The Impact of PTAs on the Duration of Antidumping Protection*

Min Zhu[a], Thomas J. Prusa[b,*]

[a]*School of Economics and Management, South China Normal University*
[b]*Department of Economics, Rutgers University*

Abstract

This paper examines the impact of preferential trade agreements (PTAs) on the duration of antidumping protection. It employs a two-step selection model where the first step accounts for the impact of PTA membership on the original antidumping determination and the second step estimates the impact of PTA membership on the duration of measures. Several key findings emerge from the analysis. First and most importantly, the duration of antidumping protection is significantly shorter for PTA members compared with targeted countries that are not PTA members. The estimates imply that PTA membership is associated with about a 40 percent reduction in the duration of protection. Second, the impact on duration depends, in part, on whether the PTA has rules specifically related to antidumping. On average, over all users and targeted countries, the duration more significantly shortened for PTAs with rules than for those without rules (and both have shorter duration than non-PTA members). (150 words)

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*Corresponding author: Rutgers University, Department of Economics, New Jersey Hall, 75 Hamilton Street, New Brunswick, NJ 08901-1248

Email addresses: min.zhu@m.scnu.edu.cn (Min Zhu), prusa@rutgers.edu (Thomas J. Prusa)

1. Introduction

Both antidumping (AD) measures and preferential trade agreements (PTAs) discriminate against trading partners. PTAs discriminate against non-PTA members by decreasing the tariff rates for members while AD duties increase the level of protection on targeted suppliers. If, in addition to lowering tariffs on member countries, PTAs increase AD protection against non-PTA members relative to PTA members, then the discretionary nature of AD protection can serve to reinforce the discrimination that is inherent in PTAs. This possibility seems particularly likely for those PTAs that have specific rules that hinder the use of AD measures against PTA members. More generally, even without explicit additional provisions related to the application of AD protection PTAs may engender closer economic and political ties between member countries, which in turn might affect the AD protection imposed on PTA members. Offsetting this possibility is the reality that AD protection is often driven by increases in imports; therefore, if PTAs deepen trade ties, they could cause an increase, not decrease, in AD protection against PTA partners.

The rapid expansion of PTAs and widespread proliferation of AD protection make these two trade policies among the most prominent developments in trade policy over the last five decades. As of 2020 there were 310 active PTAs with every World Trade Organization (WTO) member is being part of at least one PTA (WTO, 2020). Since at least the 1970s AD has been the most common form of discretionary protection, accounting for about 90% of all administered protection imposed (Bown, 2011).[1] Furthermore, the relevance of AD has increased due to its proliferation. Until the mid-1990s, AD was primarily used by developed, high-income countries; however, in the post Uruguay Round era AD protection has been increasingly embraced by "new" users, i.e., developing countries (Prusa, 2001).

In this paper we examine one specific way that PTAs might reinforce discrimination via the use of AD – the linkage between the duration of AD measures and PTAs. This study takes advantage of two data sets developed by the World Bank — the *Global Antidumping Database* (Signoret et al., 2020) and the *Content of Deep Trade Agreements* database (Mattoo et al., 2020). The former contains all key case information for all AD actions initiated between 1980 and 2019. The latter provides detailed information on the particulars of nearly every active PTA in which we exploit the AD provisions contained in the PTAs. As part of an expansive World Bank project Prusa (2020) maps the text of AD provisions contained in 283 PTAs. By combining the information in the two data sets we are able to determine for each case

[1] Bown's results are consistent with WTO reports. Based on WTO notifications (WTO, 2021), a total of 4,071 AD measures were imposed worldwide between January 1995 and December 2020, while in the same period countervailing duties and global safeguards accounted for only 344 and 191 measures, respectively.

when AD measures were imposed and when, if ever, the measures were removed. We are also able to determine if the AD user and AD target were members of a PTA, and if so, whether the AD measure was in place before, during, or after the enactment of the PTA.

We begin our analysis by using the non-parametric Kaplan-Meier estimation approach to depict the duration trends over time and duration patterns before and after the formation of PTAs. We then estimate the impact of PTA membership on the duration of AD protection using a Heckman selection model to adjust for potential selection bias. The fact that PTA membership might affect the likelihood of an affirmative AD determination creates the possibility of non-random selection in the data. The Heckman selection model corrects for such bias. Several key findings emerge from our analysis. First, and most importantly, we find compelling evidence that the duration of AD protection is significantly lower for PTA members. The median duration of AD measures for PTA members falls 13 quarters relative to pre-PTA levels. Overall, our estimates imply AD duration for PTA members has decreased by approximately 40 percent relative to non-members. Second, we examine whether the identified PTA effect is simply attributable to PTA membership or whether it is driven by AD rules. We find that rules matter: the reduction in the duration of AD protection is larger for PTAs with rules as compared to PTAs without rules. Third, all else equal, we find that AD measures are in place considerably longer in more recent years. The evidence shows that the sunset review added as part of the 1995 Uruguay Round agreement has not successfully curbed the length of AD protection. As a result, we find a clear divergence: that countries who are PTA members have experienced a reduction in the duration of protection while countries who are not PTA members are facing longer spells of protection. Fourth, the duration of AD protection against China is significantly longer than for other targeted countries. However, China's outsized duration does not affect our finding that PTA's, especially those with AD rules, have shorter duration.

Our work sheds new light on the scant literature investigating the nexus between PTAs and the use of AD measures, and as such is also related to the broader literature on the consequences of PTAs for multilateral trade liberalization, focusing on non-tariff barriers to trade. Bhagwati and Panagariya (1996) were the first to raise the concern of selective use of AD measures as a means of reinforcing discrimination towards non-PTA members. Their hypothesis was subsequently confirmed by the empirical work of Prusa and Teh (2010), Ahn and Shin (2011), and Prusa (2016). In a similar vein, Blonigen (2005) studies the impact of NAFTA on the U.S. AD activity and finds NAFTA provisions did not reduce U.S. AD and countervailing activity against Canada and Mexico at least during the immediate post-NAFTA period. Other related papers include Bown and Tovar (2016) who investigate the effect of MERCOSUR on temporary trade barriers for Argentina and Brazil, and Silberberger

and Stender (2018) who examine the interplay of regional economic integration and the use of bilateral AD measures. More recently, Tovar (2019) tests the predictions of Bagwell and Staiger (1999) theory of the effects of preferential trade liberalization on import protection imposed on non-members and Tabakis and Zanardi (2019) explore the implication of PTAs for their members' extra-PTA AD actions. None of these papers, however, have examined whether PTAs affect the duration of AD measures as we do in this paper. Additionally, our paper improves upon existing studies by covering a much longer period and broader sample of countries, i.e., all AD using countries between 1980 and 2019. As such, this study provides a comprehensive picture of the implications of PTAs on the use of AD measures.

Our paper also directly speaks to a largely neglected branch of AD literature that attempts to understand the interdependency of trade duration and AD protection. Besedeš and Prusa (2017) consider the extent to which AD actions eliminate trade, finding AD duties often cause trade from targeted countries to cease completely and also that trade relationships are less likely to be re-established even after AD orders are revoked. In related work, Bown (2013) and Silberberger et al. (2019) examine whether bilateral trade resumes upon the removal of temporary trade barriers.

Finally, relatively little work so far has been done on examining AD sunset reviews. Moore (1999; 2006) focuses on the U.S.'s use of sunset reviews while Cadot et al. (2007) examine the impact of sunset review provisions for a broader set of users. These studies are narrowly focused on the impact in the first few years following the Uruguay Round agreement. By contrast, our study offers a significantly longer perspective on the length of AD protection and a more comprehensive coverage of the policy-imposing country.

The remainder of the paper is structured as follows. Section 2 is dedicated to the description of databases we use and provides some background on how AD measures are revoked. Section 3 begins by examining AD duration using the non-parametric Kaplan-Meier estimator; we then present formal econometric analysis, a discussion of the results, and a series of robustness checks. Section 4 concludes.

2. Background and Data Description

2.1. Global Antidumping Dataset

The World Bank's *Global Antidumping Dataset* (GAD) provides details about worldwide AD proceedings from 1980 through mid-2020 (Signoret et al., 2020).[2] Using official documentation and reports from national governments, the GAD organizes information on

[2]The most recent version of the GAD contains information on initiations through the end of 2019. However, it reports information on other aspects of AD activity, including sunset determinations, through 2020-Q3.

the investigative procedures and outcomes of AD activity across importing countries (*users*) against each country subject to an AD investigation (*targets*). Because the aim of this paper is to understand whether PTAs exert any effect on the duration of AD measures, our focus is on AD case initiations that resulted in affirmative final determinations. However, as we will discuss below, our estimation procedure involves two steps, and the first step controls for the impact of PTA membership on the decision to apply AD duties. Hence, all initiations – those that result in duties and those that do not – are part of the first step of the estimation procedure. In the GAD, there are 8,243 AD cases initiated by 51 users against 118 targeted countries; measures were applied in 4,935 cases.[3]

Crucially for this study, the GAD contains the dates when all key determinations are made during the investigation and also the date when the AD measure is terminated (if it has been terminated). Under WTO rules, AD duties can be imposed before the date of the final determination. As a result, we date the start of the AD protection as the date when the preliminary AD duty was imposed, which generally occurs six months (or more) before the final determination is reached.

2.2. PTA and Mapping of AD Rules

The World Bank's *Content of Deep Trade Agreements* database contains detailed information on the AD provisions in all economically large PTAs; all PTAs that the most active AD users are members are included in the database. In addition, the PTAs are geographically and economically diverse, covering almost every corner of the world: Europe, North America, the Caribbean, Latin America, Eastern Europe, Asia and the Pacific, Africa, and the Middle East. To the best of our knowledge, this is the most comprehensive database of PTA contingent protection rules. The database allows us to classify PTAs into three mutually exclusive categories. The first category includes those PTAs that disallow AD actions among members. The second category includes PTAs that have no specific language or provisions on the use of AD. The third category includes PTAs that allow AD against PTA members but include specific provisions on how AD is to be implemented against PTA members.[4] Overall, we have 153 PTAs with no rules and 109 PTAs with AD rules; there are also 21 PTAs that prohibit the use of AD provisions. AD measures involving PTAs that eliminate the application of AD between members are dropped from our analysis because any pre-existing AD measures are

[3] In Table A1 we decompose worldwide AD measures by the top 10 users and targets for 1980-2019 to get a sense of how the AD landscape has evolved over time.

[4] As discussed in Prusa (2020) some PTAs either simply reference the WTO AD provisions or only state that AD is permissible but do not specify any *changes* to WTO AD rules for PTA members. He refers to these PTAs as having "weak" rules. We categorize PTAs with weak rules as not having rules.

immediately terminated when the PTA is enacted.[5]

The classification system is not without complications. Several PTAs which supposedly prohibit the use of AD among member states in fact continue to apply AD against member countries. For example, Belarus, Kazakhstan, Russian Federation, and Ukraine still impose AD measures despite the *de jure* prohibition in the Common Economic Zone. For the purposes of the empirical application in this paper we classify the Common Economic Zone as having AD rules. Another exception is the EEA which generally prohibits the use of AD except for one key industry: fish products. We therefore classify the EEA as having no AD rules in the empirical analysis.[6]

The next step involves merging the GAD with the PTA AD database. For each AD case we determined whether each user-target country pair were members of a PTA. For each pair of PTA members, we then identified whether the case was initiated before or after the implementation of the PTA.[7] Of the 4,916 AD measures applied during the period (by 42 countries involving 82 PTAs) 1,406 measures involved PTA members and 3,510 involved non-PTA countries.[8]

2.3. Terminating AD Measures

Unlike some other types of administrative protection, countries have great discretion over how long AD measures are allowed to remain in force. While the precise procedures vary across users, there are two primary ways AD are revoked. First, the Uruguay Round mandated that countries periodically review the continuing need for the AD measure. This is referred to as a sunset or expiry review. The sunset requirement establishes that dumping duties shall normally terminate no later than five years after first being applied, unless a review investigation initiated prior to that date establishes that expiry of the duty would be likely to lead to continuation or recurrence of dumping and injury. The Antidumping Agreement has a soft deadline of four quarters for the sunset review, however Vermulst (2010) documents that nearly half of sunset reviews last more than five quarters. A sunset review will be conducted (approximately) every five years as long as the measure remains in place.

Second, interested parties can request a so-called interim review after one year from the

[5]PTAs that are prohibiting AD include the European Union (and its various expansions), Australia–New Zealand, EU–EEA, and Canada–Chile (Prusa, 2020).

[6]The EU has imposed several AD measures on Norway (Signoret et al., 2020).

[7]We also identified whether a PTA was implemented after the AD measure was imposed. In such cases, the PTA might not have affected the original determination but could affect the sunset decision.

[8]These totals do not include the 19 measures that were immediately terminated when a country with existing AD order(s) joined a PTA where AD is prohibited. Table A2 in the Appendix gives the full list of PTAs covered in this paper.

date of imposition of the final AD measure. Exporters/importers will typically do so if they believe that the dumping margin has decreased (or stopped) or that the domestic industry is no longer suffering injury as a result of the dumped imports. On the other hand, the domestic industry will request an interim review if they consider that dumping has increased or, conversely, if they no longer have an interest in the maintenance of the AD measure, for example because of a change in business structure.[9] In addition, the administering authorities can self-initiate an interim review at any time.

For each case, we compute the number of quarters that the AD measure is applied. The quarter when the preliminary AD duty is imposed is defined as the starting point. The ending point is defined as either the quarter (i) when the measure was revoked or (ii) when the sample period ends (2020-Q3). The difference in those dates is called the spell length. About 40% of the AD measures were still in place at the end of the sample period. The survival analysis literature refers to such cases as being "censored". For example, consider a case where the AD duty was first imposed in 2017-Q1. The spell length for this case would be 15 quarters. However, it would be incorrect to infer that the AD measure lasted only 15 quarters; rather, censoring means all we know is that the AD measure lasted *at least* 15 quarters. For censored cases, the duration will be longer than the observed spell length. Henceforth, all the statistics presented will account for the censoring issue.

2.4. Overall Duration Trends

Before looking at the impact of PTAs it is instructive to consider the overall duration of AD measures. Figure 1 depicts the non-parametric Kaplan-Meier estimates for our entire sample of AD-using countries. The y-axis measures the fraction of AD measures remaining in place at a given time and the x-axis measures the time since the measure was initially imposed. Three lines are depicted in the figure: the dashed black line is the survival experience for all targeted countries, the dotted blue line is the survival experience for cases targeting China, and the solid red line is the survival experience for AD measures other than those against China. Higher lines correspond to a longer duration. For example, at quarter 40 (i.e., after 10 years), 43% of AD measures against all targeted countries remain in place; 38% of measures against countries other than China remain in force, and over 60% of AD measures against China remain in place.

The figure also reports how long it takes for a particular percentage of measures to be terminated. For example, as shown in Figure 1 (and reported in Table 1), looking at all

[9]The domestic industry may lack of interest in continuing the measure if there has been a cross-border merger. For example, if a domestic steel company purchases a steel plant in a subject country it will want the duties revoked. A change in business operations could also cause the domestic industry to lose interest in continuation of the duty.

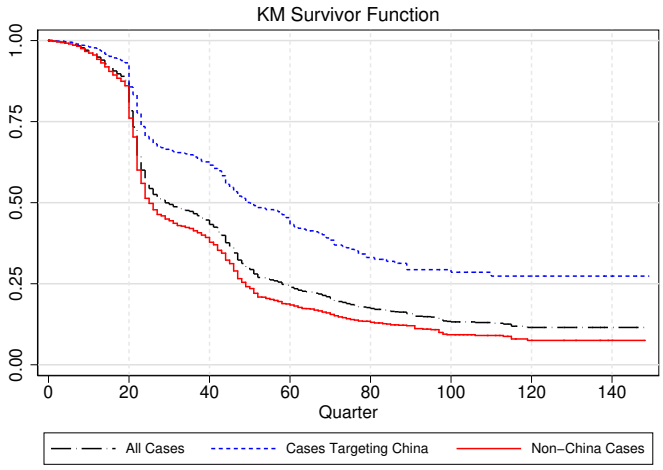

Figure 1: Duration of AD Measures, All Users

targeted countries, half the measures were revoked within 29 quarters. Clearly, despite the Uruguay Round's mandatory sunset review, many AD measures remain in place far longer than 5 years. For example, the 75th percentile of AD measures is 58 quarters which means that 25 percent of AD measures remain in place for at least 15 years.

The data also demonstrate that China fares worse than other targeted countries. The survival curve for cases that exclude China (solid red line) is quite different from the survival curve for cases against China (dotted blue line).[10] We find that 50 quarters are required before 50% of measures on China are terminated. This is far longer than the median duration of 25 quarters for other countries. In fact, the median duration for cases involving China is longer than the 75th percentile for cases against all non-China targeted countries (49 quarters). Remarkably, approximately 29% of the AD measures targeting China remain in place after 100 quarters. This finding provides *prima facie* evidence that China faces discriminatory treatment relative to other targeted countries, at least with respect to the duration of AD protection.

3. Impact of PTAs

Our analysis of how PTAs affect the duration of AD measures proceeds in two steps. We will begin by using the non-parametric Kaplan-Meier survival approach to illustrate how PTAs affect the duration of AD measures. We then turn to a more formal parametric regression approach to quantify how PTAs alter the patterns of AD measures.

[10] A log-rank test of the equality rejects that the China and non-China survival functions are equal at the 1% level.

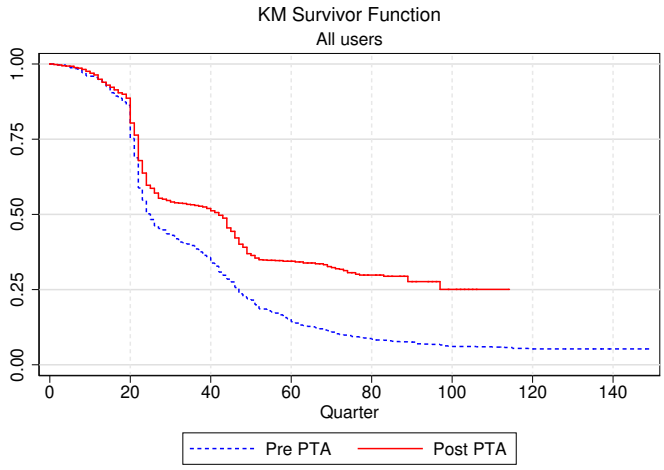

Figure 2: Duration of AD Measures, Pre- vs. Post-PTA

In order to characterize the impact of PTAs, we must also consider the evolution in the duration of AD protection over time distinct from any impact attributable to PTA membership. On the one hand, the duration could have decreased over time because of the sunset review provision in the Uruguay Round. On the other hand, the duration could have easily increased over time due in part to the growing resentment toward trade and globalization in many countries. This resentment could make authorities more reluctant to remove protection for fear of a political backlash. In addition, the specific WTO language governing sunset reviews gives great latitude to investigative authorities, making it far from obvious that simply requiring a review will cause these authorities to terminate politically popular duties. These evolving time effects are important because the changing attitude toward protection coincided with the enactment of many PTAs in our sample. Our empirical study will need to distinguish between the duration effects truly tied to PTAs and duration effects related to other factors.

Thus, we begin by examining the pre- and post-PTA duration for each AD-using country. The complication is that PTAs do not all come into effect in the same year, so we cannot use the same year for all users to define the pre-period vs. the post-period. Rather, we allow the pre-/post-period to vary by AD user, effectively implying an AD-using country-specific "early" and "late" periods. For all country pairs who are PTA members, we use the PTA inception date as the date that defines pre- vs. post-period. For country pairs who are not PTA members, we define the demarcation for the pre-/post-period as the date of each AD-using country's most economically significant PTA. For many countries, the most significant PTA is the same as their first PTA, but for others, we designate a PTA other than the first

Table 1: Estimated Duration: by Pre-/Post-PTA & PTA Rules Classification

	All Targeted Countries				Exclude China			
		Quantile				Quantile		
	# of Cases	25%	50%	75%	# of Cases	25%	50%	75%
All	4,916	21	29	58	3,724	21	25	49
Pre-PTA	1,701	21	25	47	1,470	20	24	46
No PTA	1,355	20	24	45	1,197	20	23	42
PTA	346	22	40	52	273	22	40	52
PTA No Rules	169	20	34	49	113	21	40	50
PTA Rules	177	23	42	59	160	23	39	52
Post-PTA	3,215	22	42	.	2,254	21	27	72
No PTA	2,155	22	44	.	1,458	21	33	97
PTA	1,060	21	27	49	796	20	24	47
PTA No Rules	710	21	36	49	453	21	25	47
PTA Rules	350	20	23	50	343	20	24	50

Notes: The missing value for the 75th percentile (.) is the result of the high prevalence of censoring in this cohort.

PTA. For example, the U.S. signed and enacted several PTAs prior to NAFTA (e.g., US–Israel in 1985). But, in our judgment, NAFTA was the PTA that had the most significant impact on U.S. trade patterns and policy.[11]

With this timing established, we can compare the length of protection in the early period versus the more recent period. As seen in Figure 2 the post-PTA survival curve lies above the pre-PTA survival curve, meaning that measures last longer in the post period. Specifically, the median duration has increased from 25 quarters in the pre-PTA period to 42 quarters in the post-PTA period (see Table 1). Strikingly, we find that at quarter 80, approximately 30% of AD measures remain in place in the more recent period, as compared to less than 9% in the early period. This is compelling evidence that the duration of protection has increased. Table 2 reports the log-rank test of the equality of the pre-PTA and post-PTA survival functions. We can reject the two graphs that are equal at the 1% level. The conclusion also holds if we exclude China as a target. There has been an increase in duration, albeit not as great an increase as when China is included.

The next step is to overlay the pre-/post- analysis with the information on whether the user and target are in a PTA. These results are depicted in Figure 3; three lines have been graphed in each chart: (i) no PTA (dashed black line), (ii) PTA with no rules (dotted blue

[11]Moreover, the early PTAs deemed to be less significant since they generally involved no discretionary protection. For example, Israel was not targeted in any AD action by the U.S. until 2015, well after NAFTA came into effect.

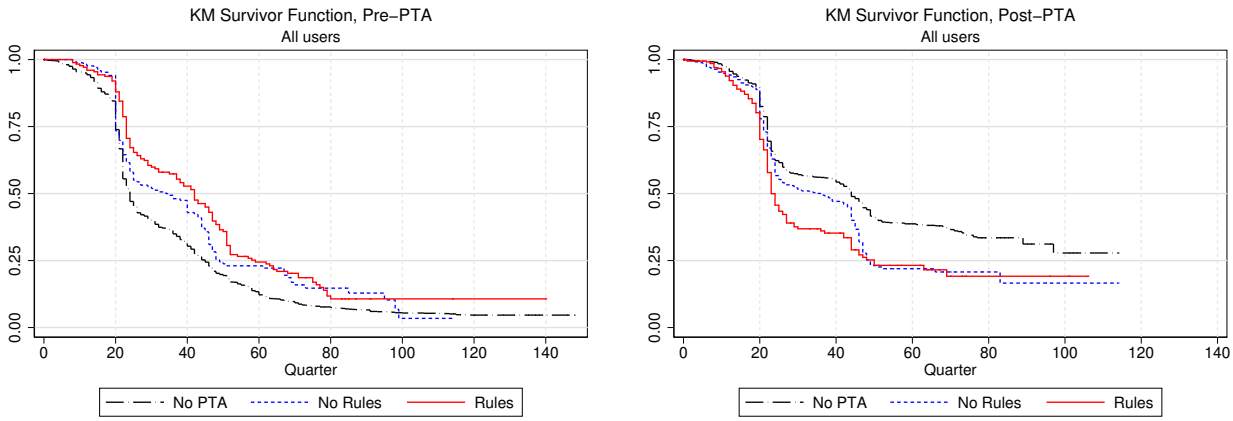

Figure 3: Duration of AD Measures: Pre-/Post-PTA, by PTA Rules Classification

line), and (iii) PTA with rules (solid red line). As seen in the left chart, before the PTA was enacted, AD cases involving PTA members had a longer duration than those not involving PTA members. By contrast, in the right chart we see that once the PTA is enacted, the ordering is flipped. As seen in Table 1, the median duration increased by 20 quarters for target countries who are not PTA members (from 24 quarters to 44 quarters) but decreased by 13 quarters for targeted countries who are PTAs members (from 40 quarters to 27 quarters).

Comparing PTAs with and without rules, it appears that rules matter and that the impact of PTAs on duration is not simply due to the beneficial effects of the "closeness" associated with PTA membership. Duration for PTAs with no rules is essentially unchanged comparing the pre- and post-period (34 and 36 quarters). On the other hand, duration for PTAs with rules falls by 19 quarters, from 42 quarters to 23 quarters.

As shown in Table 2 most comparisons of pre- vs. post- and the variety of PTA status (no PTA, rules, no rules) reject that the survival functions are the same. The two exceptions involve PTAs with no rules. First, we cannot reject that the survival experience of PTAs with no rules in the pre- vs. post-period are the same. Given the general trend in the data to longer duration, this is noteworthy. In effect, "no change" in survival experience for PTAs with no rules is an improvement compared to the benchmark (no PTA). Second, we cannot reject that the survival experience during the pre-period for "PTAs no rules" and "PTAs rules" are the same.

Given our prior discussion, we are concerned about the extent to which China causes these differential effects. To investigate this issue, we perform the analysis excluding China as a target. As shown in Table 1, excluding China indeed reduces the pre-/post-effect but does not alter our results regarding the impact of PTA membership. Said differently, when China is excluded, there is a less marked increase in duration in the more recent period as

Table 2: Log-rank Test for Equality of KM Survivor Function (p-values)

	Including China	**Excluding China**
Pre vs Post		
Entire Sample	0.000	0.000
No PTA	0.000	0.000
PTA with No Rules	0.707	0.131
PTA with Rules	0.002	0.017
Pre-Period		
PTA vs No PTA	0.000	0.000
PTA-Rules vs. PTA-No Rules	0.120	0.545
Post-Period		
PTA vs No PTA	0.000	0.000
PTA-Rules vs. PTA-No Rules	0.017	0.615

compared to when China is included in the sample. Nevertheless, when China is excluded, we continue to find (i) PTAs significantly lower duration and (ii) that PTAs with rules have a larger impact on duration than those without rules.

3.1. Parametric Regression Analysis

The above discussion based on the non-parametric analysis presents evidence that there are changes that relate to both time (pre vs. post) and also PTA membership. We now provide a regression analysis into the question of whether countries are in favor of their PTA members with respect to the duration of AD duties relative to non-members. Because PTA members may be less likely to have affirmative determinations in the first place, we employ a Heckman selection model to control for the non-random selection issue. In particular, we observe the length of the protection only for AD cases that resulted in measures being applied. For those AD investigations that were rejected (i.e., no measure applied), we do not have any information on duration. If the decision to impose AD duties is systematically correlated with unobservables that also affect the duration, using only the AD measures might produce biased estimators.

The Heckman method corrects for such selection. In the first stage, a selection equation investigates the binary decision of whether or not to impose AD measures, estimated through a probit. In the second stage, the outcome equation focuses on the length of the protection conditional on an affirmative determination. The selection equation includes the same independent variables as the outcome equation, except for the selection variables. The key feature of this procedure is to have variables that affect the decision of whether measures are imposed but which are not relevant for the duration regression. The selection variables are the bilateral real exchange rate, time trend, and the AD using and target country's GDP growth

rate (World Bank, 2021). These variables control for unobserved macroeconomic shocks such as business cycles or exchange rate fluctuations, which can have significant effects on the AD activities as shown by Knetter and Prusa (2003).

In the first stage, we estimate a probit binary choice model in the form

$$\begin{aligned}\Pr(\mathrm{OI}_{ijct}=1)=\Phi\Big[&\alpha_0+\alpha_1\mathrm{GDP}^{\mathrm{growth}}_{i(t'/t'-3)}+\alpha_2\mathrm{GDP}^{\mathrm{growth}}_{j(t'/t'-3)}\\&+\alpha_3\log\mathrm{RER}_{ij(t'-1)}+\alpha_4\mathrm{Post}^{\mathrm{Uruguay}}_{ct'}\\&+\theta_0\mathrm{Post}_{ijct}+\theta_1\mathrm{PTA}_{ij}+\theta_2(\mathrm{PTA}_{ij}\times\mathrm{Post}_{ijct})\\&+\pi_{ij}+\delta_i+\delta_j+\delta_{t'}+\mu_{ijct}\Big],\end{aligned}\tag{1}$$

where $\Phi[\cdot]$ is a standard normal distribution function and the subscripts i, j, c where $\Phi[\cdot]$ is a standard normal distribution function and the subscripts i, j, c and t stand for AD using country, targeted country, AD case, and time when the preliminary measure was imposed, respectively. Our dependent variable, OI_{ijct}, is a dummy which equals to 1 if the original investigation for case c initiated by country i against country j results in a measure being applied at the time t. $\mathrm{GDP}^{\mathrm{growth}}_{i(t'/t'-3)}$ [$\mathrm{GDP}^{\mathrm{growth}}_{j(t'/t'-3)}$] is the AD using [target] country's 3-year GDP growth prior to the initiation date t'. $\mathrm{RER}_{ij(t'-1)}$ is the bilateral exchange rate between country i and country j one year prior to the initiation date t'.[12] Following the logic of Knetter and Prusa (2003), we expect a lower GDP growth and stronger currency of the AD using country's, and better economic performance of the target country would make AD measures more likely to impose. Finally, a related concern is that PTAs become overall more deeper and countries are imposing longer AD measures. We thus include a time trend ($\delta_{t'}$) to control for such possibility.[13]

In the second stage, we estimate a duration which is right-censored; this makes it inappropriate to use OLS. We therefore use the censored normal regression model to estimate

$$\begin{aligned}\log(\mathrm{duration}_{ijct})=&\beta_0+\gamma_0\mathrm{Post}_{ijct}+\gamma_1\mathrm{PTA}_{ij}+\gamma_2(\mathrm{PTA}_{ij}\times\mathrm{Post}_{ijct})\\&+\beta_1\mathrm{Post}^{\mathrm{Uruguay}}_{ct'}+\pi_{ij}+\delta_i+\delta_j+\hat{\boldsymbol{\lambda}}+\epsilon_{ijct},\end{aligned}\tag{2}$$

where $\mathrm{duration}_{\mathrm{ijct}}$ denotes the length of the measure for an AD case c imposed by country i

[12]Following Knetter and Prusa (2003) the bilateral real exchange rate is lagged by one year based on the case initiation time at t'. This reflects that most authorities base the less than fair value calculation on the most recent year. By contrast, the GDP growth variable is the 3-year growth rate from $t'-3$ to t' based on the typical time frame for the injury investigation. The bilateral exchange rate is expressed as the number of AD targeting currency units per AD using country's currency. Therefore, an upward movement of the exchange rate is associated with an appreciation of currency from the AD using country.

[13]We thank Yoto Yotov for this insightful suggestion.

against country j measured as the time t when preliminary duty was applied until the order is revoked; for country pairs i and j who have enacted a PTA, $\text{Post}_{ijct} = 1$ if the duty imposed at time t for case c occurs after the PTA was enacted;[14] for country pairs who are not PTA members, $\text{Post}_{ijct} = 1$ if the duty imposed at time t for case c occurs after country i's most economically significant PTA was enacted. PTA_{ij} is a dummy variable indicating whether countries i and j are members of the same PTA.

The parameter of primary interest is γ_2, which measures the change in AD duration that can be attributed to PTA membership after the PTA is enacted. Intuitively, this specification compares the difference in the duration of AD measures imposed on PTA members after a PTA is formed with the duration of AD measures imposed on non-PTA members. Given the results in the prior section, we expect this coefficient to be negative, implying PTAs result in shorter AD measures on members.

Additionally, the Uruguay Round mandated that all measures receive a sunset review five years after the final AD order, with the hope that such provision would reduce the length of AD protection. To capture this effect, we include a dummy variable $\text{Post}_{ct'}^{\text{Uruguay}}$ and equals to 1 if the case c initiated at time t'. Including this variable in the analysis sheds light on the impact of this provision. If the sunset review provision were changing administrative outcomes, one would expect a negative coefficient for this variable.

The inverse Mill's ratio, $\hat{\boldsymbol{\lambda}}$, is the ratio of the probability distribution function and the cumulative distribution function that is predicted from the probit estimation in equation (1). This inverse Mill's ratio is used in the outcome equation (2) to control and test for sample selection. Selection bias is present if the inverse Mill's ratio is statistically different from zero.

We follow AD literature and include additional control variables. For example, the standard time-invariant bilateral gravity covariates (π_{ij}) including distance, language, contiguity, and common legal origin are used to account for the country-pair specific features that might affect AD duration against a particular country (USITC, 2021). We also add both AD using country and targeting country fixed effects (i.e., δ_i and δ_j) to take into account all time-invariant country-level characteristics. These control for unobserved cultural and institutional factors that might affect the decision to the duration of AD measures. In particular, there may exist certain user and/or target country characteristics that cause AD measures to be maintained longer. Finally, we cluster standard errors by AD investigations instead of AD cases, which means that we allow for determinations within the same AD investigation that targets multiple countries to be correlated.[15]

[14] For AD measures that ended before two nations have implemented a PTA, we have $\text{Post}_{ijct} = 0$.

[15] A single investigation can involve multiple cases. For example, an investigation might involve ball bearings from France, Japan, and Korea (three cases). Country-specific information is collected, but the cases

3.2. Empirical Results

Benchmark Results

Table 3 reports the benchmark estimation results using the Heckman selection procedure (equation (2)) and thus accounts for potential sample selection. Each of the coefficients, when multiplied by 100, gives the estimated percentage change in expected duration given a ceteris paribus increase of one unit in the corresponding explanatory variable. We note that the estimation results for equation (1) are reported in Table A3. The benchmark results for the first stage used for obtaining the inverse Mill's ratio, $\hat{\boldsymbol{\lambda}}$, is showed in column (1) of Table A3.

Column (1) of Table 3 reports the results when the sample includes all cases initiated by all user countries. We see that the estimates are consistent with the non-parametric results discussed above. In particular, we see that overall, regardless of PTA membership, duration has increased by 23 percent in the recent period [$\exp(0.204) - 1 \approx 0.23$]. This is consistent with the trends depicted in Figure 2. Notably, the PTA dummy estimate implies members have an approximately 87 percent longer duration [$\exp(0.628) - 1 \approx 0.87$]. Specifically, the positive coefficient is consistent with the view that PTAs are often composed of countries with deep trade relationships; it is the depth of the trading relationship that creates the trade tensions that spur AD actions, which, in turn, results in longer-lived measures. Critically, the interaction effect is quite large and statistically significant. Specifically, we find that a PTA leads to a sharp reduction by 40 percent [$\exp(-0.494) - 1 \approx -0.40$] in the duration of AD measures for its members ("PTA $\times$ Post").

In columns (2)–(7), we investigate whether the PTA effect depends on the development status of each AD using-targeted country pair. In column (2), we restrict the sample to AD measures imposed by developed countries (DC) and find that a somewhat larger PTA effect on duration (63% reduction in duration). We then estimate two additional specifications that separate the cases targeting developed countries from those targeting developing countries (DgC). While the effect of PTAs on the duration for the bilateral DC–DC income group (column (3)) is even larger than those in the previous column, the significance of the estimated coefficients disappear for DC–DgC category (column (4)). These results suggest that developed countries more substantially gain from PTAs. The findings are consistent with findings of Blonigen (2005) who found that NAFTA reduced the U.S. AD activity towards Canada but did not affect the U.S. AD activity against Mexico. In addition, we believe that DgC targets might be poorly organized, which hinders their ability to properly defend themselves

within the same investigation often proceed on identical timelines. Each targeted country would get its own determination. The investigative authority might reject duties for France but apply duties on Japan and Korea.

Table 3: The Effect of PTA Membership on Duration

Dep.Var	$\log(\text{duration}_{ijct})$						
User Sample (i)	All	DC	DC	DC	DgC	DgC	DgC
Target Sample (j)	All	All	DC	DgC	All	Dc	DgC
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post_{ijct}	0.204***	0.238***	0.259**	0.132	0.223***	0.180**	0.229***
	(0.047)	(0.087)	(0.104)	(0.134)	(0.058)	(0.073)	(0.084)
PTA_{ij}	0.628***	1.306***	2.151***	0.658	0.720***	1.240***	0.406
	(0.143)	(0.352)	(0.446)	(0.513)	(0.183)	(0.257)	(0.264)
$\text{PTA}_{ij} \times \text{Post}_{ijct}$	-0.494***	-0.987***	-1.658***	-0.247	-0.574***	-0.878***	-0.283
	(0.127)	(0.320)	(0.398)	(0.465)	(0.157)	(0.220)	(0.222)
Control variables							
$\text{Post}_{ct'}^{\text{Uruguay}}$	0.166***	0.162**	0.194**	0.137	0.290***	0.316***	0.266**
	(0.052)	(0.076)	(0.092)	(0.109)	(0.088)	(0.099)	(0.129)
$\log \text{Distance}_{ij}$	0.106***	0.159***	0.139**	0.154	0.096**	0.191***	0.117
	(0.029)	(0.050)	(0.062)	(0.108)	(0.041)	(0.060)	(0.076)
Contiguity_{ij}	-0.132**	-0.136	-0.559***	0.099	-0.159**	-0.012	-0.033
	(0.055)	(0.121)	(0.177)	(0.170)	(0.070)	(0.183)	(0.110)
$\text{Common Language}_{ij}$	0.024	-0.035	-0.091	0.043	0.028	0.057	-0.007
	(0.046)	(0.077)	(0.103)	(0.107)	(0.061)	(0.062)	(0.155)
$\text{Common Legal Origin}_{ij}$	-0.054	-0.073	0.198	-0.165	-0.005	0.071	-0.011
	(0.046)	(0.078)	(0.152)	(0.103)	(0.065)	(0.086)	(0.104)
Inverse Mill's ratio $\hat{\boldsymbol{\lambda}}$	0.486**	1.088**	1.972***	0.355	0.870***	1.472***	0.207
	(0.214)	(0.464)	(0.588)	(0.698)	(0.316)	(0.390)	(0.555)
δ_i	Yes	Yes	Yes	Yes	Yes	Yes	Yes
δ_j	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	4,375	1,850	879	971	2,525	1,071	1,454

Note: The dependent variable is the log of duration of AD measure for case c imposed by country i against country j since the time t when preliminary duty was applied. The inverse Mill's ratio, $\hat{\boldsymbol{\lambda}}$, is derived from the column (1) of Table A3. Robust standard errors in parenthesis are clustered at the AD investigation level. Asterisks denote significance levels: * < 0.10, ** < 0.05, *** < 0.01.

(i.e., lack the wherewithal to get the measure sunset).

In columns (5)–(7), the focus is on AD measures imposed by developing countries. As seen from column (5), the PTA impact for developing country users is similar to that found in column (1). In particular, PTA membership decreases the AD duration by about 60 percent. Interestingly, when we separate the impact on developed country targets (column (6)) and developing country targets (column (7)) we find a very similar pattern as seen in columns (3) and (4). In particular, we again observe PTAs have a larger impact on duration when the targeted country is a developed country. That is, the PTA effect in columns (3) and (6) are larger than those seen in columns (4) and (7), respectively.

Finally, across specifications, the estimated coefficient of $\text{Post}_{ct'}^{\text{Uruguay}}$ is always positive and significant. This implies that the duration of AD measures has increased despite the mandatory sunset review provision. It is very difficult not to conclude that the Uruguay Round's mandated sunset provision have failed to curtail the length of AD measures.

As far as the gravity variables are concerned, their coefficients are in line with what we expect: the larger is the distance, the longer is the duration, whereas sharing border

Table 4: Heterogeneous Effects of PTA Membership on Duration

Dep.Var	$\log(\text{duration}_{ijct})$			
User Sample (i)	All	All	DC	DgC
Target Sample (j)	All	All	DgC	DgC
	(1)	(2)	(3)	(4)
Post_{ijct}	0.197***	0.223***	0.161	0.245***
	(0.054)	(0.048)	(0.137)	(0.093)
PTA_{ij}	0.665***	0.806***	0.660	0.571*
	(0.135)	(0.161)	(0.562)	(0.311)
$\text{PTA}_{ij} \times \text{Post}_{ijct}$	-0.501***	-0.638***	-0.294	-0.363
	(0.118)	(0.143)	(0.509)	(0.272)
$\text{DC}_i \times \text{Post}_{ijct}$	0.051			
	(0.088)			
$\text{DC}_i \times \text{PTA}_{ij}$	0.473***			
	(0.123)			
$\text{DC}_i \times \text{PTA}_{ij} \times \text{Post}_{ijct}$	-0.431***			
	(0.161)			
$\text{China}_j \times \text{Post}_{ijct}$		-0.027	-0.070	-0.050
		(0.083)	(0.150)	(0.128)
$\text{China}_j \times \text{PTA}_{ij}$		-0.365***	0.047	-0.443**
		(0.130)	(0.225)	(0.195)
$\text{China}_j \times \text{PTA}_{ij} \times \text{Post}_{ijct}$		0.251*	0.106	0.211
		(0.151)	(0.312)	(0.225)
Control variables				
$\text{Post}_{ct'}^{\text{Uruguay}}$	0.189***	0.176***	0.145	0.260*
	(0.053)	(0.054)	(0.112)	(0.135)
$\log \text{Distance}_{ij}$	0.110***	0.123***	0.160	0.159**
	(0.030)	(0.030)	(0.111)	(0.081)
Contiguity_{ij}	-0.178***	-0.104*	0.113	0.062
	(0.057)	(0.056)	(0.174)	(0.111)
$\text{Common Language}_{ij}$	0.021	0.031	0.014	-0.028
	(0.047)	(0.047)	(0.121)	(0.151)
$\text{Common Legal Origin}_{ij}$	-0.073	-0.056	-0.180*	-0.028
	(0.047)	(0.046)	(0.102)	(0.106)
Inverse Mill's ratio $\hat{\boldsymbol{\lambda}}$	0.854***	0.656***	0.358	0.108
	(0.248)	(0.236)	(0.750)	(0.589)
δ_i	Yes	Yes	Yes	Yes
δ_j	Yes	Yes	Yes	Yes
N	4,375	4,375	971	1,454

Note: The dependent variable is the log of duration of AD measure for case c imposed by country i against country j since the time t when preliminary duty was applied. The inverse Mill's ratio, $\hat{\boldsymbol{\lambda}}$, in column (1) is derived from column (2) of Table A3. The inverse Mill's ratio, $\hat{\boldsymbol{\lambda}}$, in columns (2)–(4) is derived from column (3) of Table A3. Robust standard errors in parenthesis are clustered at the AD investigation level. Asterisks denote significance levels: * < 0.10, ** < 0.05, *** < 0.01.

generally reduces the length of protection, while the coefficients on common language and common legal origin are never statistically significant. However, we also note that, by and large, the inverse Mill's ratio is statistically significant across various sample compositions, suggesting the need for control sample selection bias in our framework.

Heterogeneous Effects of PTAs

In this part, we take the analysis a step further by exploring the bilateral and directional links to understand whether the large PTAs effects identified earlier differ across development status. Specifically, we first examine whether the PTAs effects are primarily due to rich, developed AD users. To answer this question, we add an income-specific triple interaction term to distinguish between two income groups. In other words, this term captures whether the expected effect of PTAs on shortening the duration of AD measures is magnified if users are higher-income countries. As seen from column (1) of Table 4, the estimated coefficient for the triple interaction term is negative and significant. This result gives an indication that developed AD users indeed further reduce the length of the protection for their PTA partners beyond the broad-based impact of PTAs across all income categories (consistent the findings in column (3) in Table 3).

Columns (2) to (4) contain the results when we investigate the role, if any, played by China, the top AD target. Across specifications, there is no robust evidence of the PTA effect is driven by China as a target. While the estimated coefficient on the PTA effect on China is frequently positive, it is not statistically significant across specifications. In addition, the insignificant estimate for the interaction term in column (3) indicating that PTAs involving developed and developing countries do not significantly reduce AD protection (Blonigen, 2005). This is again consistent with the findings in columns (4) and (7) in Table 3. Finally, the inverse Mill's ratio across specifications are obtained from the same independent variables listed in each column plus the four selection variables, i.e., $\text{GDP}^{\text{growth}}_{\text{i(t'/t'-3)}}$, $\text{GDP}^{\text{growth}}_{\text{j(t'/t'-3)}}$, $\log \text{RER}_{\text{ij(t'-1)}}$, and time trend.

Taken together, the estimates of Tables 3 and 4 provide strong evidence that PTAs significantly reduce the duration of AD measures for PTA members. The PTA effect is more prominent for developed countries (either as targets or uses) and does not appear to be driven by China as the AD target. In addition, there is strong evidence of a general trend toward longer duration of AD measures, which is consistent with the graphical analysis. That is to say, the Uruguay Round's sunset review did little to curb the length of AD measures.

Rules vs. No Rules

The above analysis does not distinguish whether specific AD provisions in PTAs exert a greater impact on the duration of such measures. To address this issue, we modify our specification to separate the impact for PTAs *with rules* vs. PTAs *without rules*. Table 5 reports the results. The findings are broadly consistent with those in Table 3. As seen in column (1), the duration of AD measures for country pairs with a PTA *with rules* is shorter, on average, than country pairs with a PTA *without rules*, which in turn is shorter than

Table 5: The Effect of PTA Membership and PTA Rules on Duration

Dep.Var	$\log(\text{duration}_{ijct})$						
User Sample (i)	All	DC	DC	DC	DgC	DgC	DgC
Target Sample (j)	All	All	DC	DgC	All	Dc	DgC
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post_{ijct}	0.200***	0.224**	0.270**	0.109	0.213***	0.192***	0.238***
	(0.047)	(0.088)	(0.107)	(0.132)	(0.058)	(0.073)	(0.085)
$\text{PTA}_{ij}^{\text{AD Rules}}$	0.755***	1.258***	2.109***	0.529	0.734***	1.108***	1.413***
	(0.148)	(0.329)	(0.445)	(0.486)	(0.192)	(0.248)	(0.376)
$\text{PTA}_{ij}^{\text{No AD Rules}}$	0.576***	1.132***	2.371***	0.627	0.691***	1.594***	0.521**
	(0.147)	(0.390)	(0.570)	(0.529)	(0.187)	(0.315)	(0.265)
$\text{PTA}_{ij}^{\text{AD Rules}} \times \text{Post}_{ijct}$	-0.642***	-0.881***	-1.464***	-0.268	-0.706***	-0.794***	-1.566***
	(0.140)	(0.294)	(0.387)	(0.435)	(0.180)	(0.226)	(0.373)
$\text{PTA}_{ij}^{\text{No AD Rules}} \times \text{Post}_{ijct}$	-0.419***	-0.871**	-2.155***	-0.111	-0.517***	-1.177***	-0.387*
	(0.133)	(0.374)	(0.546)	(0.490)	(0.162)	(0.277)	(0.233)
Control variables							
$\text{Post}_{ct'}^{\text{Uruguay}}$	0.180***	0.148**	0.183**	0.140	0.304***	0.324***	0.336***
	(0.053)	(0.075)	(0.089)	(0.110)	(0.088)	(0.102)	(0.118)
$\log \text{Distance}_{ij}$	0.105***	0.155***	0.146**	0.144	0.084**	0.202***	0.063
	(0.029)	(0.050)	(0.063)	(0.108)	(0.042)	(0.060)	(0.078)
Contiguity_{ij}	-0.145***	-0.172	-0.613***	0.135	-0.152**	0.116	-0.060
	(0.056)	(0.123)	(0.178)	(0.176)	(0.070)	(0.189)	(0.108)
$\text{Common Language}_{ij}$	0.027	-0.036	-0.073	0.046	0.025	0.049	-0.017
	(0.046)	(0.077)	(0.104)	(0.104)	(0.061)	(0.061)	(0.155)
$\text{Common Legal Origin}_{ij}$	-0.056	-0.071	0.246	-0.178*	-0.002	0.067	0.073
	(0.046)	(0.079)	(0.155)	(0.104)	(0.065)	(0.086)	(0.105)
Inverse Mill's ratio $\hat{\boldsymbol{\lambda}}$	0.546**	0.948**	2.009***	0.269	0.840***	1.525***	0.745
	(0.214)	(0.459)	(0.623)	(0.665)	(0.308)	(0.400)	(0.524)
δ_i	Yes	Yes	Yes	Yes	Yes	Yes	Yes
δ_j	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	4,375	1,850	879	971	2,525	1,071	1,454

Note: The dependent variable is the log of duration of AD measure for case c imposed by country i against country j since the time t when preliminary duty was applied. The inverse Mill's ratio, $\hat{\boldsymbol{\lambda}}$, is obtained from column (4) in Table A3. Robust standard errors in parenthesis are clustered at the AD investigation level. Robust standard errors in parenthesis are clustered at AD investigation level. Asterisks denote significance levels: * < 0.10, ** < 0.05, *** < 0.01.

country pairs not in a PTA. In particular, cases with PTAs with rules are associated with 47 percent reduction in duration, and cases with PTAs with no rules have 34 percent shorter duration than cases not involving PTA members, a result in conformity with the graphical analysis in Figure 1.[16]

The results in Table 5 reinforce the benchmark results reported in Table 3. Separating the impact of *rules* from *no rules* demonstrates that the content of PTAs matter. This is further supported by the fact that *rules* do not have a larger impact than *no rules* across all income pairs. As discussed in Prusa (2020) the extent of AD rules varies across PTAs. Some PTAs like NAFTA and Andean Community, have significant rules governing AD usage while other PTAs such as the ASEAN Free Trade Area (AFTA) and EU–Mexico have minimal

[16]The inverse Mill's ratio is calculated from column (4) in Table A3. The coefficient on this variable based on different subsamples has a large t-statistic, suggesting that our specifications are indeed subject to selection bias.

Table 6: One-Step Estimation (no control for sample selection)

Dep.Var	$\log(\text{duration}_{ijct})$			
	(1)	(2)	(3)	(4)
Post_{ijct}	0.155***	0.191***	0.166***	0.149***
	(0.042)	(0.051)	(0.043)	(0.042)
PTA_{ij}	0.324***	0.263***	0.382***	
	(0.046)	(0.057)	(0.049)	
$\text{PTA}_{ij} \times \text{Post}_{ijct}$	-0.233***	-0.189**	-0.277***	
	(0.061)	(0.074)	(0.067)	
$\text{DC}_i \times \text{Post}_{ijct}$		-0.099		
		(0.077)		
$\text{DC}_i \times \text{PTA}_{ij}$		0.176**		
		(0.089)		
$\text{DC}_i \times \text{PTA}_{ij} \times \text{Post}_{ijct}$		-0.139		
		(0.129)		
$\text{China}_j \times \text{Post}_{ijct}$			-0.057	
			(0.081)	
$\text{China}_j \times \text{PTA}_{ij}$			-0.321***	
			(0.122)	
$\text{China}_j \times \text{PTA}_{ij} \times \text{Post}_{ijct}$			0.211	
			(0.144)	
$\text{PTA}_{ij}^{\text{AD Rules}}$				0.416***
				(0.058)
$\text{PTA}_{ij}^{\text{No AD Rules}}$				0.228***
				(0.060)
$\text{PTA}_{ij}^{\text{AD Rules}} \times \text{Post}_{ijct}$				-0.330***
				(0.083)
$\text{PTA}_{ij}^{\text{No AD Rules}} \times \text{Post}_{ijct}$				0.134*
				(0.074)
Control variables				
$\text{Post}_{ct'}^{\text{Uruguay}}$	0.130***	0.151***	0.125***	0.135***
	(0.046)	(0.048)	(0.046)	(0.046)
$\log \text{Distance}_{ij}$	0.120***	0.116***	0.130***	0.120***
	(0.027)	(0.027)	(0.027)	(0.027)
Contiguity_{ij}	-0.028	-0.036	0.009	-0.034
	(0.048)	(0.048)	(0.050)	(0.048)
$\text{Common Language}_{ij}$	0.053	0.050	0.052	0.055
	(0.040)	(0.040)	(0.040)	(0.040)
$\text{Common Legal Origin}_{ij}$	-0.053	-0.061	-0.059	-0.055
	(0.043)	(0.044)	(0.043)	(0.043)
δ_i	Yes	Yes	Yes	Yes
δ_j	Yes	Yes	Yes	Yes
N	4,864	4,864	4,864	4,864

Note: The dependent variable is the log of duration of AD measure for case c imposed by country i against country j since the time t when preliminary duty was applied. Robust standard errors in parenthesis are clustered at the AD investigation level. Asterisks denote significance levels: * < 0.10, ** < 0.05, *** < 0.01.

rules and therefore it is not surprising that the differential effect varies across our samples.[17]

[17] Across various sample compositions, the parameter estimates for the impact of PTAs *with rules* vs. PTAs *without rules* are not statistically different from each other.

3.3. Robustness Checks

In this section, we estimate a set of additional specifications aimed at testing the robustness and sensitivity of our results. Table 6 presents the results of various specifications which do not incorporate any control for sample selection. In the first column, we show the results of a regression analogous to column (1) in Table 3; as seen, our estimates are identical in sign and statistical significance but with smaller point estimates. Both sets of results confirm that PTA members are subject to less AD protection ("duration reduced") and non-PTA members face even greater AD scrutiny ("duration extended").

In column (2), we allow for the possibility that the PTA effect differs across different income levels from the users' side. Our estimates are qualitatively unchanged to those reported in column (1) in Table 4. Although the triple interaction term identifying the PTA effect for more developed users is still negative, it becomes insignificant at standard confidence levels.

In column (3), we examine possible differences due to China, the most targeted country. This specification can be compared with column (2) of Table 4. The PTA effect (reduction in AD duration) remains qualitatively the same. The triple interaction term is still insignificant, suggesting such effect is not driven by cases against China. In column (4), we analyze the impact of PTAs with AD *rules* vs. *no rules*. Again the results do not differ from column (1) of Table 5; in particular, AD *rules* in PTAs play an important role in altering the pattern of AD duration.

We also drop several highly prominent PTAs, i.e., NAFTA and EC/EU PTAs, to see whether the PTA effect remains. Our primary concern is that the countries involved in these PTAs are not only economically important but also are among the largest users of AD, and this is the reason we find PTAs have a large effect on duration. To do so, we re-estimate all of our specifications in Table 6 in the absence of the cases initiated by the EU and US, and the results are showed in Table A4. We find that dropping these prominent AD users does not remove the PTA effect. In fact, we find a slightly stronger PTA effect since the estimated coefficients have a larger magnitude when these large PTAs are dropped.

A final specification explores the effect of PTAs on the duration of AD for a subsample of steel products (HS chapters 72 and 73).[18] Because the steel industry is an active AD user, accounting for about a quarter of all AD cases between 1980–2019, we might be concerned that the estimated effects are driven by steel products. For this purpose, we again re-estimate all of our specifications in Table 6 by restricting the sample to steel products. As seen from Table A5, our results are qualitatively identical to those for the overall sample. Moreover, the magnitude of the coefficient is larger than the coefficient in the sample of

[18]We thank Chad Bown for this insightful suggestion.

all products, suggesting that the effect in steel products is more pronounced than that in non-steel products.

In conclusion, the robustness and sensitivity checks confirm the results presented earlier. We find compelling evidence that (i) PTAs have a strong effect on decreasing the duration of AD protection, and (ii) AD protection has become longer-lived in recent period.

4. Conclusion

Two of the most significant developments in trade policy over the last five decades are the expansion of PTAs and the proliferation of AD protection. Despite their importance, economists and policymakers are only beginning to analyze the relationship between them. This paper makes an initial attempt to identify the linkage between PTAs and the duration of AD measures. To do so, we combine information on AD provisions contained in the *Content of Deep Trade Agreements* database with information in the *Global Antidumping Database*.

First and foremost, we present novel evidence that PTAs alter the duration of AD duties, tilting the playing field further in favor of the member countries. We find that PTAs shorten the duration of AD measures among partners relative to the duration of non-partners. Our key findings with respect to the impact of PTAs on the duration of protection are essentially unchanged after disentangling cases targeting China from the analysis. Consequently, our results indicate that AD measures increase the discrimination that occurs due to discriminatory PTA tariffs.

We also confirm that the duration of AD measures significantly lengthened over the last 25 years. The significant increase in duration is a noteworthy finding, especially given that mandatory sunset review was viewed as one of the more significant changes in the Uruguay Round antidumping agreement. The sunset review requirement was in response to the frustration by some member countries that AD measures often remained in place for many years longer than warranted. The hope was that requiring authorities to review all AD measures would result in the revocation of orders on weaker cases or where circumstances had changed such that AD protection was no longer warranted. Our analysis demonstrates that mandated sunset review did not lead to a shorter duration of such measures.

We believe our study is particularly relevant in the context of the current trade policy arena, which is dominated by PTAs and AD protection. One important relationship derived from our research is that after the implementation of a PTA, AD measures on non-members remain in place for longer periods of time, which serves to further reinforce the preferences already inherent in the PTA.

References

Ahn, D. and W. Shin (2011): "Analysis of Anti-dumping Use in Free Trade Agreements," *Journal of World Trade*, 45.

Bagwell, K. and R. W. Staiger (1999): "Regionalism and Multilateral Tariff Cooperation," in *International Trade Policy and the Pacific Rim*, Springer, 157–190.

Besedeš, T. and T. J. Prusa (2017): "The Hazardous Effects of Antidumping," *Economic Inquiry*, 55, 9–30.

Bhagwati, J. and A. Panagariya (1996): "The Theory of Preferential Trade Agreements: Historical Evolution and Current Trends," *American Economic Review*, 86, 82–87.

Blonigen, B. A. (2005): "The Effects of NAFTA on Antidumping and Countervailing Duty Activity," *The World Bank Economic Review*, 19, 407–424.

Bown, C. P. (2011): "Taking Stock of Antidumping, Safeguards and Countervailing Duties, 1990–2009," *The World Economy*, 34, 1955–1998.

——— (2013): "Emerging Economies and the Emergence of South-South Protectionism," *Journal of World Trade*, 47, 1.

Bown, C. P. and P. Tovar (2016): "Preferential Liberalization, Antidumping, and Safeguards: Stumbling Block Evidence from MERCOSUR," *Economics and Politics*, 28, 262–94.

Cadot, O., J. De Melo, and B. Tumurchudur (2007): "Anti-dumping Sunset Reviews: the Uneven Reach of WTO Disciplines," *CEPR Discussion Paper No. DP6502*.

Knetter, M. M. and T. J. Prusa (2003): "Macroeconomic Factors and Antidumping Filings: Evidence from Four Countries," *Journal of International Economics*, 61, 1–17.

Mattoo, A., N. Rocha, and M. Ruta, eds. (2020): *Handbook of Deep Trade Agreements*, The World Bank.

Moore, M. O. (1999): "Antidumping Reform in the US: A Faded Sunset," *Journal of World Trade*, 33, 1–17.

——— (2006): "An Econometric Analysis of US Antidumping Sunset Review Decisions," *Review of World Economics*, 142, 122–150.

Prusa, T. J. (2001): "On the Spread and Impact of Antidumping," *Canadian Journal of Economics*, 34, 591–611.

——— (2016): "Antidumping Provisions in Preferential Trade Agreements," in *The World Trade System*, ed. by J. N. Bhagwati, P. Krishna, and A. Panagariya, The MIT Press, 117–48.

——— (2020): "Antidumping and Countervailing Duties," in *Handbook of Deep Trade Agreements*, ed. by A. Mattoo, N. Rocha, and M. Ruta, The World Bank, 319–342.

Prusa, T. J. and R. Teh (2010): "Protection Reduction and Diversion: PTAs and the Incidence of Antidumping Disputes," Tech. Rep. 16276, National Bureau of Economic Research.

Signoret, J., C. P. Bown, M. Cieszkowsky, and A. Erbahar (2020): "Temporary Trade Barriers Database including the Global Antidumping Database," `https://www.worldbank.org/en/data/interactive/2021/03/02/temporary-trade-barriers-database`.

Silberberger, M., A. Slany, C. Soegaard, and F. Stender (2019): "The Aftermath of Antidumping: Are Temporary Trade Barriers Really Temporary?" *Available at SSRN 3054988*.

Silberberger, M. and F. Stender (2018): "False Friends? Empirical Evidence on Trade Policy Substitution in Regional Trade Agreements," *The World Economy*, 41, 2175–2199.

Tabakis, C. and M. Zanardi (2019): "Preferential Trade Agreements and Antidumping Protection," *Journal of International Economics*, 121, 103246.

Tovar, P. (2019): "Preferential and Multilateral Liberalization: Evidence from Latin America's Use of Tariffs, Antidumping and Safeguards," *Journal of Development Economics*, 141, 102383.

USITC (2021): "Gravity Portal Data," `https://www.usitc.gov/data/gravity/index.htm`.

Vermulst, E. (2010): *EC Anti-Dumping Law and Practice*, London, England: Sweet & Maxwell Ltd.

World Bank (2021): "World Development Indicators," `https://databank.worldbank.org/source/world-development-indicators`.

WTO (2020): "Regional Trade Agreements Database," http://rtais.wto.org/UI/charts.aspx.

——— (2021): "WTO Trade Topics," https://www.wto.org/english/tratop_e/tratop_e.htm.

Appendix

Table A1: The Top 10 Users and Targets of AD Measures

Country	1980-2019	1980-84	1985-89	1990-94	1995-99	2000-04	2005-09	2010-14	2015-19
PANEL A — User Country									
United States	784	65	128	131	78	105	65	53	159
India	741	0	0	12	109	204	149	130	137
European Union	487	4	81	106	111	68	53	39	25
Canada	298	0	72	65	44	41	10	38	28
Argentina	296	0	0	43	52	65	61	40	35
Brazil	291	0	4	21	45	17	50	116	38
Turkey	243	0	5	36	9	87	49	30	27
Australia	242	0	0	91	24	33	13	46	35
China	234	0	0	0	10	82	56	34	52
Mexico	195	0	16	61	27	31	7	28	25
Total	3,811	69	306	566	509	733	513	554	561
PANEL B — Target Country									
China	1,192	6	24	108	111	207	274	227	235
South Korea	358	5	25	43	58	70	36	55	66
United States	270	0	23	60	46	47	32	44	18
Taiwan	260	4	20	22	38	55	43	50	28
Japan	256	18	44	38	48	41	15	23	29
Thailand	181	0	5	18	25	36	35	33	29
India	173	0	4	17	35	32	27	26	32
Brazil	164	4	15	49	23	24	18	10	21
Indonesia	152	0	3	9	24	35	37	20	24
Russia	146	0	5	23	41	30	14	12	21
Total	3,152	37	168	387	449	577	531	500	503

Notes: The table reports the number of measures imposed (faced) by each user (target) country. Authors' calculations using *Global Antidumping Database* (Signoret et al., 2020).

Table A2: PTAs Included in the Analysis

ASEAN – Australia – New Zealand
ASEAN – China
ASEAN – India
ASEAN – Japan
ASEAN – Korea, Republic of
ASEAN Free Trade Area (AFTA)
Andean Community (CAN)
Aqadir Agreement
Asia Pacific Trade Agreement (APTA)
APTA – Accession of China
Australia – China
Canada – Korea, Republic of
Chile – China
Chile – Costa Rica (Chile – Central America)
Chile – Mexico
China – Korea, Republic of
China – New Zealand
China – Singapore
Colombia – Mexico
Common Economic Zone (CEZ)
Dominican Republic – Central America
Dominican Republic – Central America - US Free Trade Agreement (CAFTA-DR)
EU – Algeria
EU – Bosnia and Herzegovina
EU – CARIFORUM States EPA
EU – Colombia and Peru
EU – Egypt
EU – Faroe Islands
EU – Former Yugoslav Republic of Macedo
EU – Israel
EU – Korea, Republic of
EU – Mexico
EU – Morocco
EU – South Africa
EU – Turkey
Economic Cooperation Organization (ECO)
Egypt – Turkey
European Economic Area (EEA)
India – Japan
India – Malaysia
India – Singapore
Japan – Australia
Japan – Malaysia
Japan – Mexico
Japan – Thailand
Korea, Republic of – Australia
Korea, Republic of – Colombia
Korea, Republic of – India
Korea, Republic of – Singapore
Korea, Republic of – Turkey
Korea, Republic of – US
Korea, Republic of – Viet Nam
Kyrgyz Republic – Ukraine
Latin American Integration Association
MERCOSUR – India
Malaysia – Australia
North American Free Trade Agreement (NAFTA)
Pacific Alliance
Pakistan – China
Pakistan – Malaysia
Peru – China
Singapore – Australia
South Asian Free Trade Agreement (SAFTA)
SAFTA – Accession of Afganistan
Southern African Development Community
Southern Common Market (MERCOSUR)
Thailand – Australia
Thailand – New Zealand
Trans-Pacific Partnership
Turkey – Israel
Turkey – Morocco
Turkey – Serbia
US – Australia
US – Chile
US – Colombia
US – Israel
US – Morocco
US – Oman
US – Peru
US – Singapore
Ukraine – Belarus
Ukraine – Moldova

Notes: Does not include PTAs that prohibit AD.

Table A3: Probit Estimation for First Stage

Dep.Var	$\Pr(\text{OI}_{\text{ijct}}=1)$			
	(1)	(2)	(3)	(4)
Selection variables				
GDP growth$_{\text{i(t'/t'-3)}}$	-0.005	-0.004	-0.005	-0.005
	(0.004)	(0.004)	(0.004)	(0.004)
GDP growth$_{\text{j(t'/t'-3)}}$	0.006**	0.006**	0.006**	0.006**
	(0.002)	(0.002)	(0.002)	(0.002)
$\log \text{RER}_{ij(t'-1)}$	0.169*	0.158*	0.171**	0.166*
	(0.086)	(0.086)	(0.086)	(0.086)
Variables used in the 2^{nd} stage				
$\text{Post}_{ct'}^{\text{Uruguay}}$	0.227**	0.189**	0.224**	0.220**
	(0.091)	(0.092)	(0.091)	(0.091)
$\log \text{Distance}_{ij}$	0.054	0.055	0.054	0.054
	(0.042)	(0.043)	(0.043)	(0.043)
Contiguity_{ij}	-0.166**	-0.162**	-0.160**	-0.158**
	(0.077)	(0.077)	(0.080)	(0.077)
$\text{Common Language}_{ij}$	0.022	0.025	0.027	0.019
	(0.064)	(0.064)	(0.065)	(0.064)
$\text{Common Legal Origin}_{ij}$	0.036	0.027	0.034	0.033
	(0.069)	(0.069)	(0.069)	(0.069)
Post_{ijct}	0.146*	0.046	0.135*	0.151*
	(0.077)	(0.098)	(0.079)	(0.077)
PTA_{ij}	1.518***	1.325***	1.470***	
	(0.130)	(0.177)	(0.138)	
$\text{PTA}_{ij} \times \text{Post}_{ijct}$	-1.303***	-1.090***	-1.241***	
	(0.139)	(0.189)	(0.149)	
$\text{DC}_i \times \text{Post}_{ijct}$		0.200		
		(0.127)		
$\text{DC}_i \times \text{PTA}_{ij}$		0.382		
		(0.254)		
$\text{DC}_i \times \text{PTA}_{ij} \times \text{Post}_{ijct}$		-0.418		
		(0.275)		
$\text{China}_j \times \text{Post}_{ijct}$			0.079	
			(0.104)	
$\text{China}_j \times \text{PTA}_{ij}$			0.520	
			(0.425)	
$\text{China}_j \times \text{PTA}_{ij} \times \text{Post}_{ijct}$			-0.589	
			(0.436)	
$\text{PTA}_{ij}^{\text{AD Rules}}$				1.372***
				(0.156)
$\text{PTA}_{ij}^{\text{No AD Rules}}$				1.886***
				(0.232)
$\text{PTA}_{ij}^{\text{AD Rules}} \times \text{Post}_{ijct}$				-1.141***
				(0.169)
$\text{PTA}_{ij}^{\text{No AD Rules}} \times \text{Post}_{ijct}$				-1.686***
				(0.242)
$\delta_{t'}$	Yes	Yes	Yes	Yes
δ_i	Yes	Yes	Yes	Yes
δ_j	Yes	Yes	Yes	Yes
Pseudo R^2	0.107	0.108	0.107	0.108
N	7,240	7,240	7,240	7,240

Note: The dependent variable $\Pr(\text{OI}_{\text{ijct}}=1)$ is a binary variable equal to one if an AD case c initiated by country i against country j results in a measure being applied in time t. Robust standard errors in parenthesis are clustered at the AD investigation level. Asterisks denote significance levels: * < 0.10, ** < 0.05, *** < 0.01.

Table A4: Drop NAFTA & EC/EU PTAs

Dep.Var	$\log(\text{duration}_{ijct})$			
	(1)	(2)	(3)	(4)
Post_{ijct}	0.238***	0.185***	0.237***	0.228***
	(0.053)	(0.053)	(0.056)	(0.053)
PTA_{ij}	0.642***	0.675***	0.737***	
	(0.149)	(0.141)	(0.169)	
$\text{PTA}_{ij} \times \text{Post}_{ijct}$	-0.502***	-0.510***	-0.573***	
	(0.133)	(0.123)	(0.153)	
$\text{DC}_i \times \text{Post}_{ijct}$		0.192		
		(0.126)		
$\text{DC}_i \times \text{PTA}_{ij}$		0.411***		
		(0.136)		
$\text{DC}_i \times \text{PTA}_{ij} \times \text{Post}_{ijct}$		-0.353*		
		(0.196)		
$\text{China}_j \times \text{Post}_{ijct}$			0.050	
			(0.086)	
$\text{China}_j \times \text{PTA}_{ij}$			-0.197	
			(0.131)	
$\text{China}_j \times \text{PTA}_{ij} \times \text{Post}_{ijct}$			0.096	
			(0.155)	
$\text{PTA}_{ij}^{\text{AD Rules}}$				0.615***
				(0.152)
$\text{PTA}_{ij}^{\text{No AD Rules}}$				0.585***
				(0.153)
$\text{PTA}_{ij}^{\text{AD Rules}} \times \text{Post}_{ijct}$				-0.557***
				(0.148)
$\text{PTA}_{ij}^{\text{No AD Rules}} \times \text{Post}_{ijct}$				-0.427***
				(0.138)
Control variables				
$\text{Post}_{ct'}^{\text{Uruguay}}$	0.233***	0.222***	0.234***	0.235***
	(0.064)	(0.063)	(0.067)	(0.065)
$\log \text{Distance}_{ij}$	0.116***	0.122***	0.121***	0.108***
	(0.031)	(0.031)	(0.031)	(0.031)
Contiguity_{ij}	-0.145**	-0.168***	-0.125**	-0.135**
	(0.061)	(0.062)	(0.062)	(0.061)
$\text{Common Language}_{ij}$	0.057	0.060	0.063	0.055
	(0.048)	(0.048)	(0.048)	(0.047)
$\text{Common Legal Origin}_{ij}$	-0.054	-0.075	-0.063	-0.056
	(0.055)	(0.056)	(0.055)	(0.055)
Inverse Mill's ratio $\hat{\boldsymbol{\lambda}}$	0.555**	0.861***	0.631**	0.480**
	(0.232)	(0.266)	(0.258)	(0.227)
δ_i	Yes	Yes	Yes	Yes
δ_j	Yes	Yes	Yes	Yes
N	3,248	3,248	3,248	3,248

Note: The dependent variable is the log of duration of AD measure for case c imposed by country i against country j since the time t when preliminary duty was applied. We exclude the prominent PTAs (NAFTA & EC/EU PTAs). The inverse Mill's ratio, $\hat{\boldsymbol{\lambda}}$, is derived from the corresponding column in Table A3. Robust standard errors in parenthesis are clustered at the AD investigation level. Asterisks denote significance levels: * < 0.10, ** < 0.05, *** < 0.01.

Table A5: Steel industry only

Dep.Var	$\log(\text{duration}_{ijct})$			
	(1)	(2)	(3)	(4)
Post_{ijct}	0.386***	0.468***	0.384***	0.383***
	(0.101)	(0.150)	(0.100)	(0.100)
PTA_{ij}	0.990**	0.875**	1.410***	
	(0.442)	(0.400)	(0.437)	
$\text{PTA}_{ij} \times \text{Post}_{ijct}$	-0.942**	-0.813**	-1.262***	
	(0.398)	(0.354)	(0.383)	
$\text{DC}_i \times \text{Post}_{ijct}$		-0.062		
		(0.200)		
$\text{DC}_i \times \text{PTA}_{ij}$		0.519*		
		(0.303)		
$\text{DC}_i \times \text{PTA}_{ij} \times \text{Post}_{ijct}$		-0.592		
		(0.370)		
$\text{China}_j \times \text{Post}_{ijct}$			0.239	
			(0.151)	
$\text{China}_j \times \text{PTA}_{ij}$			-0.652**	
			(0.299)	
$\text{China}_j \times \text{PTA}_{ij} \times \text{Post}_{ijct}$			0.428	
			(0.331)	
$\text{PTA}_{ij}^{\text{AD Rules}}$				1.079***
				(0.405)
$\text{PTA}_{ij}^{\text{No AD Rules}}$				0.851***
				(0.450)
$\text{PTA}_{ij}^{\text{AD Rules}} \times \text{Post}_{ijct}$				-0.980***
				(0.357)
$\text{PTA}_{ij}^{\text{No AD Rules}} \times \text{Post}_{ijct}$				-0.832**
				(0.421)
Control variables				
$\text{Post}_{ct'}^{\text{Uruguay}}$	0.071	0.117	0.111	0.068
	(0.108)	(0.101)	(0.107)	(0.105)
$\log \text{Distance}_{ij}$	0.268***	0.261***	0.277***	0.273***
	(0.070)	(0.073)	(0.071)	(0.073)
Contiguity_{ij}	0.213*	0.214*	0.176	0.190
	(0.119)	(0.123)	(0.117)	(0.121)
$\text{Common Language}_{ij}$	-0.055	-0.044	-0.007	-0.062
	(0.073)	(0.074)	(0.077)	(0.074)
$\text{Common Legal Origin}_{ij}$	-0.044	-0.083	-0.038	-0.034
	(0.089)	(0.092)	(0.090)	(0.088)
Inverse Mill's ratio $\hat{\boldsymbol{\lambda}}$	0.785	1.138*	1.234**	0.743
	(0.609)	(0.669)	(0.609)	(0.571)
δ_i	Yes	Yes	Yes	Yes
δ_j	Yes	Yes	Yes	Yes
N	1,089	1,089	1,089	1,089

Note: The dependent variable is the log of duration of AD measure for case c imposed by country i against country j since the time t when preliminary duty was applied. We restrict the sample to steel products. The inverse Mill's ratio, $\hat{\boldsymbol{\lambda}}$, is derived from the corresponding column in Table A3. Robust standard errors in parenthesis are clustered at the AD investigation level. Asterisks denote significance levels: * < 0.10, ** < 0.05, *** < 0.01.