trade with China. What has been the cross-industry and cross-country incidence of AD use against China and does it accord with theory?" (Blonigen and Prusa 2015). In the spirit of Blonigen and Prusa, this paper not only examines cross-country but also cross-industry retaliation.

This paper examines China's use of antidumping duties as a trade retaliation mechanism using AD filings from 1995 to 2015. We consider an AD filing by China to be retaliatory if it occurs within 1 year of an initial AD filing against them and determine the factors that can explain retaliatory antidumping filings.[2] We find that over half of China's retaliatory AD actions are against the same industry targeted by the initial filer. Our estimates show that higher levels of China's country-specific imports, lower growth rates of Chinese GDP, and China's WTO membership all increase the likelihood of retaliation. In contrast, higher import growth reduces AD retaliation.

This paper is structured as follows: a review of current literature, data, empirical methodology, results, and conclusion.

## Current Literature

Despite the limited circumstance under which antidumping duties may be applied, the lack of clear mechanisms to prove the presence of dumping allows antidumping duties to be used as a more general form of trade protection. Several studies have found evidence of tit-for-tat behavior in AD activity. Blonigen and Prusa explain that "the way government agencies decide to determine dumping and injury is flexible, allowing discretion to find dumping in almost any situation" (Blonigen and Prusa 2015). Consequently, antidumping duties have the potential to be used for protectionism when no dumping is occurring. Finger thus describes antidumping as "ordinary protection with a good public relations program" (Finger 1993). Empirical data support this claim as well. A 2016 study by Bown and Crowley analyzes global antidumping patterns and finds that domestic industry demands contribute more to antidumping patterns than dumping by foreign firms (Bown and Crowley 2016).

While it is possible that these industry demand patterns are due to business cycle effects, it is also possible that antidumping duties can be used as a mechanism for trade retaliation by WTO countries prohibited from utilizing other forms of retaliation. In 2002, Prusa and Skeath analyzed economic and strategic motivations for AD use from 1980 to 1998. They found that countries are more likely to initiate AD action against trade partners that supply them with a large share of imports. However, import surges are unlikely to increase AD activity. This indicates that the total value of imports from a country is more important than changes in import value in motivating AD behavior. Moreover, Prusa and Skeath discovered retaliation patterns

[2] This is the same definition of AD retaliation as in Feinberg and Reynolds (2006).

in the data; countries are more likely to file AD cases against countries that have previously filed AD action against them (Prusa and Skeath 2002). Similar analysis by Prusa and Skeath in (2005) with an updated dataset came to a similar conclusion (Prusa and Skeath 2005). Notably, both studies by Prusa and Skeath considered aggregate trade data for each country, rather than industry-specific data, and thus could not capture industry-specific motivations. In 2013, Besedes and Prusa found that the filing of an AD action has large trade exit effects, even before the AD duty is implemented (Besedes and Prusa 2013). If this is true, we would expect the implementation of an AD duty to be irrelevant to retaliation against it.

A study performed by Feinberg and Reynolds in (2006) analyzed tit-for-tat AD behavior across countries and broad industry categories, using Harmonized System (HS2) data to analyze industry-specific antidumping behavior. They found that higher values of industry imports from a given country increase the likelihood of retaliation—defined as a counter-AD filing against the instigating country within 1 year of initial filing (Feinberg and Reynolds 2006). Feinberg and Reynolds include country-specific dummy variables to account for time-invariant AD differences between countries, thereby omitting country-specific variables such as geographic distance. In addition, they do not consider change in retaliator's GDP, import penetration, industry-specific export values, or aggregate country import and export values as potential right-hand side regressors.

Feinberg and Reynolds recently expanded their analysis to evaluate the effects of AD implementation, the size of a retaliator's sectoral exports to an instigator, the importance of trade relationship (defined as a country's exports and imports with the instigator as a share of total GDP), annual GDP growth for the retaliating country, and several other factors. They found that countries are more likely to retaliate when GDP growth is lower, consistent with Bao and Qiu (2011). Contrary to Besedes and Prusa's (2013) analysis of filing frequency, Feinberg and Reynolds find that retaliation is more likely when the instigator's AD is implemented. Feinberg and Reynolds also find that higher sectoral exports to an instigator increase the likelihood of retaliation. Finally, they find that trade importance (combined levels of imports and exports) did not change the likelihood of AD retaliation (Feinberg and Reynolds 2018).

## Data

China has been the target of more antidumping duties than any other country in the world. According to the World Bank's *Global Antidumping Database* (World Bank 2018), China was targeted by antidumping duties 1045 times from 1995 to 2015, as given in Table 1. In comparison, the second most targeted country, South Korea, was only subject to AD duties 201 times from 1995 to 2013. Table 1 lists the number of AD actions initiated against China from 1995 to 2015 by country. India has been the most frequent user of AD duties against China, initiating 16.75% of all cases (175 cases) from 1995 to 2015. The European Union accounts for 11.67% (122 cases) of AD actions against China, followed by Brazil with 8.71% (91 cases), Argentina with

**Table 1** Antidumping action against China by country (1995–2015)

| Country name | Frequency | Percent |
|---|---|---|
| India | 175 | 16.75 |
| European Union | 122 | 11.67 |
| Brazil | 91 | 8.71 |
| Argentina | 87 | 8.33 |
| Turkey | 84 | 8.04 |
| USA | 62 | 5.93 |
| Peru | 53 | 5.07 |
| Mexico | 51 | 4.88 |
| Australia | 46 | 4.40 |
| Colombia | 42 | 4.02 |
| Canada | 39 | 3.73 |
| South Africa | 39 | 3.73 |
| South Korea | 29 | 2.78 |
| Indonesia | 22 | 2.11 |
| Thailand | 19 | 1.82 |
| Pakistan | 17 | 1.63 |
| Russia | 12 | 1.15 |
| Malaysia | 11 | 1.05 |
| Taiwan | 10 | 0.96 |
| New Zealand | 8 | 0.77 |
| Israel | 7 | 0.67 |
| Ukraine | 7 | 0.67 |
| Japan | 3 | 0.29 |
| Trinidad and Tobago | 3 | 0.29 |
| Philippines | 2 | 0.19 |
| Venezuela | 2 | 0.19 |
| Chile | 1 | 0.10 |
| Uruguay | 1 | 0.10 |
| Total | 1045 | 100.00 |

8.33% (87 cases), Turkey with 8.04% (84 cases), the USA with 5.93% (62 cases), and Peru with 5.07% (53 cases).

Although China is the most frequent target of antidumping action, it is only the 6th most frequent user of antidumping measures (Blonigen and Prusa 2015). Table 2 displays China's AD filings by country from 1995 to 2015. Although China has been targeted by AD duties 1045 times since 1995, it has only filed 232 AD cases over the same period. Notably, China directs more than 77% of its AD filings toward five countries: the European Union (43 cases, 18.53%), Japan (43 cases, 18.53%), the USA (42 cases, 18.10%), South Korea (35 cases, 15.09%), and Taiwan (16 cases, 6.90%). Comparing AD filings by China to AD filings against China produces a few interesting observations. First, although China has targeted Japan for AD action more than any other country, Japan has only initiated seven AD cases against China.

**Table 2** Antidumping filings by China (1995–2015)

| Country | Frequency | Percent | Cumulative frequency | Cumulative percent |
|---|---|---|---|---|
| European Union | 43 | 18.53 | 43 | 18.53 |
| Japan | 43 | 18.53 | 86 | 37.07 |
| USA | 42 | 18.10 | 128 | 55.17 |
| South Korea | 35 | 15.09 | 163 | 70.26 |
| Taiwan | 16 | 6.90 | 179 | 77.16 |
| Russia | 11 | 4.74 | 190 | 81.90 |
| India | 7 | 3.02 | 197 | 84.91 |
| Singapore | 7 | 3.02 | 204 | 87.93 |
| Thailand | 6 | 2.59 | 210 | 90.52 |
| Indonesia | 5 | 2.16 | 215 | 92.67 |
| Malaysia | 4 | 1.72 | 219 | 94.40 |
| Saudi Arabia | 3 | 1.29 | 222 | 95.69 |
| Canada | 2 | 0.86 | 224 | 96.55 |
| Brazil | 1 | 0.43 | 225 | 96.98 |
| Iran | 1 | 0.43 | 226 | 97.41 |
| Kazakhstan | 1 | 0.43 | 227 | 97.84 |
| Mexico | 1 | 0.43 | 228 | 98.28 |
| New Zealand | 1 | 0.43 | 229 | 98.71 |
| South Africa | 1 | 0.43 | 230 | 99.14 |
| Turkey | 1 | 0.43 | 231 | 99.57 |
| Ukraine | 1 | 0.43 | 232 | 100.00 |
| Total | 232 | 100.00 | 232 | 100.00 |

This suggests that China uses AD duties as a form of protectionism against Japan, rather than retaliation against Japanese AD action. Second, although India is the most frequent user of AD against China, China has only initiated three AD cases against India. A similar discrepancy is also present with Brazil, Argentina, Turkey, Peru, Mexico, Australia, and most other frequent AD users against China. Finally, China anecdotally appears to be engaging in tit-for-tat AD behavior with the USA and the European Union.

This study evaluates all antidumping duties against China listed in the World Bank's *Global Antidumping Database* over the period 1995–2015. There were 1045 antidumping duties initiated against China by 28 countries from 1995 to 2015 and 232 antidumping duties initiated by China against 21 countries over the same period. We gather Chinese GDP data from the World Bank and bilateral exchange rate data from Oanda (World Trade Organization 2016; Oanda 2018). Additionally, we collect aggregate and industry-specific (using HS4 codes) import and export data for each country (except Taiwan), from *World Integrated Trade Solution* for the period 1994–2015 (Bown 2016). Data from 1994 were included in order to observe a 1-year lag for economic variables. For filings involving multiple HS4 codes, industry

**Table 3** Variable descriptions

| Variable name | Description \| note: subscript $t$ = year of initial AD filing |
|---|---|
| $CHN\_Retal_{t,i}$ | For each antidumping filing against China by country $i$, this binary response variable is equal to one if China has an AD filing against country $i$ within 1 year of the initial filing by country $i$, and equal to zero otherwise |
| $IndExpVal_{t-1,i}$ | This is a continuous variable representing the industry-specific value (represented by HS4 codes) of Chinese exports (in thousands of US dollars) to country $i$ in the year before an AD filing by country $i$ |
| $IndImpVal_{t-1,i}$ | This is a continuous variable representing the industry-specific value (represented by HS4 codes) of Chinese imports (in thousands of US dollars) from country $i$ in the year before an AD filing by country $i$ |
| $\Delta IndExpVal_{t,i}$ | This is a continuous variable representing the change in industry-specific value (represented by HS4 codes) of Chinese exports (in thousands of US dollars) to country $i$ from the year before an AD filing by country $i$ to the year that country $i$ initiates the AD filing |
| $\Delta IndImpVal_{t,i}$ | This is a continuous variable representing the change in industry-specific value (represented by HS4 codes) of Chinese imports (in thousands of US dollars) from country $i$ from the year before an AD filing by country $i$ to the year that country $i$ initiates the AD filing |
| $TotExpVal_{t-1,i}$ | This is a continuous variable representing the total value of Chinese exports (in thousands of US dollars) to country $i$ in the year before an AD filing by country $i$ |
| $TotImpVal_{t-1,i}$ | This is a continuous variable representing the total value of Chinese imports (in thousands of US dollars) from country $i$ in the year before an AD filing by country $i$ |
| $ImpPen_{t-1,i}$ | This is a continuous variable representing the import penetration ratio with country $i$ in the year before country $i$ initiates an AD filing. Calculated by $(TotImpVal_{t-1,i}/GDP_{t-1})$ |
| $\Delta TotExpVal_{t,i}$ | This is a continuous variable representing the change in the total value of Chinese exports (in thousands of US dollars) from country $i$ from the year before an AD filing by country $i$ to the year that country $i$ initiates an AD filing |
| $\Delta TotImpVal_{t,i}$ | This is a continuous variable representing the change in the total value of Chinese imports (in thousands of US dollars) from country $i$ from the year before an AD filing by country $i$ to the year that country $i$ initiates an AD filing |
| $\Delta GDP\%_t$ | This is a continuous variable representing the percentage change in Chinese GDP (in USD) from the year before country $i$ initiates an AD filing to the year of the filing |
| $\Delta realGDP\%_t$ | This is a continuous variable representing the percentage change in real Chinese GDP (in USD) from the year before country $i$ initiates an AD filing to the year of the filing |
| $Distance_i$ | The geographic distance (in kilometers) between China's capital and the capital of country $i$ |
| $Implement_i$ | This is a dummy variable, equal to one if country $i$ implements the AD duty, and zero otherwise |
| $WTO$ | This is a dummy variable, equal to one if the initial AD filing by country $i$ occurred after China entered the WTO, and zero otherwise |
| $\Delta Exchange\%_{t,i}$ | This is a continuous variable representing the percentage change in bilateral exchange rate between China and country $i$ the year before country $i$ initiates an AD filing to the year of the filing |
| $Learn_{t,i}$ | The cumulative number of AD filings against China by country $i$ in year $t$ |

values were summed to determine industry-specific import and export values for the observation. In our analysis, we treated the European Union as a single country. We gather the geographic distance between capital cities from the dataset *Distance*

*Between Capital Cities* (Gleditsch 2016). Paris was used as the capital of the European Union. WTO is a constructed dummy variable indicating whether China was a WTO member at the time of initial AD filing against China. Table 3 provides the list of variables in our analysis, along with a description of each variable.

## Empirical Methodology

To evaluate China's retaliation against AD filings, we need to identify China's retaliatory AD filings, that is, how often China files an AD case against country *i* within 1 year of an AD filing by country *i* against China. Our analysis is distinct from previous work in that it captures China's rate of AD retaliation rather than the frequency of all AD filings. Thus, the retaliation response variable can have a value that exceeds the number of AD filings by China against country *i* if country *i* initiates more than one AD case against China in the given time period. For example, if India initiates five AD filings against China in 2005, and China files one AD case against India in 2006, China's AD filing would be considered retaliation against all five filings by India.

All variables listed in Table 3 were entered into the following linear model:

$$CHN\_Retal_{t,i} = \alpha + \boldsymbol{\beta}_1' \boldsymbol{Exports}_{t,i} + \boldsymbol{\beta}_2' \boldsymbol{Imports}_{t,i} + \beta_3 \Delta GDP\%_t + \beta_4 Implement_i + \beta_5 WTO_t + \beta_6 Distance_i + \beta_7 Learn_{t,i} + \varepsilon_{t,i},$$

where $CHN\_Retal_{t,i}$ is a dummy variable equal to 1 if there is a retaliatory AD filing by China in year *t* against country *i*.

$\boldsymbol{Exports}_{t,i}$ denotes a vector comprised of the following variables: AD-targeted industry export value to a country, change in AD-targeted industry export values to a country, total export value to a country, and change in total export value to a country. Because AD filings negatively impact exports, we expect high industry and total export values to increase the likelihood of retaliation. Additionally, we expect changes in industry and total export values to decrease the likelihood of retaliation. That is, if we observe a decrease in the change in industry-specific or total exports to a country, China is more likely to initiate a counter-filing.

$\boldsymbol{Imports}_{t,i}$ denotes a vector comprised of the following variables: AD-targeted industry import value from a country, change in AD-targeted industry import values from a country, total import values from a country, and change in total import values from a country. Given that higher import levels are associated with higher AD filings, it is also likely that they will trigger retaliatory AD filings.

$\Delta GDP\%_t$ represents the percentage change in real Chinese GDP from the year before an AD filing to the year of the filing. Like Bao and Qiu's findings, we expect an increase in China's GDP growth to decrease the likelihood of retaliation, an increase in geographic distance between China and country *i* to decrease the likelihood of retaliation, and an increased number of filings by country *i* to increase the likelihood of retaliation. Finally, we expect China's WTO membership to increase the likelihood of AD retaliation, as membership limited other avenues of trade retaliation. $\varepsilon_{t,i}$ represents the error term.

## Results

Twenty-eight of China's 232 total AD filings (12.07%) over the sample period were directed against the initial filer within 1 year. We will refer to them as China's retaliatory AD filings. Since each retaliatory AD filing by China covers multiple AD filings against China, the total number of AD filings against China that China retaliates against is substantially larger than 28. In effect, 162 of the 1045 AD filings against China (15.5%) can be linked to a retaliatory AD response by China. This means that, on average, countries can expect China to file an AD case against them within 1 year of the initial AD action about 15% of the time. Figure 1 shows the number of AD filings against China over time, as well as the number of filings covered by China's retaliatory AD filings. Interestingly, China's retaliatory AD actions appear to be lumpy, with only a small number of retaliatory AD responses in the pre-WTO years (1995–1999) and in the years around the great recession (2006–2011), and much more frequent AD retaliations in the remaining periods (2000–2005, 2012–2015).

Additional insight into China's retaliation behavior is provided when evaluating country-specific retaliation levels. Figure 2 shows China's rate of AD retaliation against countries that have filed an AD against China. The lightest shade of gray (see Australia for example) represents countries who filed an AD against China but never experienced retaliation.[3] Darker shading represents a higher retaliation rate. Countries shown in white have not filed an AD against China in our sample period. Out of the 28 countries that have initiated AD action against China, China has only retaliated against 14 of them. As can be seen from the map, China's retaliation activities are heavily focused on North America, Western Europe, and East Asia. More specifically, China has the highest rate of retaliation against Japan (66.67%) followed by the USA (46.77%), the European Union (36.07%), South Korea (31.03%), India (24.00%), Brazil (16.48%), and Russia (16.67%).

Next, we examine the pattern of same- industry versus cross-industry retaliation. If a Chinese export industry is hurt by a foreign AD, China might want to initiate a counter-AD filing against the same industry to limit foreign presence in that industry. Alternatively, it is conceivable that China would want to maximize the retaliatory effect of its filing, in which case it would target the foreign industry that has the largest presence in the Chinese market which may or may not be within the same industry classification. Feinberg and Reynolds (2006) previously found anecdotal evidence at the global level that AD retaliation is directed at the same industry targeted in the initial filing, but claim that HS2 industry categories are too broad to prove this claim without case-by-case analysis. Thankfully, this analysis is easier to perform with our smaller, China-specific dataset.

[3] Notably, China has never initiated counter AD action against Argentina, Peru, Australia, Colombia, Taiwan, New Zealand, Israel, Ukraine, Trinidad and Tobago, Pakistan, the Philippines, Venezuela, Chile, or Uruguay within 1 year of an AD filing by these countries.

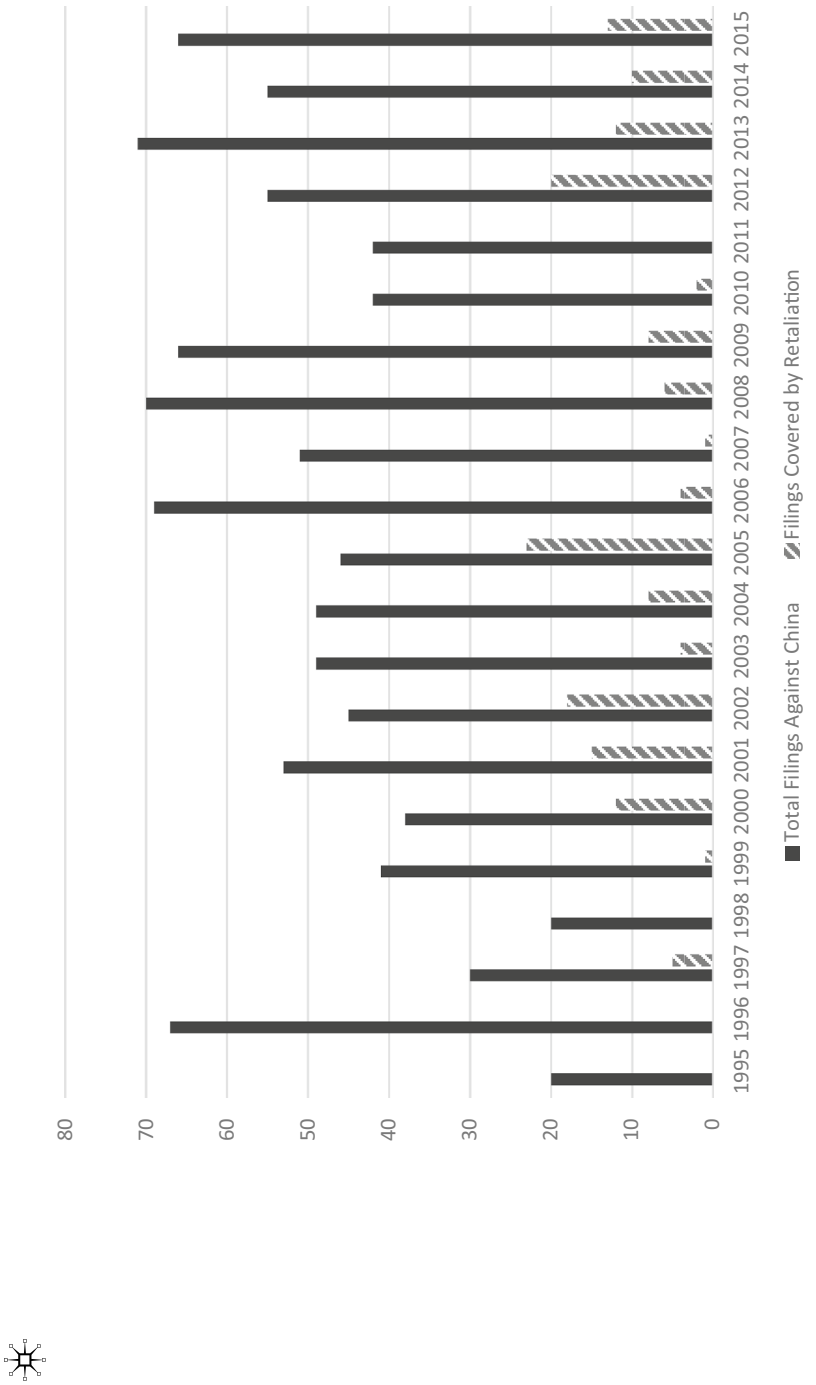
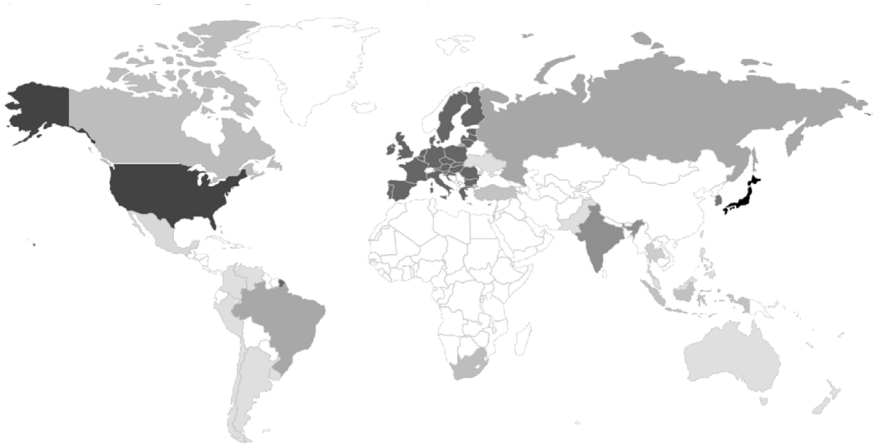



**Fig. 1** AD filings against China and retaliation by China



| 2-Digit Country Code | One-Year Retaliation Rate | 2-Digit Country Code | One-Year Retaliation Rate | 2-Digit Country Code | One-Year Retaliation Rate |
|---|---|---|---|---|---|
| **IN** | 24% | **CA** | 10.26% | **NZ** | 0% |
| **EU** | 36.07% | **ZA** | 10.26% | **IL** | 0% |
| **BR** | 16.48% | **KR** | 31.03% | **UA** | 0% |
| **AR** | 0% | **ID** | 9.09% | **JP** | 66.67% |
| **TR** | 8.33% | **TH** | 5.26% | **TT** | 0% |
| **US** | 46.77% | **PK** | 0% | **PH** | 0% |
| **PE** | 0% | **RU** | 16.67% | **VE** | 0% |
| **MX** | 1.96% | **MY** | 0% | **CL** | 0% |
| **AU** | 0% | **TW** | 0% | **UY** | 0% |
| **CO** | 0% | | | | |

**Fig. 2** China's AD retaliation rates by country. Darker shades represent higher retaliation rates

We first analyze the cases in which China's AD retaliation was initiated against the same Harmonized System category at the HS2 level.[4] We find that China has initiated industry-specific (HS2) AD retaliation within 1 year 10 times against 23 AD filings by the USA (three cases), India (10 cases), and the European Union (10 cases). Eighteen of these cases involved the chemical industry, four the steel industry, and one the paper industry. Of China's 28 retaliatory AD actions, ten (more than one-third) are against the same HS2 industry targeted by the initial filer.

China's cross-industry retaliatory AD actions were most heavily focused in the chemical (13 cases) and paper (three cases) industries, with the remainder of industries being one-off examples that seem to target major exports of a country, such as chicken and automobiles from the USA, wine from the EU, and steel from both the USA and EU.

[4] Since only one case of industry-specific retaliation occurred at the HS4 level, we concentrate on HS2 level data for industry-specific retaliation.

**Table 4** Summary statistics

| Variable | *N* | Mean | SD | Minimum | Maximum |
|---|---|---|---|---|---|
| $CHN\_Retal_{t,i}$ | 1045 | 0.1550239 | 0.3621008 | 0 | 1.0 |
| $IndExpVal_{t-1,i}$ | 1011 | 114,673.47 | 541,102.15 | 0.0730000 | 14,277,213.59 |
| $\Delta IndExpVal_{t,i}$ | 1011 | 10,279.19 | 114,723.69 | − 701590.71 | 2,793,848.01 |
| $TotExpVal_{t-1,i}$ | 1035 | 36,107,679.94 | 74,409,926.70 | 16,754.70 | 397,104,906 |
| $\Delta TotExpVal_{t,i}$ | 1035 | 4,397,672.89 | 12,925,862.73 | − 56,974,578.90 | 74,653,626.92 |
| $IndImpVal_{t-1,i}$ | 1045 | 25,419.37 | 166,819.55 | 0 | 4,039,570.83 |
| $\Delta IndImpVal_{t,i}$ | 1045 | 877.0228249 | 34,427.46 | − 664,372.23 | 455,977.96 |
| $TotImpVal_{t-1,i}$ | 1035 | 23,414,208.14 | 40,791,313.97 | 1.1800000 | 240,098,468 |
| $\Delta TotImpVal_{t,i}$ | 1035 | 2,212,856.07 | 7,455,762.73 | − 33,010,672.90 | 41,153,812.97 |
| $\Delta GDP\%_t$ | 1045 | 0.1547986 | 0.0718248 | 0.0555498 | 0.3016394 |
| $\Delta realGDP\%_t$ | 1045 | 0.0947919 | 0.0184486 | 0.0690020 | 0.1423139 |
| $Implement_i$ | 1045 | 0.6813397 | 0.4661801 | 0 | 1.0 |
| *WTO* | 1045 | 0.3110048 | 0.4631264 | 0 | 1.0 |
| $Distance_i$ | 1045 | 9801.66 | 5387.45 | 959.0 | 19,275.0 |
| $Learn_{t,i}$ | 1045 | 3.8832536 | 3.7970241 | 1.0 | 29.0 |
| $\Delta Exchange\%_{t,i}$ | 967 | 0.0681943 | 0.1708057 | − 0.2812834 | 2.4918254 |

**Table 5** Logistic regression

| Criterion | | | Intercept only | | Intercept and covariates |
|---|---|---|---|---|---|
| *Model fit statistics* | | | | | |
| AIC | | | 900.084 | | 561.382 |
| SC | | | 905.026 | | 586.093 |
| − 2 Log L | | | 898.084 | | 551.382 |
| Parameter | DF | Estimate | SE | Wald Chi-square | Pr > ChiSq |
| *Analysis of maximum likelihood estimates* | | | | | |
| *Intercept* | 1 | − 2.4227 | 0.3604 | 45.1969 | < 0.0001 |
| $TotImpVal_{t-1,i}$ | 1 | 6.724E−9 | 2.198E−9 | 9.3562 | 0.0022 |
| $\Delta TotImpVal_{t,i}$ | 1 | − 2.37E−8 | 1.373E−8 | 2.9830 | 0.0841 |
| $\Delta GDP\%_t$ | 1 | − 10.7348 | 2.2365 | 23.0387 | < 0.0001 |
| *WTO* | 1 | 3.6831 | 0.2870 | 164.6454 | < 0.0001 |
| Description | | | *N* | | Mean |
| *Average marginal effects on the probability of Chinese retaliation* | | | | | |
| Marginal effect of $TotImpVal_{t-1,i}$ | | | 1035 | | 5.577196E−10 |
| Marginal effect of $\Delta TotImpVal_{t,i}$ | | | 1045 | | − 1.965805E−9 |
| Marginal effect of $\Delta GDP\%_t$ | | | 1045 | | − 0.8898410 |
| Marginal effect of WTO | | | 1045 | | 0.3053078 |

Dependent variable is $CHN\_Retal_t$. Sample size is 1035 cases

Table 4 lists the frequency, mean, standard deviation, as well as the minimum and maximum values for each variable used in our regression analysis. Although there were 1045 antidumping cases initiated against China from 1990 to 2015, 10 of those cases had missing export data, primarily those regarding Taiwan. Thus, our regression analysis of antidumping cases against China covers 1035 cases.

Table 5 lists the pooled logistic regression results with a 1-year retaliation dummy as a dependent variable. The results shown are derived from a backward selection approach using a cutoff value of 0.10. With the chosen set of variables, more observations have complete data, so we rerun the regression with only the variables chosen by backward selection. The final regression covers 1035 cases, only excluding the cases initiated by Taiwan. Besides the intercept, two explanatory variables are significant at the 0.01 level and two others at the 0.10 level. The positive coefficient estimate for total value of Chinese imports ($TotImpVal_{t-1,i}$) suggests that China is more likely to retaliate against countries from which it receives a large level of imports, consistent with Prusa and Skeath's findings for general AD filings (2002, 2005). Second, the change in total import values ($\Delta TotImpVal_{t,i}$) is significant with a negative coefficient estimate. Since large changes in import values are most likely to occur when import levels are small, the result indicates that China is less concerned with AD filings by countries with fast rising import rates but small import levels. This is consistent with Prusa and Skeath's (2002, 2005) findings that import surges are unlikely to increase the frequency of AD filings. The negative coefficient estimate for the growth rate for Chinese GDP ($\Delta GDP\%_t$) suggests that higher levels of GDP growth decrease the likelihood that China will retaliate. Thus, in favorable economic conditions, China is less prone to retaliate against AD filings. This is consistent with our hypothesis and previous research by Bao and Qiu (2011) regarding China's AD filing frequency and the general findings in Feinberg and Reynolds (2018) on AD retaliation.

The most precisely measured variable in our model is WTO membership (*WTO*). Its large, positive coefficient estimate and very small $p$ value suggest that China increased its use of AD filings as a trade retaliation mechanism after joining the WTO. Similar to existing research on general AD filings by Besedes and Prusa (2013), the implementation of an AD ($Implement_i$) does not significantly impact the likelihood of retaliation. This result is at odds with Feinberg and Reynold's (2018), finding that the implementation of an AD increased the likelihood of retaliation. One possible explanation for this is that AD implementation generally increases retaliation, but not for China. Unlike Feinberg and Reynolds (2018), our model does not find industry-specific export values to be a significant factor for China's retaliatory AD actions, possibly due to aggregate trade effects crowding out industry effects in the case of China.

Since the estimated coefficients from logistic regression are not easily interpretable, we construct marginal effects as an alternative metric to describe the impact of the explanatory variables on the predicted probability of a retaliatory AD filing by China. Marginal effects can be described as the change in the dependent variable as a function of the change in the independent variable of interest holding all other variables in the model constant. We report the average marginal effects (AME) for each explanatory variable in the bottom part of Table 5. The results show that for

**Table 6** Logistic regression with real GDP

| Criterion | | | Intercept only | | Intercept and covariates |
|---|---|---|---|---|---|
| *Model fit statistics* | | | | | |
| AIC | | | 900.084 | | 574.021 |
| SC | | | 905.026 | | 598.731 |
| − 2 Log L | | | 898.084 | | 564.021 |
| Parameter | DF | Estimate | SE | Wald Chi-square | Pr > ChiSq |
| *Analysis of maximum likelihood estimates* | | | | | |
| *Intercept* | 1 | − 1.5479 | 0.6581 | 5.5331 | 0.0187 |
| $TotImpVal_{t-1,i}$ | 1 | 6.019E−9 | 2.207E−9 | 7.4380 | 0.0064 |
| $\Delta TotImpVal_{t,i}$ | 1 | − 4.14E−8 | 1.278E−8 | 10.4751 | 0.0012 |
| $\Delta realGDP\%_t$ | 1 | − 25.0210 | 6.8614 | 13.2980 | 0.0003 |
| *WTO* | 1 | 3.6990 | 0.2854 | 168.0219 | < 0.0001 |

Dependent variable is $CHN\_Retal_t$. Sample size is 1035 cases

**Table 7** Logistic regression with bilateral exchange rates

| Criterion | | | Intercept only | | Intercept and covariates |
|---|---|---|---|---|---|
| *Model fit statistics* | | | | | |
| AIC | | | 872.375 | | 571.859 |
| SC | | | 877.238 | | 601.041 |
| − 2 Log L | | | 870.375 | | 559.859 |
| Parameter | DF | Estimate | SE | Wald Chi-square | Pr > ChiSq |
| *Analysis of maximum likelihood estimates* | | | | | |
| *Intercept* | 1 | − 1.6996 | 0.6841 | 6.1720 | 0.0130 |
| $TotImpVal_{t-1,i}$ | 1 | 5.789E−9 | 2.192E−9 | 6.9754 | 0.0083 |
| $\Delta TotImpVal_{t,i}$ | 1 | − 3.95E−8 | 1.272E−8 | 9.6406 | 0.0019 |
| $\Delta realGDP\%_t$ | 1 | − 23.2278 | 6.9260 | 11.2475 | 0.0008 |
| *WTO* | 1 | 3.6595 | 0.2959 | 153.0004 | < 0.0001 |
| $\Delta Exchange\%_{t,i}$ | 1 | 0.7540 | 0.6735 | 1.2530 | 0.2630 |

Dependent variable is $CHN\_Retal_t$. Sample size is 957 cases

every 1 billion dollar increase in the value of imports, the probability of a retaliatory AD action by China increases on average by 55%. A 1% decline in China's GDP growth rate increases the predicted probability of AD retaliation by 89%, while China's entry into the WTO increased the probability of retaliatory AD filings by 31%. Finally, a one billion increase in the change of China's total import value lowers the predicted probability by 197%.

**Table 8** Logistic regression with import penetration

| Criterion | | | Intercept only | | Intercept and covariates |
|---|---|---|---|---|---|
| *Model fit statistics* | | | | | |
| AIC | | | 900.084 | | 543.868 |
| SC | | | 905.026 | | 568.579 |
| − 2 Log L | | | 898.084 | | 533.868 |
| Parameter | DF | Estimate | SE | Wald Chi-square | Pr > ChiSq |
| *Analysis of maximum likelihood estimates* | | | | | |
| *Intercept* | 1 | − 2.4608 | 0.3555 | 47.9128 | < 0.0001 |
| $ImpPen_{t-1,i}$ | 1 | 56,927.3 | 11,146.5 | 26.0833 | < 0.0001 |
| $\Delta TotImpVal_{t,i}$ | 1 | − 4.17E−8 | 1.506E−8 | 7.6535 | 0.0057 |
| $\Delta GDP\%_t$ | 1 | − 12.1109 | 2.2967 | 27.8067 | < 0.0001 |
| *WTO* | 1 | 3.6620 | 0.2912 | 158.0953 | < 0.0001 |

Dependent variable is $CHN\_Retal_t$. Sample size is 1035 cases

**Table 9** OLS regression

| Source | DF | Sum of squares | Mean square | *F* value | Pr > *F* |
|---|---|---|---|---|---|
| *Analysis of variance* | | | | | |
| Model | 5 | 45.82197 | 9.16439 | 103.65 | < 0.0001 |
| Error | 1005 | 88.85656 | 0.08841 | | |
| Corrected total | 1010 | 134.67854 | | | |
| $R^2$ | 0.3402 | | | | |
| Variable | Parameter estimate | SE | Type II SS | *F* value | Pr > *F* |
| *Intercept* | 0.09614 | 0.02505 | 1.30200 | 14.73 | 0.0001 |
| $\Delta TotExpVal_{t,i}$ | − 2.43087E−9 | 1.124677E−9 | 0.41304 | 4.67 | 0.0309 |
| $TotImpVal_{t-1,i}$ | 1.041982E−9 | 2.5632E−10 | 1.46109 | 16.53 | < 0.0001 |
| $\Delta TotImpVal_{t,i}$ | − 3.41558E−9 | 1.986586E−9 | 0.26136 | 2.96 | 0.0859 |
| $\Delta GDP\%_t$ | − 0.51108 | 0.14247 | 1.13785 | 12.87 | 0.0004 |
| *WTO* | 0.43128 | 0.02246 | 32.59648 | 368.68 | < 0.0001 |

Dependent variable is $CHN\_Retal_t$. Sample size is 1011 cases

To support the validity of our main results in Table 5, we run a serious of robustness checks. First, we rerun the pooled logistic regression model, replacing change in nominal GDP with change in real GDP, since China's mean real GDP growth rate of 0.095 is significantly less than the mean nominal GDP growth rate of 0.155. Similarly, the standard deviation of real GDP growth of 0.0183 is much smaller than the standard deviation of nominal GDP growth, which is equal to 0.0718. Results are given in Table 6. Interestingly, the switch to real GDP growth does not change our estimation results compared to the baseline regression in

**Table 10** Logistic regressions with fixed effects

| Variable | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| *Intercept* | −2.4227 (<0.0001) | −2.3046 (<0.0001) | −2.2664 (<0.0001) | −2.222 (<0.0001) |
| $TotImpVal_{t-1,i}$ | 6.724E−9 (0.0022) | 7.463E−9 (0.0016) | −1.84E−9 (0.5479) | −1.35E−9 (0.6740) |
| $\Delta TotImpVal_{t,i}$ | −2.37E−8 (0.0841) | −2.74E−8 (0.0580) | −4.35E−8 (0.0064) | −4.56E−8 (0.0061) |
| $\Delta GDP\%_t$ | −10.7348 (<0.0001) | −11.1782 (<0.0001) | −11.0033 (<0.0001) | −11.1582 (<0.0001) |
| *WTO* | 3.6831 (<0.0001) | 3.6348 (<0.0001) | 3.4253 (<0.0001) | 3.4035 (<0.0001) |
| *Fixed effects* | N | N | Y | Y |
| *Time trend* | N | Y | N | Y |
| −2 *Log L* | 551.382 | 550.461 | 502.176 | 501.929 |

Dependent variable is $CHN\_Retal_t$. Sample size is 1035 cases

*p* values in parentheses

any substantial way. The coefficient signs are identical to the original regression, and each variable, including real GDP growth, is statistically significant at levels comparable to Table 5.

Next, we rerun the pooled logistic regression model, this time including a variable for change in the bilateral exchange rate. The results are given in Table 7. Accounting for the change in the bilateral exchange rate does not alter the coefficient signs or levels of statistical significance for our explanatory variables from Table 5. Furthermore, the exchange rate coefficient estimate itself is not statistically significant, a result also reported by Bao and Qiu (2011).

Additionally, we rerun the pooled logistic regression model, replacing total import value with import penetration ratio at the country level. Like the results for import value in our original model, import penetration ratio is statistically significant at the 0.05 level with a positive coefficient, as given in Table 8. Next, we estimate a linear probability model (pooled OLS) using backward selection with a cut-off of 0.10. The results are given in Table 9. Our results are similar to the logistic regression results in Table 5, with one exception. The significant negative coefficient estimate for change in total Chinese exports ($\Delta TotExpVal_{t,i}$) indicates that a decrease in overall export growth to an AD filer increases the likelihood to retaliate. With lower total export growth, the importing country likely has less incentive for counter-retaliation, increasing China's ability to file a retaliatory AD.

Next, we rerun the pooled logistic regression, allowing for country fixed effects and/or time trend. The results are given in Table 10. When including the time trend, all variables are statistically significant with the same signs of the coefficient estimates as in the original logistic regression. When including country fixed effects, with and without time trend, the total lagged value of Chinese imports from other countries ($TotImpVal_{t-1,i}$) is no longer significant.

This result indicates that the main variation in total import value appears to come from cross-sectional variation, rather than changes over time.

**Table 11** Logistic regressions with different response periods

| Variable | 6-month response period | 18-month response period |
|---|---|---|
| *Intercept* | −3.5000 (<0.0001) | −1.7788 (<0.0001) |
| $TotImpVal_{t-1,i}$ | 6.326E−9 (0.0029) | 4.512E−9 (0.0440) |
| $\Delta TotImpVal_{t,i}$ | −2.68E−8 (0.0779) | −1.87E−8 (0.1418) |
| $\Delta GDP\%_t$ | −6.5361 (0.0102) | −9.3348 (<0.0001) |
| *WTO* | 3.1485 (<0.0001) | 3.6692 (<0.0001) |
| −2 *Log L* | 432.569 | 663.204 |

Dependent variable is $CHN\_Retal_t$. Sample size is 1035 cases

Finally, we test the sensitivity of our baseline results in Table 5 to the retaliation response period. First, we only consider Chinese counter-filings within 6 months of the initial AD against China, of which there are 88. The results, shown in the first column of Table 11, match the findings in Table 5. The variables $ImpPen_{t-1,i,}$ $\Delta TotImpVal_{t,i}$, $\Delta GDP\%_t$, and *WTO* have the same coefficient signs and are statistically significant. Next, we consider Chinese counter-filings within 18 months of the initial AD against China, of which there are 235. The results are shown in the second column of Table 11. Once again, we find that the four explanatory variables from Table 5 have the same coefficient signs and are statistically significant at similar levels, except for the change in total import values ($\Delta TotImpVal_{t,i}$) which is only significant at the 0.20 level.

## Summary and Conclusion

This paper examines China's retaliatory antidumping behavior. Several key insights emerge from the analysis. First, China's use of antidumping duties as a retaliation tool increased significantly after joining the WTO despite the WTO's rule against retaliatory dumping. Second, stronger growth of both Chinese GDP and total import values will decrease the likelihood of Chinese retaliation. Third, China is more likely to retaliate against AD filings from trading partners with higher import levels or import penetration of the Chinese market. This helps explain why China has never countered AD filings by countries such as Argentina, Peru, and Israel. Finally, less growth in the value of Chinese exports to a foreign country increases the likelihood of retaliation in the linear probability model but not in the logistic regression model.

In addition to these regression results, several interesting descriptive patterns emerge. First, China's AD retaliation rate is relatively low. It only retaliates

against 15% of all AD filings. Second, China's AD retaliation is not case for case. That is, in cases of retaliation, China uses a single AD action to respond to several AD cases initiated against them. Finally, approximately one-third of China's retaliatory AD filings are against the same industry targeted by the initial filer. This same-industry retaliation is especially prevalent in the chemical, steel, and paper industries.

Future research on this topic should compare the size of targeted industries and the *value* of the AD duties imposed by each country to determine whether the value of retaliation is symmetric or asymmetric.

**Acknowledgements** We would like to thank Richard Nugent, Maurizio Zanardi, an anonymous referee, as well as seminar participants at the Eastern Economic Association meetings and the Midwest Economic Theory and International Trade conference for useful comments and suggestions.

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