Temporary trade barriers as a tool for trade retaliation

Davide Furceri*, Jonathan D. Ostry† , Chris Papageorgiou‡,

and Pauline Wibaux§

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Abstract

Concerns of trade wars are on the rise as deliberate attempts to limit imports or promote exports by placing barriers to trade have reemerged at an alarming rate and intensity. As trade protectionism through tariffs is on a downward trend around the globe, countries look to use alternative protectionist instruments, especially "temporary trade barriers" (TTBs). In this paper, we take a systematic look at the use of protectionist policies, with a particular focus on the role of retaliation. A key innovation of this paper is that it provides a succinct definition of "trade retaliation", exploiting the daily frequency of the Temporary Trade Barriers database. This allows us to carefully count measures from trading partners and identify these as potential triggers of retaliation. Our precise definition of retaliation allows us to state that countries retaliate against each other within a three-months interval at most. Using trade policy data for 25 countries at the HS4 sector level, we show that on average, an additional investigation in sector k by country i on country r increases the number of investigated products by r on i by about 6 percent in sector k and by slightly less in other sectors. This result is robust to the inclusion of several control variables and accounting for the substitution between applied tariffs and TTBs. Further analysis show that importers are more likely to retaliate by protecting their comparative advantage sectors, irrespective of the sector in which the exporter previously launched an investigation. Surprisingly, and against standard thinking in strategic trade policy studies, in general the retaliater does not target the exporter's comparative advantage sector.

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*International Monetary Fund,DFurceri@imf.org.
†International Monetary Fund, JOSTRY@imf.org.
‡International Monetary Fund, CPapageorgiou@imf.org.
§Paris School of Economics, University Paris 1 Panthéon-Sorbonne, France, pauline.wibaux@univ-paris1.fr.

1 Introduction

Despite the well-documented merits of free trade, protectionism has been widely practiced for decades or even centuries. Recently, trade protectionism through the deliberate attempt to limit imports or promote exports by putting up barriers to trade is on the rise, raising concerns about trade wars. As trade protectionism through tariffs is on a downward trend around the globe, countries look to use alternative protectionist instruments, especially "temporary trade barriers" (TTBs). The beginning of the 2000s, for example, highlights a period of significant increase in import protection, while fears are mounting at present about an even larger spike involving the largest players in the global system.

An increasing part of the trade barriers are implemented for protectionist motives, while their initial goal is elsewhere, whether it is sanitary and phytosanitary measures (SPS), or technical barriers to trade (TBT) for example. In particular, TTBs are legitimate, according to the World Trade Organization, when applied exceptionally, to compensate for "unfair" practices from other trading partners, such as unfair pricing (where anti-dumping measures, and countervailing duties can be called for). The empirical literature on trade policies provided evidence for misuse of TTBs, from pure trade protection to retaliation. Kuenzel (2020) shows how tighter WTO tariff commitments (lower bound tariffs) induce the use of temporary trade barriers as substitutes to satisfy domestic protectionist demands when applied MFN tariffs cannot be raised. In this paper, we take a systematic look at the use of TTBs, with a particular focus on the role of retaliation.

Our paper belongs to a strand of this trade policy literature that explores the determinants of import protection. A key goal of this literature is to test the hypothesis that import protectionism depends importantly on strategic considerations. We extend this literature by trying to determine why, when and how countries retaliate against each other using TTBs, providing additional evidence of the diverted use of these trade barriers. We do so using bilateral data covering temporary trade barriers for a panel of 25 advanced and emerging economies over the period 1989-2014, at the HS4-digit sector level. The very rich data provides information on four different types of measures: anti-dumping duties, countervailing duties, China-specific safeguards, and global safeguards. A key contribution of this paper is that it offers a concise definition of "trade retaliation", and exploits the daily frequency of the *Temporary trade barriers database*. This allows us to carefully count measures from trading partners and identify them as potential triggers of

retaliation.

Such definition of retaliation allows us to calculate that countries retaliate against each other within a median three-months interval, when considering the sample median. Given the large heterogeneity between each country's trade policy, we use a country-specific threshold to define retaliation, that is the median number of days of each country to respond to a trading partner's investigation. Our main findings are the following: on average, an additional investigation in a HS4-sector by country i on country r increases the number of investigated products by r on i by 6% in another sector, and by 7% in the same sector. This result is robust to the inclusion of several control variables, and accounting for the substitution between applied tariffs and TTBs. Further analysis show that importers are more likely to retaliate by protecting their comparative advantage sectors, irrespective of the sector in which the exporter previously launched an investigation. Surprisingly, and against standard priors in strategic trade policy studies, the retaliater will never target the exporter's comparative advantage sector, unless if the first move was made in another sector (on the exporter's side).

The remainder of the paper is organized as follows. Section 2 presents a brief literature review on import protection with particular focus on trade barriers and trade retaliation. Section 3 discusses the data used in the analysis, presents our definition of retaliation and highlights some trade retaliation patterns. Section 4 discusses the estimation strategy followed in the analysis and Section 5 presents and discusses in detail the results obtained using sector-level data. Section 6 concludes.

2 Literature review

There is an extensive literature highlighting the theoretical determinants of import protection. The political economy literature introduces lobby pressures as determinants of tariffs, as in the seminal papers of Grossman and Helpman (1994) and Mitra (1999), where interest groups contribute to political campaign to support a set of trade policies.[1] Additionally, Bagwell and Staiger (2003) find theoretical support for countercyclical movements in protection levels. The fast growth in trade volume that is associated with a boom phase facilitates the maintenance of more liberal trade policies than can be sustained during a

[1] There is only fragmented evidence of these theoretical mechanisms, mainly due to data constraints. See Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000) for empirical tests.

recession phase in which growth is slow.[2] This is consistent with empirical studies showing that protectionism varies with economic growth.[3] Consistent with the terms-of-trade rationale to imposing import protection, Bagwell and Staiger (2011) predict negotiated tariffs based on pre-negotiation tariffs, import volumes and prices, and trade elasticities.

On top of these standard determinants of protectionism, trade policy should also be considered through the lens of strategic behavior, as pointed out by the theoretical literature, in particular Bagwell and Staiger (1990). They show that if protectionism tends to increase when countries face trade shocks, then tariffs should increase in a cooperative equilibrium to mitigate high trade volumes and decrease the incentive to defect from the cooperative equilibrium. Likewise, political pressures on governments can induce countries to increase their level of import protection, often leading to trade retaliation, as shown in Grossman and Helpman (1995).[4] These non-cooperative behaviors are particularly important at the WTO level. Nicita et al. (2018) build a political economy model where, in the absence of cooperation, there is a positive relationship between importers' market power and their import tariffs. This relationship is reversed in the presence of cooperation.

The empirical literature on the strategic use of trade barriers is still scarce. Bown and Crowley (2013b) estimate a model of trade protection at the industry level that provides empirical support for the theoretical model of Bagwell and Staiger (1990). Nicita et al. (2018) test their cooperation hypothesis using binding tariffs and find that tariffs are positively correlated with the importer's market power when they are set non-cooperatively.

Closer to our paper, Blonigen and Bown (2003) test the impact of retaliation threats on U.S. anti-dumping duties. Indeed, an industry is more likely to file an anti-dumping (AD) petition the greater the import penetration and the lower its exposure to retaliation (defined as significant exports to the country it is petitioning against)[5] and the decision of government agencies to grant AD protection may be influenced by the possibility that

[2]Hillberry and McCalman (2016) estimates US trade protection in response to the import demand and export supply shocks.

[3]Empirical evidence show that import protection depends on standard macroeconomic variables, such as economic growth and the real exchange rate. Knetter and Prusa (2003) show that the number of anti-dumping duties depends positively on lagged variations of the real exchange rate, and negatively on exporter and importer's GDP growth rates, a relationship that seems to exist prior to 1980, as shown by Irwin (2005). Similarly, Bown and Crowley (2013a, 2014) and Georgiadis and Gräb (2016) show that trade protectionism reacts to the same variables, focusing at both advanced and emerging economies. As shown by the low protectionist response of most countries during the 2008 Global Financial Crisis, they also find evidence that import protection might have become a-cyclical (see also Gawande et al., 2011, Rose, 2012, Kee et al., 2013 and Lake and Linask, 2016).

[4]See Ossa (2014) for empirical tests.

[5]See Blonigen (2000) for the model of reciprocal dumping in a repeated game setting.

such an affirmative AD ruling leads to retaliation[6]. Using all US AD cases from 1980 to 1998 in a nested logit framework with two stages (first industries, then trade agencies), these authors find that both US petitioning industries and government agencies' behavior depends on the foreign countries' capacity to retaliate.

Using the same time period (1980-1998), but in panel, Prusa and Skeath (2005) show that countries are more likely to target other users of AD than those without such enforcement, and that countries are more likely to target exporting countries with a history of bringing cases against them.[7] They also find evidence that AD actions are used strategically to deter further use of AD and sometimes to punish trading partners who have used AD. With the same idea, but with industry-level data, Feinberg and Reynolds (2006) find that the likelihood of a country filing a case is more than 7 percent higher against those countries that targeted it in the previous year. Moore and Zanardi (2011) find similar results, again focusing on AD filings with panel data.

However, Boffa and Olarreaga (2012) find no evidence of retaliatory motives driving protectionism during the crisis, but rather the opposite. Using the Global Trade Alert database, they show that a protectionist measure is imposed by a trading partner on home exports reduces the probability of observing a measure imposed by home on the partner's export bundle by 40 to 70 percent. They suspect that these results arise from countries refraining to retaliate against big players. Furthermore, Tabakis and Zanardi (2017) documents that there are, within industrial sectors, intertemporal correlations in the use of antidumping policy across countries, which they call "anti-dumping echoing". These studies, by their different approach and results, point out how crucial the definition of retaliation is for the analysis of strategic trade policy.

Our paper extends this literature in three important ways. First and most importantly, we investigate precisely retaliatory behaviors, by defining retaliation using daily data. Second, we cover a larger panel of countries, sectors, and years than other studies. Third, we highlight the key role of the specificities of the initiater to shape the strategic response.

[6] See Bown (2001) for the theoretical model.

[7] This cannot be interpreted as retaliation or tit-for-tat given that this response is not immediate in their paper.

3 Data

3.1 Temporary trade barriers

We use a panel dataset of bilateral measures of import protection for 25 advanced and emerging economies,[8] for the period 1989–2015. We focus on temporary trade barriers' data obtained from the World Bank's *Temporary Trade Barriers Database* (Bown, 2015) which provides information on four different types of measures: anti-dumping (AD), countervailing (CVD), China-specific safeguards (CS), and global safeguards (GS).

Relying on the work by Bown and Crowley (2013a, 2014), our dependent variable is the count of HS6 imported products on which the government of country r initiated an investigation to impose a new temporary trade barrier against a particular trading partner i in the HS4-sector k in year t. In this paper, we account for all investigations, whether or not they led to the implementation of a new protectionist measure.[9] This count variable is constructed for each policy-imposing country by trading partner and by year in a way that does not allow for redundancy. Indeed, governments impose temporary trade barriers on HS8 or 10-digit products. Unfortunately, the HS6 digit is the most disaggregated level by this classification that is comparable across countries. We count as one product all HS-08-digit products falling into the same HS-06 category.[10]

Trade protectionism through tariffs has been decreasing, and so is flexibility for countries to use them due to the reduction in binding tariffs. Hence, countries are resorting to other protectionist measures to control their import flow. The so-called "temporary trade barriers" are such a measure. Figure 1 highlights the recent use of these measures, and shows that they are generally used amid economic turmoil. One noticeable spike in protectionism appears in 1996, and came from Latin American countries, namely Argentina and Brazil, and from South Korea. Figure B1 reports the detail of the yearly use of TTB investigations for each country in the sample.

The beginning of the 2000s also illustrates a significant increase in import protection and a first example of possible trade retaliation. In 2001, the US administration used

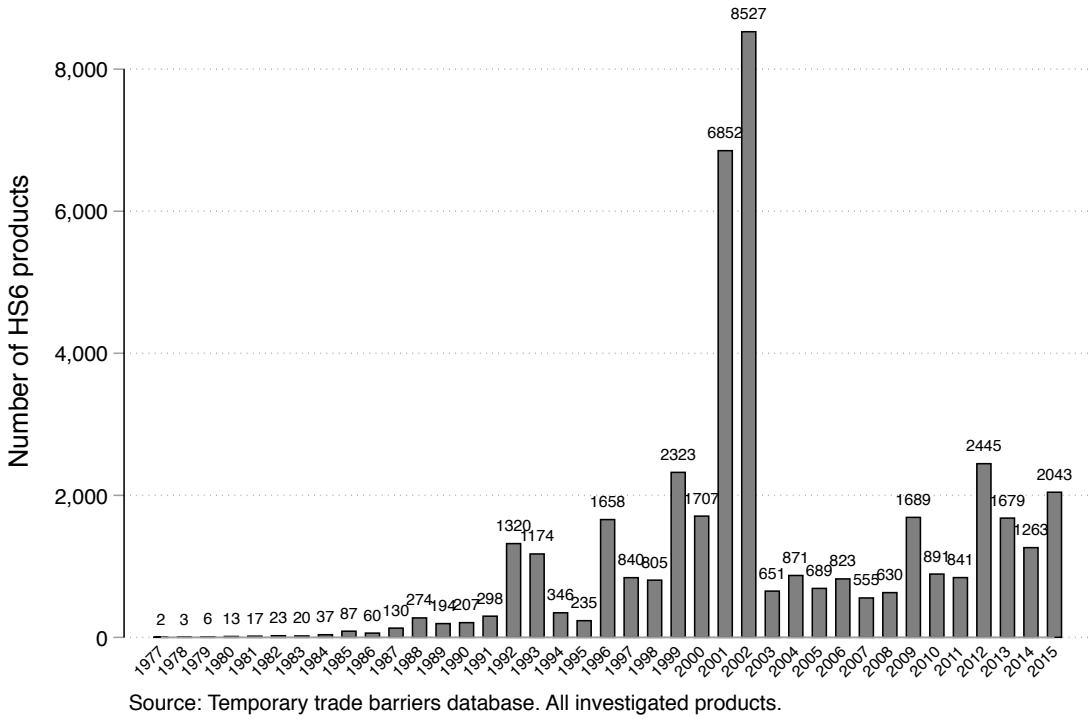
[8] See Appendix A for country coverage in our sample.

[9] The information available in the database highlights the fact that a temporary tariff can be implemented for the time of the investigation. Moreover, research from Staiger et al. (1994) showed that even an investigation can dampen bilateral trade.

[10] We consider the European Union as a static entity throughout our period of analysis, and consider 2015 members as members from 1989.

global safeguards to restrict steel imports, a measure which was followed by other countries such as Canada, China and the EU, explaining the spike in the average number of investigated products in 2002.[11] As explained by Bown and Crowley (2013a), countries did not resort to protectionism during the Great Recession.

Figure 1: Average number of newly investigated products per country



3.2 Timing of retaliation

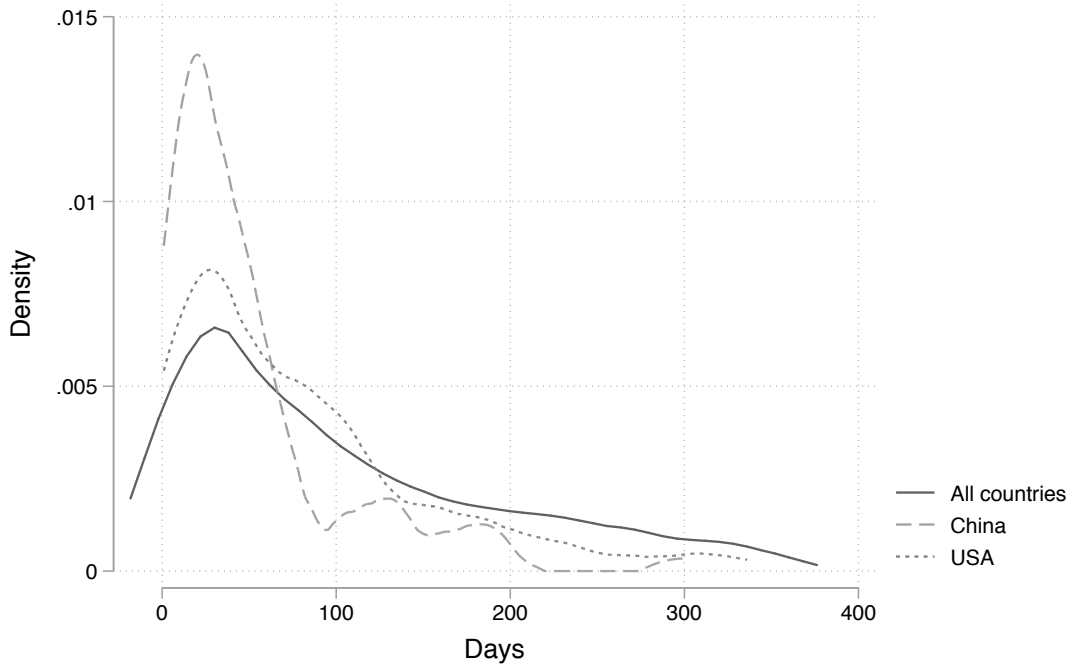
The *Temporary Trade Barriers database* gathers very granular data, providing us the exact date of each investigation. Focusing on retaliation, our variable of interest is the measures that the trading partner, country i, initiated against country r before any of country r's measures. Therefore, we use the daily frequency of our data to define a time interval determining whether a measure from the trading partner can be considered as a potential trigger for retaliation.

Figure 2 plots the number of days between country r's investigations and country i's investigations, illustrating clearly that they alternate rapidly, with a peak of the density around 50 days. The country-specific densities presented in Figure B3 reveal strong het-

[11] "EU adopts temporary measures to guard against floods of steel imports resulting from US protectionism". European Commission press release on March 27th, 2002.

erogeneity between countries: for example, trade barriers between China and its trading partners alternate much faster than the average. We therefore compute the median number of days for each country which ranges from 38 days for China, up to 427 days for Costa Rica.[12] Given this large dispersion of values,we adopt a country-specific definition of retaliation. Therefore, our variable of interest will be the number of investigated products from trading partners preceding an investigation of the retaliater by at most x days, where x will be the retaliater's median number of days before any response.

Figure 2: Number of days before potential retaliation



Source: Temporary trade barriers database. Kernel density.

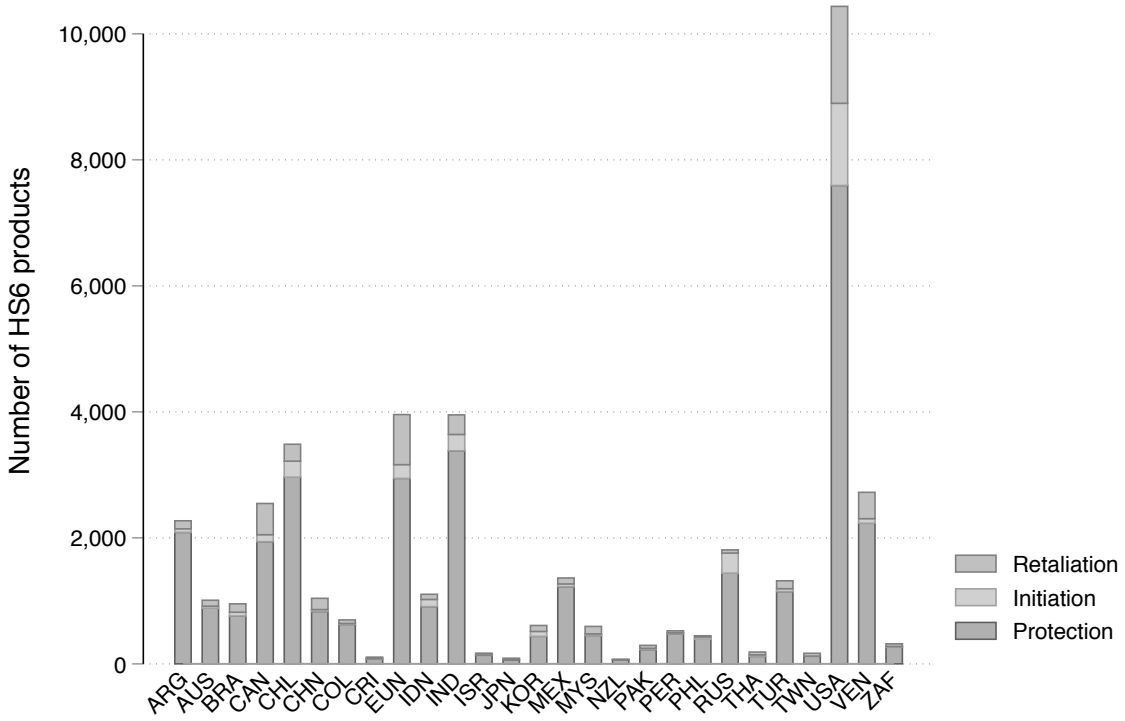
3.3 Initiaters or retaliaters?

We build on our country-specific threshold to define retaliation, and we classify investigations as being a potential retaliation whenever they are following a trading partner's measure by less than x days, where x is the country-specific threshold. Based on this, we distinguish between three categories: initiation (the country's investigation triggered a potential retaliation), retaliation (the country's measure was coded as a potential retal-

[12] See Table C1 for statistics on these values.

iation) and protection (the measure is not a response, but did not trigger any response either). Then, we sum up the number of HS6 products within each category, over each country in our sample. Figure 3 plots the total number of HS6 product falling into these three categories, for each country. The main players in the trade policy game are roughly the same when considering initiaters and retaliaters. The United States, the European Union, Canada, Venezuela and India seem to be the biggest retaliaters, acting generally against the United States, Russia, India, Chile and the European Union.[13]

Figure 3: Which country initiates and retaliates?



Note: Each bar represents the total number of newly investigated HS6 products distinguishing between protection (lower part), initiation (middle part) and retaliation (upper part) motives, for each country, over 1989-2015.

In a second exercise, we aggregate our data at the bilateral level (rit), and estimate

[13]Figure B4 presents the same exercise, focusing only on the US, over each of its trading partners.

the following equation:

$$
\begin{aligned}
TTB_{ri,t} = {} & \beta_1 TTB_{ir,xdays} + \beta_{USA} TTB_{ir,xdays} * USA_i + \beta_{IND} TTB_{ir,xdays} * IND_i \\
& + \beta_{EUN} TTB_{ir,xdays} * EUN_i + \beta_{CAN} TTB_{ir,xdays} * CAN_i + \beta_{CHL} TTB_{ir,xdays} * CHL_i \\
& + \beta_{CHN} TTB_{ir,xdays} * CHN_i + \beta_{ARG} TTB_{ir,xdays} * ARG_i + \beta_2 \Delta RER_{ri,t-1} \\
& + \beta_3 \Delta Imports_{ri,t-1} + \alpha_{rt} + \delta_{it} + \gamma_{ri} + \epsilon_{rjt}, \qquad (1)
\end{aligned}
$$

where the dependent variable is the total number of HS-6 products on which an investigation was launched by country r on country i in year t. The control variables are the bilateral real exchange rate change, $\Delta RER_{ri,t-1}$, the growth of bilateral imports, $\Delta Imports_{ri,t-1}$, country-time (rt and it) and country-pair (ri) fixed effects. $TTB_{ir,xdays}$ stands for the number of HS6-digits products investigated by country i on country r, x days before an investigation of r on i, where x is defined as the median number of days for r to respond to a trading partner's investigation (this is the country-specific threshold used to define retaliation). We then interact this variable with dummies equal to one when the initiater is the United States (USA), India (IND), the European Union (EUN), Canada (CAN), Chile (CHL), China (CHN) and Argentina (ARG), which are the biggest users of TTBs.

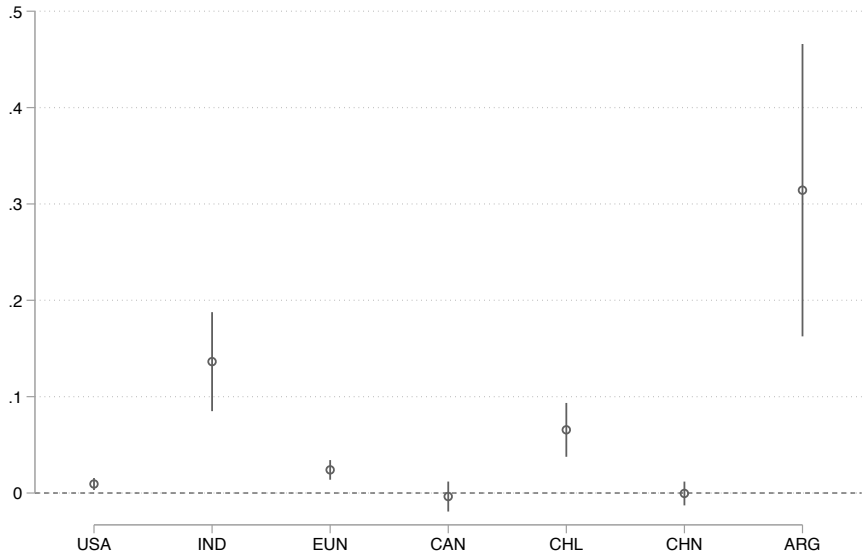
Figure 4 plots the estimates on these interacted variables (plus β_1). This exercise highlights again a large heterogeneity between countries. Some large countries, with large consumption markets, never experience retaliation, such as the United States, the European Union, Canada or even China. Conversely, countries such as India and Argentina face strong retaliation whenever they use TTBs.

In the next section, we present in details our estimation strategy, as well as the improvement of our definition of retaliation for the analysis of strategic trade policies.

4 Estimation strategy

The dependent variable $TTB_{rik,t}$ is the total number of products imported from country i to country r that is subject to a new TTB investigation in the HS4-sector k in year t. Specifically, we focus on new temporary trade barriers, that is the flow of initiated investigations in year t, not at the stock of products in year t. Empirically, this variable

Figure 4: Who faces retaliation?



Note: Each dot represents the estimates on $\beta_1 + \beta_i$. The bands represent a 95% confidence interval.

is a non-negative count which may display over-dispersion: the conditional variance of $TTB_{rik,t}$ would be larger than the conditional mean, therefore requiring a negative binomial estimation. Consistent with the recent literature on estimating count data asserting that a Poisson estimation is robust in this case (see Silva and Tenreyro, 2006 and Silva and Tenreyro, 2011), we estimate the following equation with a fixed-effect Poisson estimator, and clustered standard errors:

$$\begin{aligned} TTB_{rik,t} = \beta_1 TTB_{irk,xdays} + \beta_2 TTB_{irk' \neq k,xdays} + \beta_3 \Delta RER_{ri,t-1} \\ + \beta_4 \Delta Imports_{rik,t-1} + \alpha_{rt} + \delta_{it} + \gamma_{st} + \lambda_{ij} + \nu_{rikt}, \end{aligned} \tag{2}$$

where s is the subscript for the HS2 sector, and k for the HS4-sector. As we are investigating possible retaliation effects, we add to these variables the number of domestic products subject to new investigation from the trading partner i, $TTB_{irk,x}$, counting the products only if this investigation occurred within a x-day interval before any of country r's measure $TTB_{rik,t}$. We also add $TTB_{irk' \neq k,xdays}$ to account for retaliation in any other HS4 sector. We also introduce the bilateral real exchange rate change, $\Delta RER_{ri,t-1}$, the growth of bilateral imports, $\Delta Imports_{rik,t-1}$ as control variables. We also introduce three sets of fixed effects that are country-time (rt and it) and HS2-sector-time (st). The

standard errors are clustered at the most conservative level, that is at the country-pair-HS4-sector (rik) level. The bilateral real exchange rate is defined such that an increase in this variable is an appreciation of the currency of the domestic economy, country r. To account for the political delay of initiating import protection, all economic variables are lagged by one year.

Our measure of retaliation, besides from being more accurate, also allows us to prevent possible endogeneity issues. If our variable of interest were the total number of measures of country i against r within a year, we would count measures sometimes initiated before any of country r's measures in our variable $TTB_{ir,xdays}$. We would also count measures that were initiated too long before country r's to be considered as potential triggers. Thus, our estimation strategy improves significantly when using our definition of retaliation to built $TTB_{ir,xdays}$ and $TTB_{irk' \neq k,xdays}$. The next section presents the results of our estimations.

5 Results

5.1 Baseline results

Table 1 presents the results of the estimation of our baseline equation, Equation 2. In the first column, we look at the total number of measures from country i, irrespective of the targeted sector. The estimates indicate that an additional investigation from country i increases the number of newly investigated products by r on i by almost 6%. In the rest of the table, we distinguish between retaliation in the same or in another HS4 sector. In this case, the protectionist response occurs strongly in another sector, in the same magnitude as before, but the response in the same HS4-sector is less certain. Results in Column (2) show that, on average, an additional investigation in a HS4-sector by country i on country r increases number of newly investigated products by r on i by 6% in another sector, and by 7% in the same sector. In both cases, the growth of imports, computed at the HS4-digit level, does not appear to determine trade protection. Oddly, trade barriers arise after a depreciation of the domestic currency.[14] To be as conservative as possible, we will keep the estimation scheme of Column (2) in the following estimations.

In the following columns, we perform several robustness checks, adding different control

[14] It is likely that the growth of the real exchange rate is strongly collinear to the fixed effects, as shown in the trade gravity literature. The estimates becomes non-significant as we add other control variables.

Table 1: Baseline results

	Dependent variable: $TTB_{rik,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$TTB_{ri,xdays}$	0.0585***					
	(0.00347)					
$TTB_{rik,xdays}$		0.0726**	0.0971***	0.0708**	0.0706**	0.0761**
		(0.0308)	(0.0304)	(0.0309)	(0.0308)	(0.0361)
$TTB_{irk' \neq k,xdays}$		0.0582***	0.0577***	0.0589***	0.0589***	0.0662***
		(0.00360)	(0.00412)	(0.00378)	(0.00378)	(0.00471)
$\Delta RER_{ri,t-1}$	-0.0318*	-0.0317*	-0.0311	-0.0305	-0.0296	-0.0327
	(0.0179)	(0.0179)	(0.0207)	(0.0192)	(0.0192)	(0.0294)
$\Delta Imports_{rik,t-1}$	-2.48e-06	-2.48e-06	-5.76e-06	-2.44e-06	-2.42e-06	-0.000116
	(7.43e-06)	(7.43e-06)	(1.89e-05)	(7.39e-06)	(7.38e-06)	(0.000106)
$Tariff_{rik,t-1}$			0.00665***			
			(0.000947)			
$Trade\ Deficit_{ri,t-1}$				-0.0240		
				(0.0263)		
$Imports_{ir,t-1}$					-1.446**	
					(0.615)	
CA_{jk}						-0.239***
						(0.0471)
CA_{ik}						0.539***
						(0.0438)
Observations	2,327,948	2,327,948	1,792,686	2,275,699	2,277,973	1,448,765
FE rt-it-st-ri	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	rik	rik	rik	rik	rik	rik

Notes: Clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

variables that could trigger a rise in import protection. First, we add the (lagged) level of the applied tariff in the HS4-sector k, by country r on country i. Each TTB, if implemented after investigation, translates into an additional tariff, for a period of time up to three years. Therefore, countries may resort to TTBs in sectors in which the initial tariff level is low, for the additional measure to be meaningful. The estimates in Column (3) show that a higher tariff actually triggers more import protection in the same sector. Though the size of the sample is significantly restricted, the estimates on our two retaliation variables are almost unchanged. In Column (4) we add the (lagged) level of the bilateral deficit between country r and i, expressed as a share of country r's GDP, as trade barriers are sometimes called for to restore a country's competitiveness and its external imbalances. An improvement of the bilateral trade balance decreases the number of new investigation, though this estimates is non-significant. Again, the retaliation evidence is

left unchanged.

In the descriptive statistics, we showed that the protectionist response varies greatly with the identity of the initiater and the retaliater. Here, we introduce the (lagged) logarithm of total imports of country i, except those from country r. The underlying idea is to account for the demand power of the initiater: import protection is unlikely to occur against a large market, which would increase potential losses arising from trade diversion for example. The results in Column (5) show indeed that the larger the foreign market the lower the trade barriers. Finally, we introduce a comparative advantage index, computed as the ratio of the share of exports in a sector k in a country's total exports, over the share of exports in the same sector k in world's exports. An index larger than one indicates that the country's productivity in the sector is greater than the worldwide average level of productivity, illustrating the country's comparative advantage in this sector. Hence, we create a dummy equal to one when the exporter (importer) has a comparative advantage in the sector k, CA_{ik} (CA_{rk}), and add it to the regressors. As expected, import protection is going to be smaller in the importer's comparative advantage sectors, while the same country will be more likely to target the comparative advantage sector of its trading partner.

The empirical trade policy literature evidenced the positive correlation between tighter WTO tariff commitments, *ie* lower bound tariffs, and the use of alternative measures such as TTBs We perform additional robustness tests in Table 2, to account for this substitution effect between tariffs and TTBs. First, we introduce the (lagged) difference between bound tariffs and applied tariffs, also known as "tariff overhang" or "tariff water". As expected, a decrease in this variable, implying thighter tariff commitments, increases the number of newly investigated products. The estimates are slightly affected by the introduction of these new regressors, but this is mainly due to the changing size of the sample, as shown by the estimates in Column (2). Because one country could increase tariffs instead of using TTBs, or because this could be the trigger of trading partner's TTB measures, we introduce the (lagged) variation of country r's tariffs in Column (3). An increase in the tariff is associated with a larger number of investigated products the following year. Though it could pick up a general rise of protectionism from country r our estimates on the retaliation variables are left unchanged. Because these two arguments can play together, we interact the tariff overhang with the change in the applied tariff.

Table 2: Trade policy substitutes?

	Dependent variable: $TTB_{rik,t}$				
	(1)	(2)	(3)	(4)	(5)
$TTB_{rik,xdays}$	0.0959***	0.0998***	0.0984***	0.0990***	0.102***
	(0.0300)	(0.0305)	(0.0306)	(0.0303)	(0.0292)
$TTB_{irk' \neq k,xdays}$	0.0580***	0.0562***	0.0567***	0.0562***	0.0786***
	(0.00420)	(0.00418)	(0.00405)	(0.00414)	(0.00630)
$\Delta Imports_{rik,t-1}$	8.42e-08	-1.95e-06	-4.24e-06	-2.22e-06	-0.000265
	(1.17e-07)	(0.0000113)	(1.74e-05)	(1.25e-05)	(0.000212)
$\Delta RER_{ri,t-1}$	-0.0488**	-0.0473**	-0.0281	-0.0480**	-0.0348
	(0.0209)	(0.0221)	(0.0213)	(0.0222)	(0.0304)
$\Delta Tariff_{rik,t-1}$			0.00674**	-0.00177	
			(0.00286)	(0.00733)	
$Overhang_{rik,t-1}$	-0.00782***			-0.00775***	
	(0.00269)			(0.00216)	
$Overhang * \Delta Tariff_{rik,t-1}$				-0.000234***	
				(5.97e-05)	
$\Delta Tariff_{irk,t-1}$					-0.00511*
					(0.00290)
Observations	1,698,199	1,521,702	1,685,643	1,521,702	839,941
FE rt-it-st- ri	Yes	Yes	Yes	Yes	Yes
Cluster	rik	rik	rik	rik	rik

Notes: Clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

The estimates in Column (4) show that import protection through TTBs decreases when applied tariff increased previously if the tariff commitments are still loose (high tariff overhang). Finally, because applied tariffs and TTBs appear to be strong substitutes, we introduce the (lagged) variation of country i's applied tariff, as new investigations from country r could arise in response of this variation, rather than in response to other TTB investigations. The significance level of the estimates is low, and the other estimates are left unchanged.

Overall, these results provide strong support for a diverted usage of temporary trade barriers, as trade policy tools to intentionally retaliate against trading partners, well beyond their initially-designed exceptional use to correct market distorsions. The following subsection explores more in detail the determinants of retaliation through TTBs.

5.2 The determinants of retaliation

At this stage, one question remains: how do importers determine the trading partner and the sector which they will retaliate against or into? One can expect retaliaters to react in the exporter's comparative advantage sector, if the underlying strategy is to hit its competitiveness. We therefore investigate the impact of country-sector specific variables on the decision to retaliate. The results are presented in Table 3.

First, we interact both retaliation variables by the size of the foreign demand market, the log of total imports in the sector k of country i. The estimates in Column (1) show that the larger the foreign market, the lower the response, as the estimates on same-sector retaliation variable goes to zero (from a negative estimates), and the other-sector retaliation estimates decreases towards zero as well. We then interact the exporter's and the importer's comparative advantage dummies with the exporter's trade policy variables. Column(2) presents significant estimates highlighting import protection in the CA sector in response to another sector being initially targeted. Column (3) shows that the non-interacted coefficient are highly significant, while the interacted terms are not.

This exercise highlights three facts. First, importers are more likely to retaliate by protecting their comparative advantage sectors, irrespective of the sector in which the exporter previously launched an investigation. Second, if the exporter increases import protection to protect its most competitive sectors, the importer will never retaliate $(TTB_{irk,xdays} + TTB_{irk,xdays} * CA_{ik})$. Third, retaliation may happen in the exporter's comparative advantage sector if the trigger was in another sector $(TTB_{irk' \neq k,xdays} + TTB_{irk' \neq k,xdays} * CA_{ik})$. The common behavior appears to be to respond in any case, but never where it could badly hurt the foreign trading partner. This goes against every prior regarding strategic use of trade policy. Again, descriptive statistics highlighted strong heterogeneity between countries, which remains to be further explored in this paper. Finally, because TTBs and applied tariffs are substitutes, we interact our retaliation variables with the tariff overhang in the retaliation sector: one could assume that retaliation is stronger in those sectors where the room for increase in applied tariff is already low. The estimates in Column (4) present no evidence of such a mechanism. Overall, it seems that pure political economy rationale are at play, and this needs further investigations.

6 Conclusion

In this paper, we investigate the diverted use of temporary trade barriers, in particular for trade retaliation motives. The empirical analysis is based on bilateral data covering four type of temporary trade barriers for a panel of 25 advanced and emerging economies over the period 1989-2014 and is based on HS4-digit sector-level data. One novelty of this paper is that we construct a precise definition of trade "retaliation", exploiting the daily frequency of the *Temporary Trade Barriers Database*. This allows us to carefully count measures from trading partners and identify these as potential triggers of retaliation.

Our precise definition of retaliation allows us to state that countries retaliate against each other within a three-months interval, when considering the sample median. Using a country-specific definition of retaliation, due to heterogeneity between countries, our main findings are the following: an additional investigation in a HS4-sector by country i on country r increases the number of investigated products by r on i by 6% in another sector, and by 7% in the same sector. Furthermore, the trading partner's market size, and comparative advantages are strong determinant of retaliation through TTBs.

These results provide strong support for a diverted usage of temporary trade barriers, as trade policy tools to intentionally retaliate against trading partners, well beyond their initially-designed exceptional use to correct market distorsions.

Table 3: Determinants of retaliation

	Dependent variable: $TTB_{rik,t}$			
	(1)	(2)	(3)	(4)
$TTB_{rik,xdays}$	-2.845***	0.00948	0.0991***	0.0875***
	(0.946)	(0.0893)	(0.0286)	(0.0252)
$TTB_{irk' \neq k,xdays}$	0.846***	0.0592***	0.0728***	0.0600***
	(0.162)	(0.00437)	(0.00612)	(0.00423)
$TTB_{rik,xdays} * CA_{rk}$		0.177*		
		(0.101)		
$TTB_{irk' \neq k,xdays} * CA_{jk}$		0.115***		
		(0.0268)		
$TTB_{rik,xdays} * Imports_{ir,t-1}$	0.111***			
	(0.0354)			
$TTB_{irk' \neq k,xdays} * Imports_{ir,t-1}$	-0.0288***			
	(0.00590)			
$TTB_{rik,xdays} * CA_{ik}$			-0.0882	
			(0.101)	
$TTB_{irk' \neq k,xdays} * CA_{ik}$			-0.0119	
			(0.00776)	
$TTB_{rik,xdays} * Overhang_{rik,t-1}$				0.00131
				(0.00364)
$TTB_{rik' \neq k,xdays} * Overhang_{rik,t-1}$				-0.000165
				(0.000109)
$Imports_{ir,t-1}$	-1.442**			
	(0.620)			
CA_{rk}		-0.253***	-0.239***	
		(0.0469)	(0.0471)	
CA_{ik}		0.538***	0.544***	
		(0.0438)	(0.0438)	
$Overhang_{rik,t-1}$				-0.00760***
				(0.00272)
$\Delta Imports_{rik,t-1}$	-2.28e-06	-0.000114	-0.000114	8.42e-08
	(7.23e-06)	(0.000105)	(0.000105)	(1.17e-07)
$\Delta RER_{ri,t-1}$	-0.0295	-0.0312	-0.0327	-0.0487***
	(0.0192)	(0.0292)	(0.0292)	(0.0209)
Sum $TTB_{rik,xdays}$	-2.734	0.186	0.0609	0.0889
Joint test p-value	0.00267	1.01e-10	0.910	0.000283
Sum $TTB_{irk' \neq k,xdays}$	0.817	0.174	0.0109	0.0598
Joint test p-value	1.69e-07	2.20e-05	0	0
Observations	2,277,973	1,448,765	1,448,765	1,698,199
FE rt-it-st-ri	Yes	Yes	Yes	Yes
Cluster	rik	rik	rik	rik

Notes: Clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

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A Data

A.1 Country list

Advanced economies: Australia, Canada, European Union, Japan, New-Zealand, South Korea, USA.

Emerging economies: Argentina, Brazil, Chile, China, Colombia, Costa Rica, India, Indonesia, Israel, Malaysia, Mexico, Pakistan, Peru, Philippines, Russia, South Africa, Thailand, Turkey.

A.2 Temporary trade barriers

Anti-dumping duties are used when the importer suspects the exporter of selling its product at a lower price in its jurisdiction than when exporting to another market. When a firm suspects a competing firm of dumping its products, it can file a petition with the national trade authority. For example, after United States Steel Corporation filed a petition against several Chinese firms exporting iron and steel tubes and pipes, the US Trade authority initiated an (publicly announced) investigation in April 2009, during which a preliminary tariff was applied. After evidence of dumping was found, an additional temporary tariff of 32.07 percent was imposed.

Countervailing duties are imposed to compensate for the effects of foreign subsidies on foreign exports. The process is the same as for AD, and CVD petitions are generally filed jointly with AD petitions.

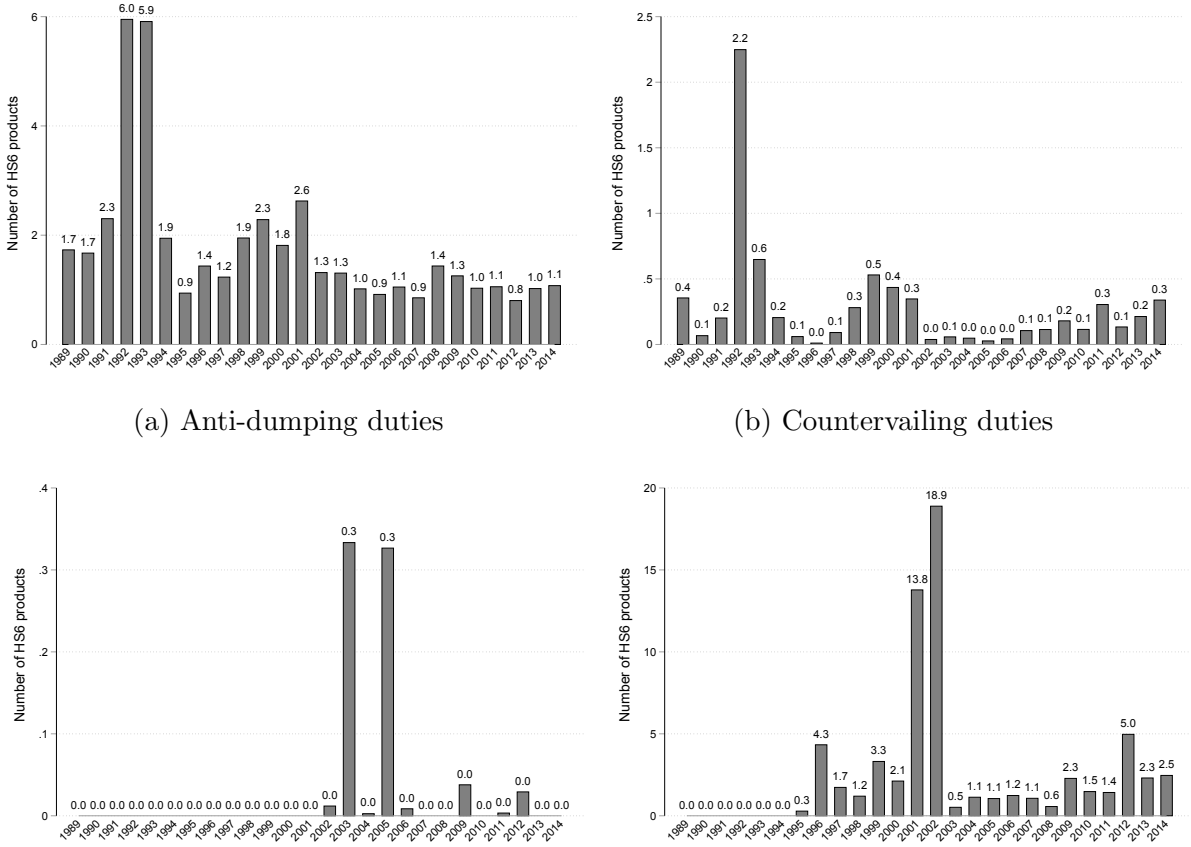
Global safeguards are a type of emergency protection from imports, allowing a country to restrict imports of a product if its domestic industry is injured by a surge in imports. In principle, implementing a global safeguard measure means restricting imports from all countries, but a list of exempted exporters is always defined. They are generally implemented for four years. Global safeguards can take the form of different trade barriers, such as an additional tariff, or a quota. For example, Indonesia initiated an investigation to implement a global safeguard in 2012, in the form of a quota on imports of wheat flour. Most emerging and developing economies were exempted from this measure.

Finally, the China-specific safeguards are a particular case of GS. With China's entry in the WTO system, WTO members' tariffs against China decreased, increasing China's exporting capacity. Hence, if a country were to be hurt by a surge of imports coming

from China, this country could file a petition to put a safeguard against specific Chinese products. This type of measure was mainly used by the U.S. and India, between 2001 and the late 2010s.

B Additionnal figures

Figure B1: Average number of investigated products under each type of TTB



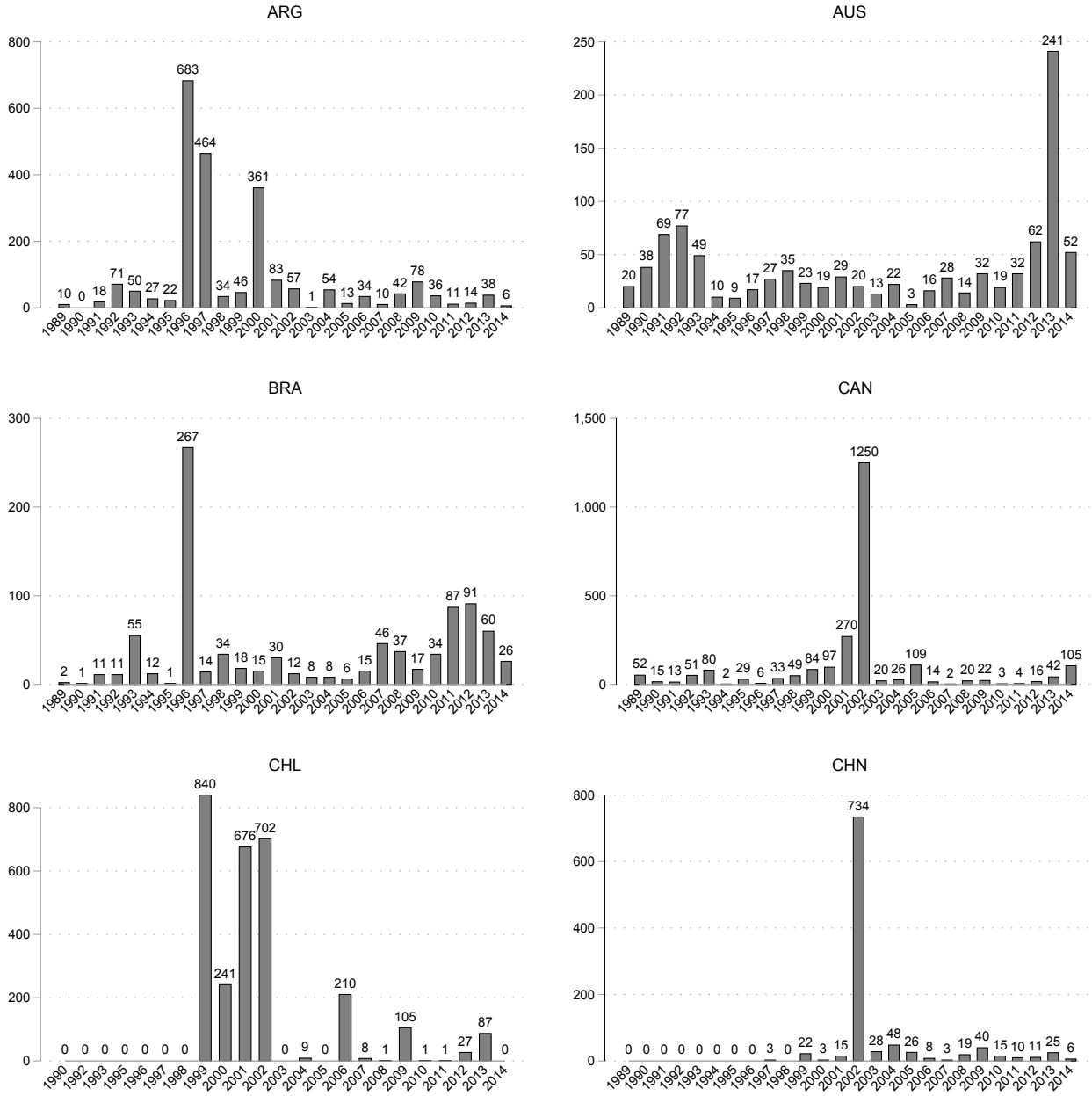
(a) Anti-dumping duties

(b) Countervailing duties

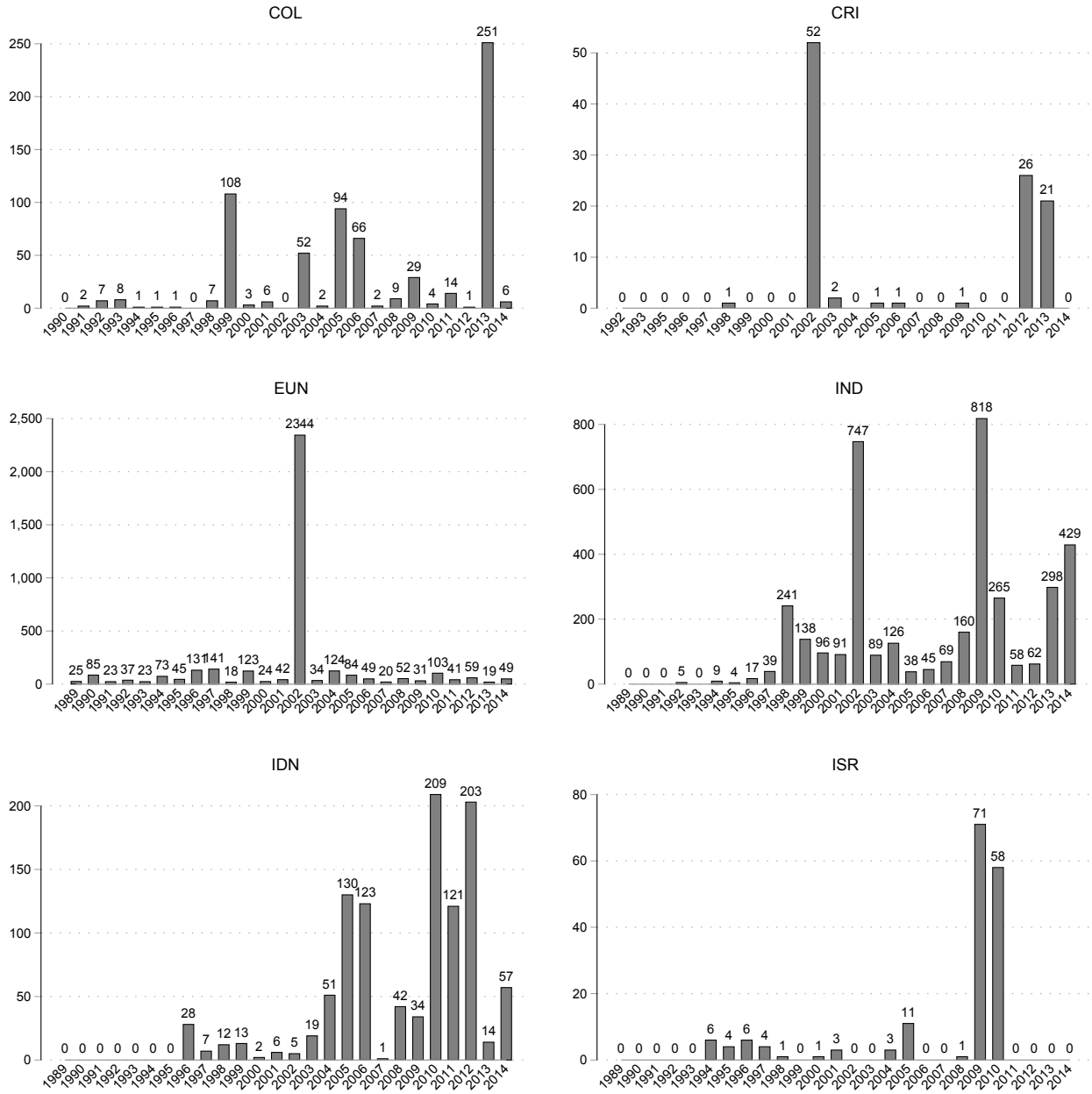
(c) China-specific safeguards

(d) Global safeguards

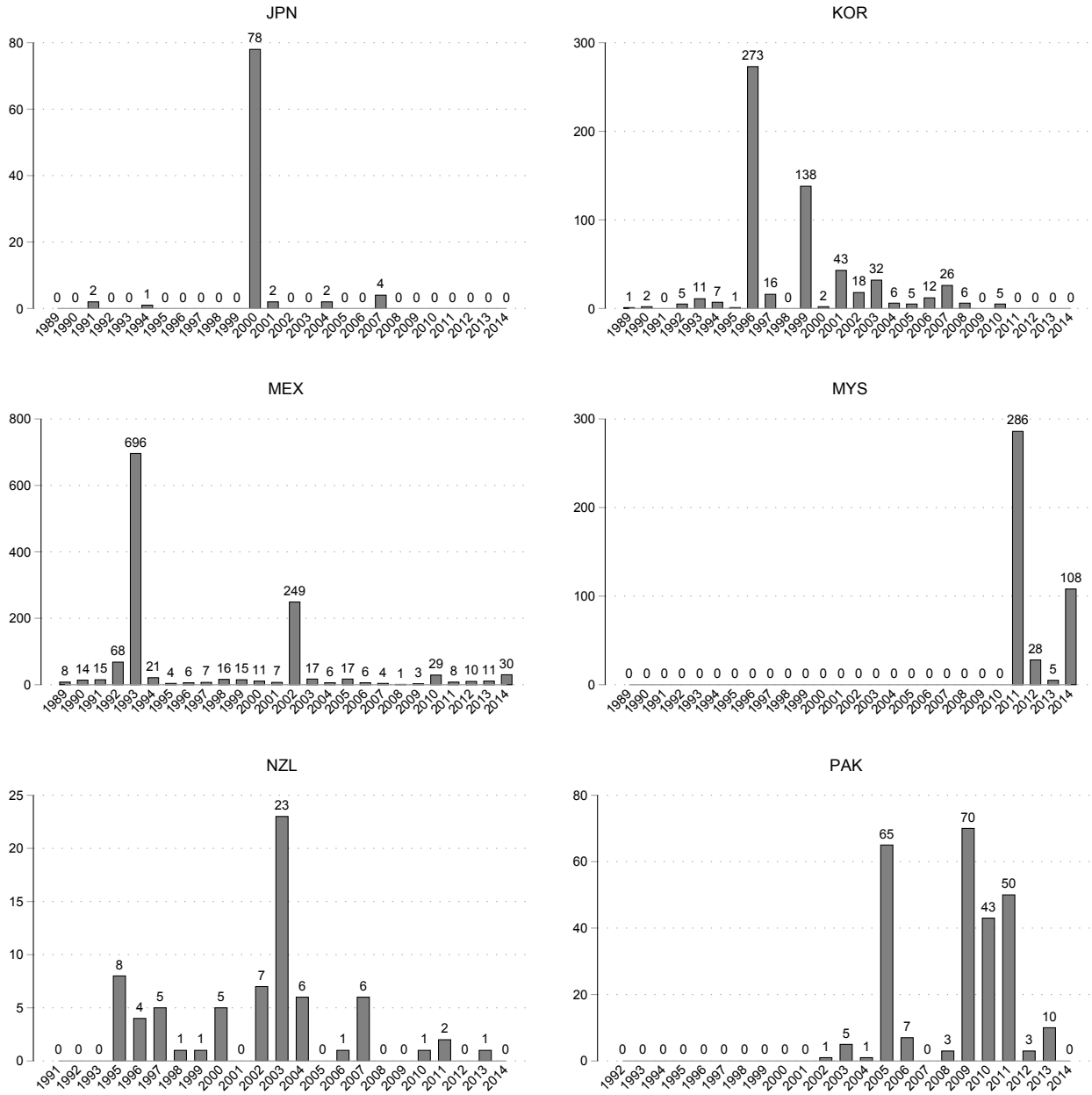
Figure B2: Total number of investigated products under each TTB



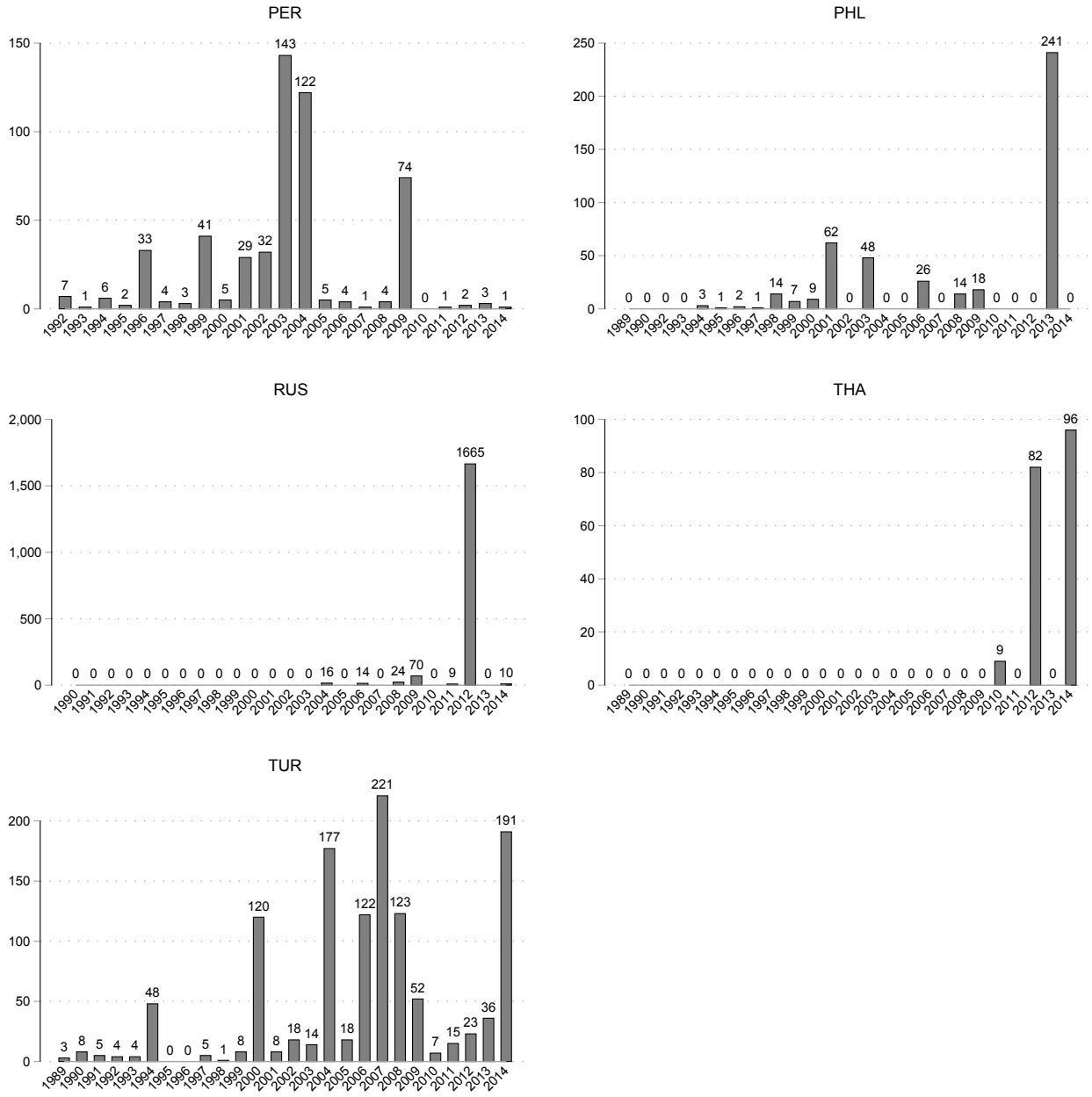
Source: Temporary trade barriers database (Bown, 2016). Authors' calculation.
ARG = Argentina, AUS = Australia, BRA = Brazil, CAN = Canada, CHM = Chile, CHN = China.



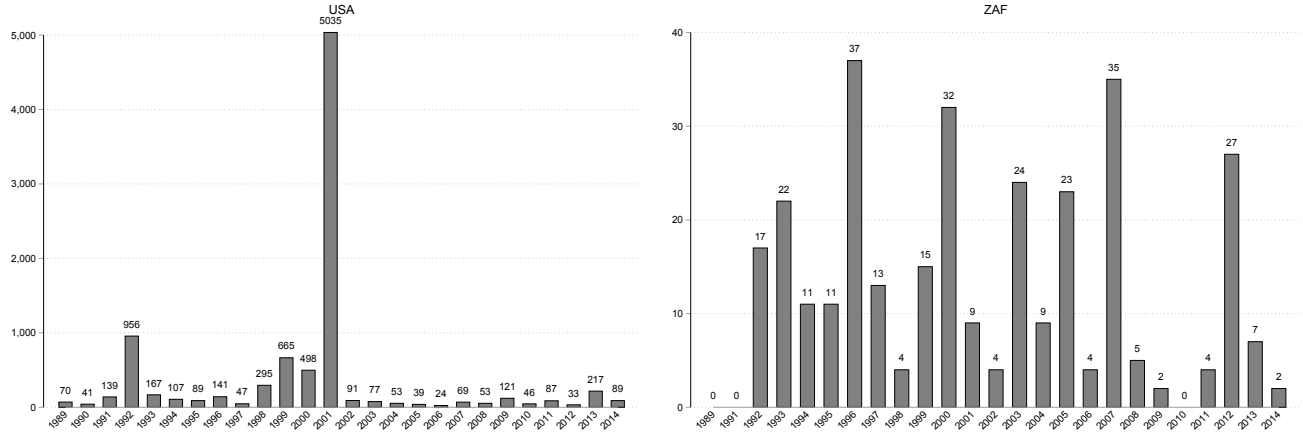
Source: Temporary trade barriers database (Bown, 2016). Authors' calculation.
COL = Colombia, CRI = Costa Rica, EUN = European Union, IND = India, IDN = Indonesia, ISR = Israel.



Source: Temporary trade barriers database (Bown, 2016). Authors' calculation.
JPN = Japan, KOR = South Korea, MEX = Mexico, MYS = Malaysia, NZL = New Zealand, PAK = Pakistan.

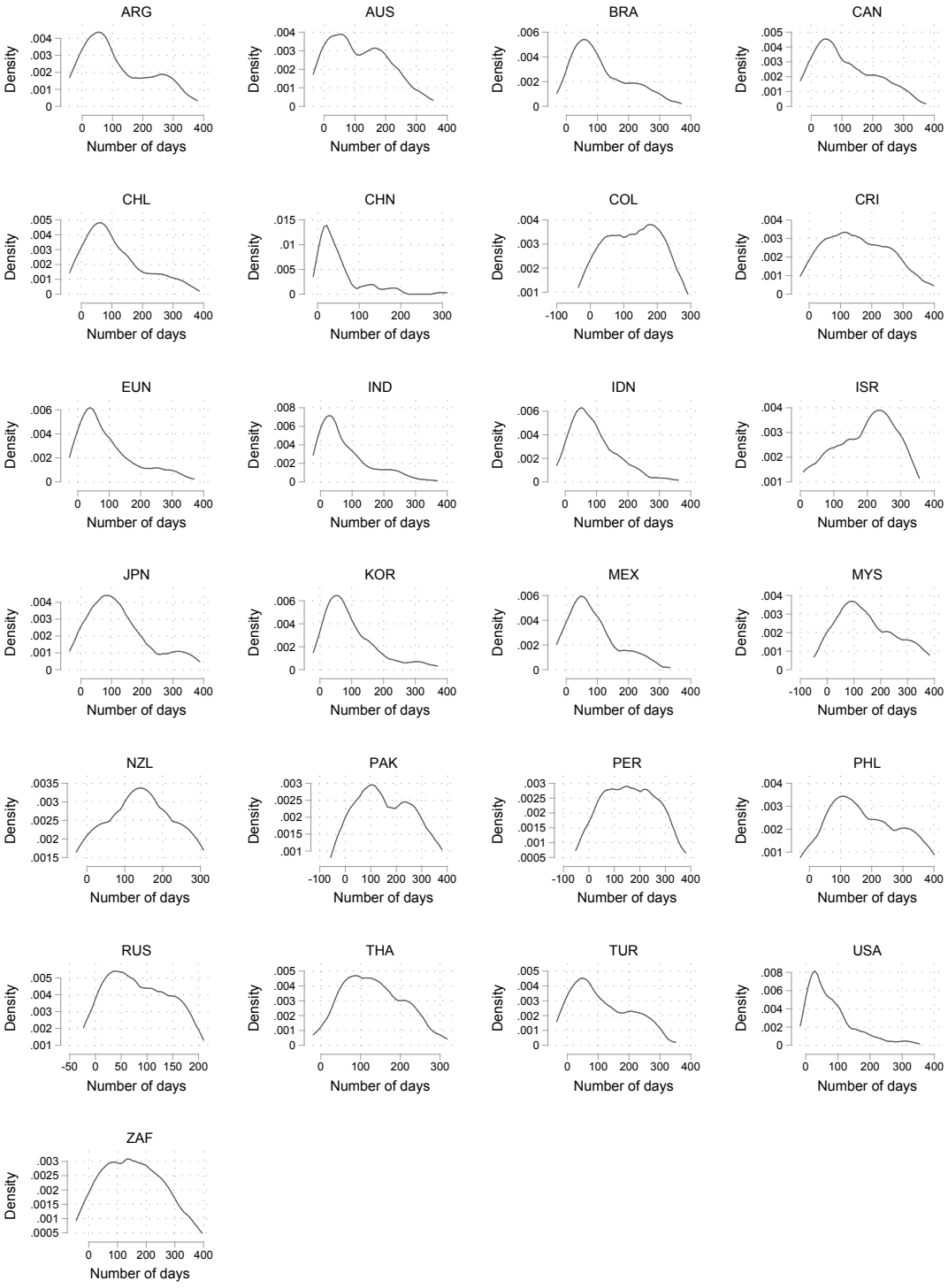


Source: Temporary trade barriers database (Bown, 2016). Authors' calculation.
PER = Peru, PHL = Philippines, RUS = Russia, THA = Thailand, TUR = Turkey.



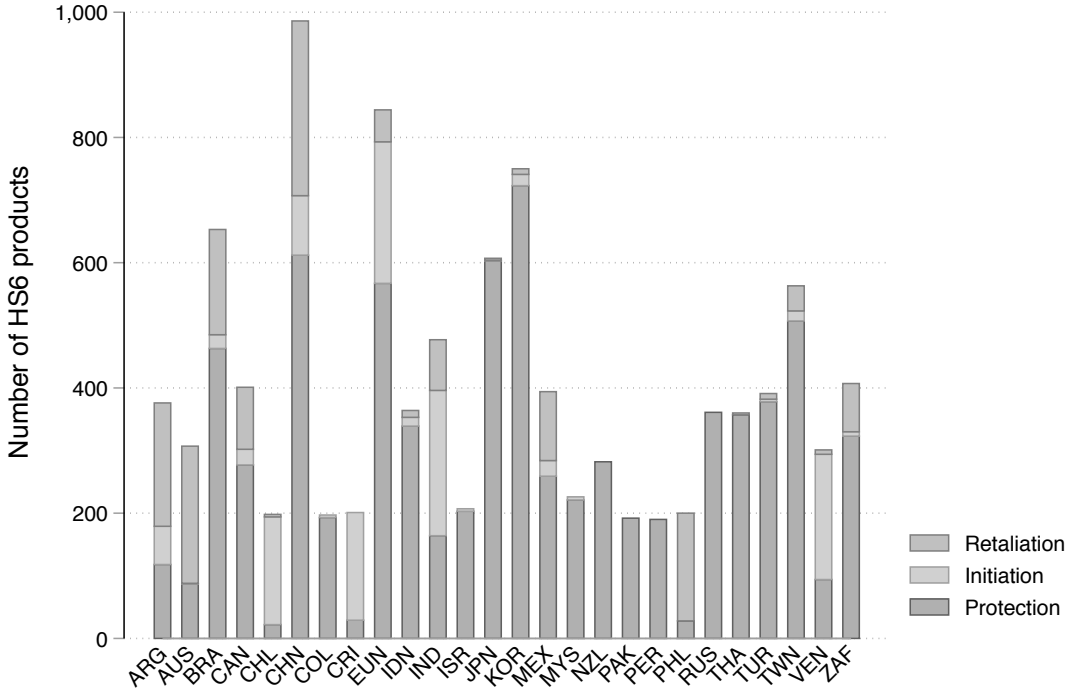
Source: Temporary trade barriers database (Bown, 2016). Authors' calculation.
USA = United States, ZAF = South Africa.

Figure B3: Number of days before potential retaliation



Note: Number of days between two opposing investigations. Kernel densities.

Figure B4: TTB use of the USA against other trading partners



C Additional tables

C.1 Descriptive statistics

Table C1: Retaliation threshold for each country

ARG	137	MEX	108
AUS	198	MYS	423
BRA	125	NZL	423
CAN	177.5	PAK	315.5
CHL	155	PER	450
CHN	38	PHL	302
COL	454	RUS	443
CRI	426.5	THA	192.5
EUN	80	TUR	126
IDN	87	TWN	140
IND	60	USA	64
ISR	523	VEN	204
JPN	289	ZAF	288.5
KOR	76.50	Whole sample	116.5

Note: The retaliation threshold is defined as the median number of days before any response to a foreign TTB.

Table C2: Total number of investigations per HS2 sector

HS2	Sector	Nber of investigations	Largest investigator
1	Animals; live	10	USA
2	Meat and edible meat offal	338	VEN
3	Fish and crustaceans, molluscs...	210	EUN
4	Edible products of animal origin	530	CHL
5	Animal originated products	3	CHN
6	Trees and other plants, live	2	CAN
7	Vegetables and certain roots and tubers; edible	281	USA
8	Fruit and nuts, edible; peel of citrus fruit or melons	58	EUN
9	Coffee, tea, mate and spices	0	
10	Cereals	164	CRI
11	Products of the milling industry; malt, starches, inulin, wheat gluten	145	CHL
12	Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit	1	AUS
13	Lac; gums, resins and other vegetable saps and extracts	4	USA
14	Vegetable plaiting materials	0	
15	Animal or vegetable fats and oils and their cleavage product	1198	CHL
16	Meat, fish or crustaceans, molluscs; preparations thereof	56	USA
17	Sugars and sugar confectionery	263	CHL
18	Cocoa and cocoa preparations	0	
19	Preparations of cereals, flour, starch or milk; pastrycooks' products	77	IND
20	Preparations of vegetables, fruit, nuts or other parts of plants	383	AUS
21	Miscellaneous edible preparations	19	USA
22	Beverages, spirits and vinegar	45	BRA
23	Food industries, residues and wastes thereof; prepared animal fodder	35	ZAF
24	Tobacco and manufactured tobacco substitutes	54	CAN
25	Salt; sulphur; earths, stone; plastering materials, lime and cement	86	USA
26	Ores, slag and ash	7	EUN
27	Mineral fuels, mineral oils and products of their distillation	42	EUN
28	Inorganic chemicals; compounds of precious or rare metals	545	IND
29	Organic chemicals	1613	IND
30	Pharmaceutical products	24	AUS
31	Fertilizers	43	EUN
32	Tannins, dyes, pigments, inks and other colouring matter;	58	USA
33	Essential oils and resinoids	1	USA
34	Soap, organic surface-active agents	6	AUS
35	Albuminoidal substances; modified starches; glues; enzymes	35	IND
36	Explosives; pyrotechnic products; matches; pyrophoric alloys	44	IDN
37	Photographic or cinematographic goods	68	USA
38	Chemical products n.e.c.	316	IND
39	Plastics and articles thereof	776	IND
40	Rubber and articles thereof	438	USA
41	Raw hides and skins (other than furskins) and leather	9	AUS
42	Articles of leather; travel goods, handbags and similar containers	31	MEX
43	Furskins and artificial fur; manufactures thereof	0	
44	Wood and articles of wood; wood charcoal	519	MEX

Continued on next page

Table C2 – *Continued from previous page*

HS2	Sector	Nber of investigations	Largest investigator
45	Cork and articles of cork	1	CAN
46	Manufactures of straw, esparto; basketware and wickerwork	26	JPN
47	Pulp of wood or other fibrous cellulosic material	10	CHN
48	Paper and paperboard	1304	IND
49	Products of the printing industry	2	MEX
50	Silk	7	IND
51	Wool, fine or coarse animal hair	0	
52	Cotton	788	EUN
53	Vegetable textile fibres; paper yarn	16	MEX
54	Man-made filaments, textile materials	1021	RUS
55	Man-made staple fibres	1427	RUS
56	Wadding, felt and nonwovens, twine, cordage, ropes and cables	98	USA
57	Carpets and other textile floor coverings	3	CAN
58	Fabrics	35	USA
59	Textile fabrics	33	USA
60	Fabrics; knitted or crocheted	37	COL
61	Apparel and clothing accessories; knitted or crocheted	786	VEN
62	Apparel and clothing accessories; not knitted or crocheted	1232	VEN
63	Textiles, made up articles	147	EUN
64	Footwear; gaiters and the like; parts of such articles	1733	ARG
65	Headgear and parts thereof	1	USA
66	Umbrellas, sticks, whips	0	
67	Feathers and down, prepared	0	
68	Stone, plaster, cement, asbestos	108	ISR
69	Ceramic products	251	TUR
70	Glass and glassware	428	IDN
71	Natural, cultured pearls; precious, semi-precious stones and metals	2	USA
72	Iron and steel	16714	USA
73	Iron or steel articles	3232	USA
74	Copper and articles thereof	41	CAN
75	Nickel and articles thereof	0	
76	Aluminium and articles thereof	248	IND
78	Lead and articles thereof	0	
79	Zinc and articles thereof	11	KOR
80	Tin; articles thereof	2	CAN
81	Metals; n.e.c., cermets and articles thereof	46	USA
82	Tools, implements, cutlery, spoons and forks, of base metal	115	ARG
83	Metal; miscellaneous products of base metal	71	USA
84	Nuclear reactors, boilers, machinery and mechanical appliances	595	USA
85	Electrical machinery and equipment	1039	TUR
86	Railway, tramway locomotives, rolling-stock	7	USA
87	Vehicles; other than railway or tramway rolling stock	609	KOR
88	Aircraft, spacecraft and parts thereof	6	USA
89	Ships, boats and floating structures	0	
90	Optical, photographic, cinematographic, medical instruments	239	TUR

Continued on next page

Table C2 – *Continued from previous page*

HS2	Sector	Nber of investigations	Largest investigator
91	Clocks and watches and parts thereof	5	EUN
92	Musical instruments; parts and accessories of such articles	1	USA
93	Arms and ammunition; parts and accessories thereof	2	CAN
94	Furniture	32	USA
95	Toys, games and sports requisites	729	ARG
96	Miscellaneous manufactured articles	266	IDN
97	Works of art; collectors' pieces and antiques	0	
99	Commodities not specified according to kind	1	USA