The determinants of retaliation in international economic conflict and the implications for global climate policy: a difference-in-difference design

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Abstract When do the targets of punitive economic measures retaliate and what are the implications for global climate policy? Economic conflict has increasingly come to the forefront of international relations. Even though countermeasures are frequently imposed by the sanctioned country (the target), little is known about what determines a target's decision to retaliate. This is particularly unfortunate considering a newly appearing area of major economic conflict: the use of punitive economic measures in international climate politics. Combined with regional carbon pricing, punitive economic measures such as border carbon adjustments (BCAs) have the power to overcome the collective action problem posed by climate change but at the same time risk sparking costly economic conflict without reducing carbon emissions. This paper investigates the determinants of retaliation. Based on a simple framework that considers reputational and material payoffs it argues that (1) retaliation is more likely if the initial sender is relatively weak compared to the target, (2) retaliation is less likely if an international organization (IO) supports the initial measures, (3) relatively weak senders disproportionately benefit from IO support, and (4) punitive measures adopted in pursuit of mutually beneficial cooperation (like the reduction of carbon emissions) as opposed to zero-sum issues are less likely to spark retaliation. I use the Threat and Imposition of Economic Sanctions (TIES) dataset to create a new panel dataset that includes 2,007 episodes of economic coercion with 11 panel years each (t-5 to t5), amounting to 22,077 panel observations. A difference-in-difference (DiD) analysis with fixed effects (FEs) supports the four arguments.

Key words: international climate politics · border carbon adjustments (BCAs) · retaliation · economic statecraft · global public goods

1 Introduction

When do the targets of punitive economic measures[1] retaliate and what are the implications for the provision of global public goods like the reduction of carbon emissions? Determinants of retaliation have received considerable consideration in the context of WTO disputes and their settlement (Bouët & Métivier, 2020; Bown, 2004; Guzman & Simmons, 2005; Mavroidis, Nordström, & Horn, 1999). Furthermore, several notable studies investigate retaliation in a US trade policy context (Bayard & Elliott, 1994; Kherallah & Beghin, 1998; Zeng, 2004). However, the determinants of retaliation have received much less scholarly attention when it comes to economic sanctions and other global economic conflicts that fall outside the WTO framework. One of the few exceptions to this is a recent exploratory study by Peksen and Jeong (2021) on which my empirical analysis partially builds. The deployment of economic sanctions and trade restrictions has steadily increased over recent years. The lack of research on the determinants of retaliation is unfortunate for several reasons. First, the threat of retaliation can be an important deterrent for the potential senders of punitive economic measures. Furthermore, rash adoptions of punitive economic measures that are likely to lead to a tit for tat type of response risk adding to ongoing trends of de-globalization and increasing barriers to global trade. Finally, the lack of research is particularly unfortunate in light of a new policy realm which is likely to play an important role in the fight against climate change: tariffs on imported goods and services that were not subjected to carbon pricing during production, commonly referred to as border carbon adjustments (BCAs).[2]

1.1 Global public goods & punitive economic measures

Carbon pricing is crucial to reducing emissions efficiently (Hepburn, Stern, & Stiglitz, 2020; Nordhaus, 2015). One global carbon price would be the economically most efficient way to achieve global abatements but, considering the major costs and global scale, collective action is politically difficult. Reducing global carbon emissions is typically conceptualized as a global public good (Barrett, 2003; Dai, Sampson, & Snidal, 2010; Keohane & Victor, 2016; Olson, 1965; Sandler, 2004). Global emission reductions are particularly difficult to achieve because they are an 'aggregated effort' type of public good, meaning that everyone has to participate but at the same time everyone is better off polluting while others cut emissions (Barrett, 2007). The result is that the regional pricing of carbon through market-based solutions, such as emission trading systems (ETSs) or carbon taxes, is only partially effective at reducing global emissions as carbon intensive industries shift production to wherever emissions are cheapest. This effect is also referred to as 'carbon leakage'. As a result, countries that price carbon emissions risk losing domestic industry due to the comparative disadvantage inflicted by carbon pricing, while at the same time total global emissions remain unchanged. Many other pressing global problems like over-fishing and the pollution of oceans have similar structures.

The threat of punitive economic measures has often been argued to have the potential to overcome free-riding and sustain collective action (Barrett, 1997, 2003; Böhringer, Carbone, & Rutherford, 2016; Mehling, van Asselt, Das, Droege, & Verkuijl, 2019; Nordhaus, 2015). The Montreal Protocol on Substances

[1] I refer to 'punitive economic measures' to capture a relatively wide range of measures, including economic sanctions, trade restrictions that aim to coerce a foreign government, and the withdrawal of economic inducements.

[2] BCAs are often also referred to differently, e.g. as trade sanctions, carbon taxes (on imports), or tariffs. For the sake of simplicity, I refer to these measures as BCAs even though some technical differences exist.

that Deplete the Ozone Layer is one of few major success stories of a 'common effort' global public good being provided. The punitive trade measures that are part of the agreement are largely credited for the success (Barrett, 2003). When it comes to the reduction of carbon emissions, high hopes are placed in BCAs, as they come with three advantages. First, they avoid competitive disadvantages of domestic firms subjected to carbon pricing. Second, BCAs can provide an incentive for countries that do not price carbon at all or at a lower rate to increase their own carbon prices as this allows them to collect the levy themselves opposed to a foreign government doing so through the BCA. Third, international reciprocity is an important determinant of public support for domestic carbon pricing (Beiser-McGrath, Bernauer, Song, & Uji, 2021; Tingley & Tomz, 2014). Although more research is needed, existing studies suggest that BCAs – deployed to ensure reciprocal carbon pricing – would enjoy public support.

1.2 Literature gap: the risk of retaliation

The risk of retaliation is, arguably, the biggest obstacle to BCA-induced collective action.[3] The view that it is likely and, under certain conditions, economically rational is shared by collective action approaches (Barrett, 2016, p. 14518; Böhringer, Balistreri, & Rutherford, 2012; Böhringer et al., 2016; Fouré, Guimbard, & Monjon, 2016) as well as the recent asset revaluation concept (Colgan, Green, & Hale, 2021, pp. 603-604).The risk of retaliation means that punitive economic measures like BCAs may lead to economically costly trade conflicts that strain international relations without reducing global carbon emissions.

The world's first and to date only attempt of implementing an international BCA exemplifies the risk. In 2008 the EU announced that, besides flights within its territory, also cross-border flights would be subjected to carbon pricing from 2012 onwards. After the implementation of the EU Aviation Directive in 2012, the so-called 'coalition of the unwilling' – consisting of 26 countries, including the US, China, and Russia – emerged and threatened to retaliate in various ways (Ahmad, 2015; Pauer, 2018, 2019). As a result, the EU put its carbon levy for international flights on hold. In July 2021 the EU announced a renewed attempt to implementing a BCA (European Commission, 2021) and in September 2021 it announced that it would extend its planned BCA to additional industries after 2030 (Abnett, 2021). The success of the EU's renewed attempt to adopt a BCA appears uncertain. The risk of retaliation is confirmed by the EU trading partner's initial response to the planned BCA (Hook, Seddon, & Astrasheuskaya, 2021). Understanding the determinants of retaliation is therefore essential for the development of successful climate policies and the avoidance of costly economic conflict.

Influential studies that rely on game theoretic modeling and that have greatly contributed to our understanding of BCAs, base their models on the assumption that retaliation can be prohibited through international trade agreements or IOs (Helm, Hepburn, & Ruta, 2012; Nordhaus, 2015). Though justifiable, this assumption is often unrealistic, considering the anarchy within which states act and as the example of the EU's airline directive shows. Böhringer et al. (2016) investigate the conditions under which it would be economically rational for states to retaliate in response to BCAs and supplements game theoretic with economic modeling using real-world trade data.

[3] Other obstacles that BCAs must overcome are (1) technical feasibility and high administrative workload, (2) compliance with international law – especially the World Trade Organization (WTO) and the General Agreement on Tariffs and Trade (GATT) (Mehling et al., 2019), and (3) domestic political opposition, incl. through lobby groups.

This study aims to add to the existing literature on BCAs and economic retaliation in two ways. First, on a theoretical level, it compliments existing research by considering the multifaceted international politics of environmental policymaking and retaliation. Second, this study generates empirical insights testing the developed theory on past cases of economic conflict and retaliation. Studying BCAs empirically may be viewed as difficult due to the low number of prior cases but is not as difficult as it may seem. BCAs are trade restrictions with two major goals: mitigating competitive disadvantages and inducing foreign actors to adopt carbon pricing. BCAs therefore are a combination of trade policy (the goals of which are primarily to achieve economic gains and/or induce foreign states to adapt their own trade practices[4]) and economic sanctions (the goals of which are to achieve political concessions). This study takes advantage of this feature of BCAs by relying on the Threat and Imposition of Economic Sanctions (TIES) dataset. Even though the name might suggest otherwise, the TIES dataset's 1,412 observations include a similar number of trade disputes and economic sanctions. Furthermore, it includes a considerable number of cases in which the sender threatens and/or imposes punitive economic measures in the pursuit of environmental goals.

1.3 The argument & structure

This study develops a simple framework distinguishing between a target's material and reputational payoffs depending on its decision (not) to retaliate. Four hypotheses result from the framework's application to important characteristics of economic conflict. First, retaliation is more likely if the sender coalition is relatively weak compared to the target. Second, the involvement of an IO on behalf of the sender reduces the likelihood of retaliation. Third, relatively weak senders benefit disproportionately from the support of an IO. Fourth, retaliation is less likely if punitive economic measures pursue the provision of mutually beneficial cooperation (like the provision of a global public good) as opposed to zero-sum issues.

The next section lays out the argument in detail. Section three introduces the data and the deployed difference-in-difference (DiD) models. Section four presents the results. I finish with a discussion of the results' implications for international climate policy.

2 The determinants of retaliation

2.1 Framework

Figure 1 summarizes the basic theoretical framework. To understand why a targeted state decides (not) to retaliate in the face of initial punitive economic measures I distinguish between two types of payoffs: material and reputational payoffs. Material payoffs include both the economic costs and benefits resulting from the measures adopted by each state and payoffs resulting from the policy outcome that is being disputed. For reputational payoffs I distinguish between deterrence and legitimacy.

[4] An increasing focus on non-trade issues in trade agreements (Milewicz, Hollway, Peacock, & Snidal, 2016) is the exception to this general rule.

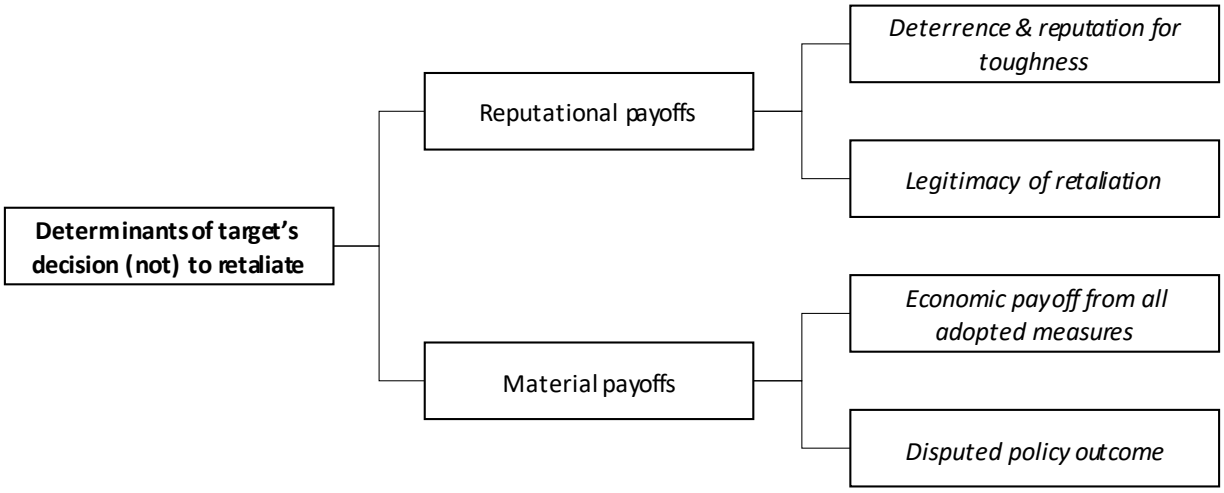


Figure 1. *Summary of theoretical framework*

A targeted state may derive two advantages from retaliation. First, retaliation through protectionist import restrictions or the withdrawal of inducements (like foreign aid) may benefit the target economically, provided this does not spark further measures by the initial sender. Second, (unexpected) retaliation may induce the initial sender to end its measures, improve the initial target's reputation for toughness, and/or deter the adoption of similar measures in the future. Reputation and deterrence matter especially when the sender and target are rivals and the future conflict expectation between them is high (Drezner, 1999).

There also are several reasons why a target may decide not to retaliate. First, retaliatory measures available to the target may not be economically beneficial but costly instead. While beneficial for some interest groups, even import restrictions hurt the consumers/importers of the restricted good or service. Similarly, other restrictions like financial or export sanctions are costly for both sides, even if costs are asymmetric (Keohane & Nye, 1973). Second, and as already mentioned, retaliation may provoke additional measures by the initial sender and, in extreme cases, a continuous tit for tat escalation with increasing economic costs for both sides. Third, retaliation may reduce the likelihood of mutually beneficial cooperation, including collective action, leading to less optimal policy outcomes. Finally, legitimacy does matter in international relations (Barnett & Duvall, 2005; Nye, 2004; Stacie, 2018). Depending on the circumstances, retaliation may be viewed as illegitimate by various audiences, including the international community of states and the retaliating state's domestic constituency.

2.2 Episode characteristics

In the following, I apply the above framework to three characteristics of economic conflict: (a) the sender coalition's economic strength relative to the target, (b) the involvement of IOs, and (c) the type of issue under dispute. My goal is not to be exhaustive but to consider the most important determinants of retaliation with a special focus on the provision of global public goods and international environmental politics.

2.2.1. Relative economic strength of sender and target

Escalating economic conflict is economically costly for both sides. Some interest groups might benefit from economic conflict but in aggregate and in the mid- to long-term states have an incentive to adopt (retaliatory) punitive economic measures only in cases where either the reputational payoffs and/or potential policy concessions by the other side outweigh the increasing economic costs.

If states retaliate, they tend do so proportionally to the initial measures. This means that while the two sides tend to suffer comparable absolute economic costs, the relative economic pain of each actor is directly proportional to its relative economic size. In other words, the economically weaker actor suffers disproportionately (losing $1 is worse if your total wealth is $2 than when it is $20). Of course, this is only a general rule and independent of the relative economic size, asymmetric economic interdependencies might mean that one actor finds it easier to impose economic costs than the other (Keohane & Nye, 1973). This can, for example, be the case if an actor controls a chokepoint within a network of economic interdependence (Farrell & Newman, 2019). This said, asymmetric networks of interdependence, too, tend to favor larger economies, and are therefore likely to only increase power disparities.

> *H1: Retaliation is more likely if the initial sender is economically relatively weak compared to the target.*

Of course, the same logic applies to the initial sender. A relatively weak potential sender is less likely to adopt punitive economic measures in the first place. Despite this bias (which the empirical DiD design will mitigate), relatively weak states do threaten and/or adopt punitive economic measures against economically stronger opponents. This can have various reasons, including reputational considerations vis-à-vis domestic and international audiences. A further reason for relatively weak senders to engage in economic conflict with a materially stronger opponent is the support of an IO, which I will now turn to.

2.2.2. International organizations' support

Institutions play a crucial role in facilitating cooperation on international trade and beyond (Axelrod & Keohane, 1985; Goldstein, Rivers, & Tomz, 2007; Keohane, 2020; Milewicz, 2020). When it comes to environmental policy, a wide range of influential academics and policymakers are currently advocating for the creation of an international environmental organization with the goal of achieving deeper cooperation (Dasgupta, 2021; Keohane & Victor, 2016; Nordhaus, 2015, 2021). Research on the effectiveness of punitive economic measures has shown that, under certain conditions, the support of an IO increases states' likelihood of successful economic coercion (Bapat & Morgan, 2009).

IOs play an important role in the coordination of punitive economic measures but mostly rely on their members to implement them as they mostly lack the capacity to do so themselves.[5] I expect IO involvement on behalf of the sender to reduce the likelihood of retaliation for two reasons. First, IOs function as forums in which coalitions of states coordinate the adoption punitive economic measures. This increases the coalition's efficiency (Abbott & Snidal, 1998) and cohesiveness (Drezner, 2000). Furthermore, IOs indirectly increases the sender's economic size and power vis-à-vis the target by serving as a secondary coalition of potential senders: initial punitive measures might be adopted by only one or a

[5] The one big exception to this is the EU which implements most types of punitive economic measures itself (although enforcement still lies with the member states).

few member states. The IO's support of these initial measures, does however signal the support of a wider coalition of potential sender states, that may be mobilized if the target were to escalate the conflict. Suddenly having to face this larger sender coalition in an escalating economic conflict, increases the target's *economic costs* of escalation considerably. Second, IOs are not only forums in which member states coordinate their actions but do possess some autonomy that gives them the capacity to operate with a degree of neutrality (Abbott & Snidal, 1998). This neutrality increases the legitimacy of initial punitive economic measures that are supported by an IO, and in turn decrease the legitimacy of potential retaliatory measures.

H2: Retaliation is less likely if an IO supports the initial punitive economic measures.

Powerful sender states, with an economy many times the size of their target, can rely on their economic might to deter targets from retaliating. Economically weaker senders lack this ability (H1), which is why I expect them to benefit disproportionally from the support of an IO support:

H3: For relatively weak senders the support of an IO is associated with a disproportionately large reduction in retaliation likelihood.

2.2.3. Zero-sum issues vs. mutually beneficial cooperation

Disputed issues will fall on a spectrum between two extremes. On one side, there are conflicts over indivisible zero-sum issues in which the payoffs of the two sides are inversely proportional. Trade conflicts, for example, are often thought of in these terms, as the tariffs levied by one country are paid by (the exporting firms of) another country. On the other side of the spectrum, there are issues where cooperation can deliver mutually beneficial outcomes. This is the category into which the provision of global public goods (like the global reduction of carbon emissions) falls.

I expect retaliation to be less likely if initial punitive measures are aimed at achieving cooperation (as opposed to pursuing zero-sum goals) for two reasons. First, when it comes to material payoffs, the target does get to enjoy the policy benefits of cooperation (e.g. limited climate change, cleaner air and water, or sustainable fish populations), if cooperation is achieved. This additional benefit, that does not exist in zero-sum disputes, opens the bargaining range making acquiescence to the sender's demands (as opposed to retaliation) more likely. Second, retaliation in response to punitive economic measures that pursue cooperation will be seen as less legitimate than retaliation in zero-sum conflicts.[6]

H4: Retaliation is less likely if the initial punitive economic measures pursue mutually beneficial cooperation as opposed to zero-sum issues.

[6] Note that senders will tend frame their punitive measures as legitimate and as pursuing cooperation while targets will tend to portray the same measures as illegitimate and motivated by the sender's self-interest. The 2012 episode in which the EU attempted to adopt a carbon tariff on international flights is a good example of this. This does not mean, however, that a true narrative does not exist and that on average and in the mid- to long-term it won't prevail. I further address the issue of framing and its implications for the provision of global public goods in the *Discussion* section.

3 Data & Methods

3.1 The original data

To test the hypotheses, I rely on the TIES dataset (Morgan, Bapat, & Kobayashi, 2014), which captures threatened as well as imposed punitive economic measures between 1945 and 2010. The TIES dataset is particularly well suited for the study of economic retaliation and for applying the findings to the study of BCAs for several reasons. First, it includes punitive economic measures that were imposed in the pursuit of both, political goals (i.e., economic sanctions and aid withdrawals) and trade policy changes (tariffs, currency devaluations, non-tariff protectionist measures, etc.). This distinguishes it from alternative datasets which typically focus on one of the two. The combination of political and trade policy goals is crucial as BCAs combine the two by aiming to prevent competitive disadvantages resulting from the sender's domestic carbon pricing (trade policy) and at the same time strive to induce their targets to price carbon emissions themselves (political goal). Furthermore, the original TIES dataset includes 47 observations in which the disputed issue was related to environmental protection. Second, the TIES dataset includes observations on all kinds of senders and does not focus on a subset of senders (e.g., US, EU, UN), which is crucial for being able to observe retaliation. Third, as a result of its relatively broad approach, the TIES dataset counts 1,412 episodes, making it one the most comprehensive datasets of economic conflict in the post-World-War-II period. In several of the observations, the punitive measures are not adopted by a single sender but by a coalition of senders. To test for retaliation in response to each of the involved senders, I split these cases to create one observation per sender, leading to a total of 2,007 episodes.[7]

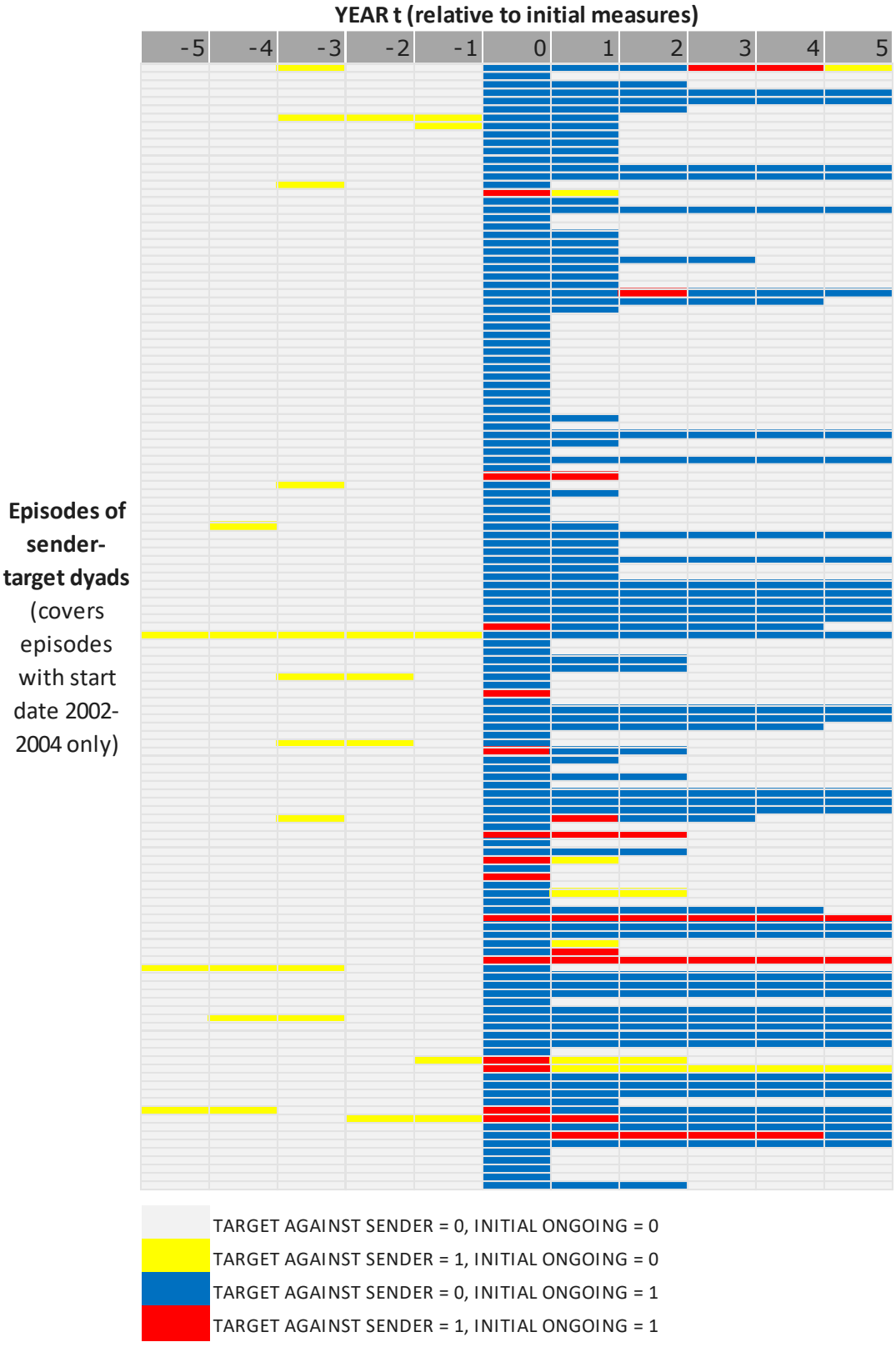
3.2 New panel data & dependent variable

I transform the dataset's 2,007 episodes into panel data. Figure 2 illustrates the new data format for episodes that start between 2002 and 2004. For each episode, I create five yearly panels prior to the adoption of initial punitive economic measures (t-5 to t-1), and six yearly panels starting with the adoption of the initial measures (t0 to t5). This amounts to 22,077 (11x2,007) panel observations. For each panel I code dummy variables indicating (a) whether the initial measures are ongoing (INITIAL ONGOING), and (b) whether the initial target adopts measures against the initial sender (TARGET AGAINST SENDER). The INITIAL ONGOING dummy is coded 0 for all episodes between t-5 and t-1, and 1 for all episodes in t0. For episodes t1 to t5 the coding depends on whether the initial measures are still in place at the beginning of that given year.[8]

[7] I still run robustness tests with only the original 1,412 episodes.

[8] The dataset includes the threat as well as the imposition of punitive economic measures. For the main analysis I code both the dependent TARGET AGAINST SENDER variable and the INITIAL ONGOING variable as 1 for threat and imposition panels. For both variables I do, however, run robustness tests that count only threat and only imposition panels as measures by the TARGET AGAINST the SENDER and as INITIAL ONGOING.

Figure 2. *Exemplary extract from panel dataset for 2002-2004 and dependent variable coding*



The TARGET AGAINST SENDER dummy serves as my dependent variable. It indicates whether the episode's target adopts punitive economic measures against the episode's sender during any of the panel years between t-5 and t5. Naturally, 'retaliation' cannot occur prior to the adoption of initial measures in t0. However, the initial target might have previously adopted punitive measures against the episode's sender. If these prior measures were ongoing between t-5 and t-1 but finished before the episode's 'initial measures' started in t0, the TARGET AGAINST SENDER variable is coded as a 1 (see yellow fields in Figure 2, TARGET AGAINST SENDER = 1 | INITIAL ONGOING = 0). If the 'prior measures' are still ongoing in t0, it is the episode's 'initial measures' that are in fact retaliatory. In these cases, the TARGET AGAINST SENDER variable is coded 0, and the retaliation will be picked up in the dataset's episode that covers the 'prior measures'. If the sender adopts initial measures and the target adopts its own measures while the senders 'initial measures' are still in place, this is counted as retaliation (see red fields in Figure 2, TARGET AGAINST SENDER = 1 | INITIAL ONGOING = 1).

This coding has the advantage that we can exploit the time variation within EPISODES and deploy a DiD approach, comparing the likelihood of measures by the TARGET AGAINST the SENDER when the initial sender has put measure against the target in place (INITIAL ONGOING = 1) to times where no such measures are in place (INITIAL ONGOING = 0). In other words, we can compare the likelihood of measures by the TARGET AGAINST the SENDER, within (as opposed to across) the 11-year sender-target dyads. This enables us to estimate the likelihood of measures by the TARGET AGAINST the SENDER depending on whether, and if so under what circumstances, initial measures were adopted.

Examples of cases coded as retaliatory are rows over gas supplies between Russia and Ukraine between 2000 and 2004, a dispute over the trade of beef between the US and Japan (2003-2005), and the conflict between the US and EU over subsidies to airplane makers that started in the early 2000s.

3.3 Independent variables

WEAK SENDER COALITION is a dummy that is coded 1 if the aggregated GDP of all sender states involved is smaller than the GDP of the target in t0. I conduct robustness test with dummies that are coded 1 only if the target's GDP is 1.5 and 2 times larger than that of the sender coalition. Furthermore, I also conduct a robustness test with a continuous variable obtained by taking the natural log of the GDP ratio of the target and the sender coalition (GDP target/GDP sender coalition). I rely on GDP data from an updated version of Gleditsch's (2002) dataset (Gleditsch, 2013).

IO SUPPORT is a dummy variable that is included in the TIES dataset. For this variable to be coded as 1, "at least one member of the institution must threaten or propose that the body as a collective adopts sanctions against the target" (Morgan, Bapat, & Kobayashi, 2013). In other words, the institution need not be the sole sender of the punitive measures. In fact, I exclude the dataset's 87 observations where an institution is the primary sender. This is because target states can retaliate against other states but cannot feasibly target an IO. Not excluding the episodes in which an IO is the sole sender would therefore risk biasing the results in favor of H2 which predicts retaliation to be less likely if an IO supports the initial measures. At the same time this exclusion means that the impact of institutions on the likelihood of retaliation might not be captured in full. The exclusion does not apply to the EU, which I treat as a state since target states can (and do) retaliate against the EU's punitive measures.

IO x WEAK SENDER is an interaction of the previous two variables. Its purpose is to test whether the effect of IO SUPPORT differs depending on the relative economic strength of the sender and target (H3).

PUBLIC GOOD is coded 1 if the disputed issue is related to the provision of a global public good. It aims to capture the theories prediction that retaliation is less likely if the disputed issue can be solved in a mutually beneficial manner. For the main analysis I capture both issues of environmental protection and foreign aid through this variable. To test the robustness of the results, I run additional tests with variables capturing these two issues individually. Environmental issues captured by the dataset have included wildlife protection, emission reductions, adoption of cleaner technologies, and the control of acid rain (Morgan et al., 2013). Instances of foreign aid refer to cases where the sender withdraws previously granted aid.

RIVALRY is a control based on the rivalry dataset by Klein, Goertz, and Diehl (2006). Specifically, I deploy the dataset's Type 2 rivalry variable, which focuses on enduring political rivalries that typically last for several years (while Type 1 captures isolated military conflicts that do not require the two actors to be rivals). To determine whether punitive economic measures were adopted during an ongoing rivalry, I convert the rivalry data to a dyadic format, and match it with the sender, target, and year of the punitive measures.

TRADE LINKAGE is a control that approximates trade dependencies of the sender and the target. I follow Peksen and Jeong (2021) in coding it by adding up the target's imports and exports (in current US$) with the sender and dividing the sum by the target's GDP. Import and export data is also taken from the Gleditsch (2013) dataset.

3.4 Model specification

The new panel data format has the advantage that it enables the deployment of a DiD model with fixed-effects (FEs).

FEs mitigate the risk of time-invariant characteristics of a certain EPISODE (incl. characteristics of the sender, the target, and their relation) biasing the results. This is because EPISODE FEs restrict the model to comparisons of the likelihood of measures by the TARGET AGAINST the SENDER between panels within episodes (as opposed to making comparisons across episodes). In other words, the counterfactual to which panels during which initial measures are in place (INITIAL ONGOING = 1) are compared, are panels of the same EPISODE during which initial measures are not in place (INITIAL ONGOING = 0).

In their basic form, DiD models compare a treated and an untreated group. However, the comparison of two different treatments is well established (Duflo, 2001; Fricke, 2017), and well suited to address whether different forms of initial measures (i.e. different treatments), such as measures with and without IO involvement or with a relatively WEAK SENDER, effect the likelihood of measures by the TARGET AGAINST the SENDER differently.

In sum, this approach allows us to test in a first instance whether the likelihood of measures by the initial target against the initial sender (TARGET AGAINST SENDER) changes at all with the adoption of initial measures (INITIAL ONGOING), and in a second instance (but within the same model) whether characteristics such as IO SUPPORT or a relatively WEAK SENDER effect the likelihood of measures by the TARGET AGAINST the SENDER.

All models include unit (EPISODE) FEs. Therefore, the models compare changes within episodes. As previously mentioned, this mitigates the risk of time-invariant factors (e.g. geographic proximity) that differ across sender-target dyads (i.e. EPISODES) biasing the results. Furthermore, I include TIME FEs that control for the decade into which each panel falls to capture potential changes in sender and target behavior across time.

I use a linear OLS model despite the binary dependent variable. This is because OLS works better for models with FEs and interaction effects (Gomila, 2021; Hellevik, 2007), both of which I use. Furthermore, non-linear models are problematic when testing DiD's parallel trends assumption (Lechner, 2011).

Standard errors are clustered by EPISODE as observations within episodes are not random/uncorrelated.

Model 1 starts by testing only the effect of whether initial measures are in place (INITIAL ONGOING) on the dependent variable:

$$TARGET\ AGAINST\ SENDER_i = c_1 + \gamma\ INITIAL\ ONGOING_i + \sum_{i=1}^{2,007} \delta_i\ EPISODE_i\ +\ \varepsilon_i$$

Model 2 focuses on the effect of IO SUPPORT (H2) and is specified as follows:

$$\begin{aligned} TARGET\ AGAINST\ SENDER_{itd} \\ &= c_1 + \beta_1\ (\boldsymbol{IO}_i \times INITIAL\ ONGOING_{it}) + \gamma\ INITIAL\ ONGOING_{it} \\ &+ \sum_{i=1}^{2,007} \delta_i\ EPISODE_i + \sum_{d=1940\text{s}}^{2010s} \mu_t\ DECADE_d\ +\ \varepsilon_{itd} \end{aligned}$$

Model 7 includes all three explanatory variables and an interaction term (IO x WEAK SENDER) to test the prediction of H3 that WEAK SENDERS benefit disproportionately from IO involvement:

$$\begin{aligned} TARGET\ AGAINST\ SENDER_{itd} \\ &= c_1 + \beta_1\ (\boldsymbol{IO}_i \times INITIAL\ ONGOING_{it}) \\ &+ \beta_2\ (\boldsymbol{WEAK\ SENDER}_i \times INITIAL\ ONGOING_{it}) \\ &+ \beta_3\ (\boldsymbol{IO}_i \times \boldsymbol{WEAK\ SENDER}_i \times INITIAL\ ONGOING_{it}) \\ &+ \beta_4\ (\boldsymbol{PUBLIC\ GOOD}_i \times INITIAL\ ONGOING_{it}) + \gamma\ INITIAL\ ONGOING_{it} \\ &+ \sum_{i=1}^{2,007} \delta_i\ EPISODE_i + \sum_{d=1940\text{s}}^{2010s} \mu_t\ DECADE_d\ +\ \varepsilon_{itd} \end{aligned}$$

Models 3, 4, 5, and 6 are specified similarly.

3.5 Summary statistics

Table 1 summarizes the data, differentiating between treated and untreated units (INITIAL EPISODE ONGOING). Furthermore, this study distinguished not only between treated and untreated units but also between different types of treatment (e.g. initial measures with IO SUPPORT vs. initial measures without IO SUPPORT) which is reflected in Table 1.

Table 1. *Summary statistics for treated and untreated panel observations*

Variable	Obs	Mean	Std. Dev.	Min	Max
Untreated					
(INITIAL EPISODE ONGOING = 0)					
Dependent variable					
TARGET AGAINST SENDER	16,863	.041	.199	0	1
Independent variables					
(variation of treatment)					
WEAK SENDER COALITION	15,344	.228	.42	0	1
IO SUPPORT	16,863	.352	.478	0	1
IO X WEAK SENDER	15,344	.077	.267	0	1
PUBLIC GOOD	16,863	.178	.382	0	1
Independent variables					
(unrelated to treatment)					
RIVALRY	16,863	.042	.201	0	1
TRADE LINKAGE	13,573	5.148	8.784	0	89.57
DECADE	16,863	1978.413	16.556	1940	2010
t	16,863	-.449	3.384	-5	5
Treated					
(INITIAL EPISODE ONGOING = 1)					
Dependent variable					
TARGET AGAINST SENDER	5,214	.072	.259	0	1
Independent variables					
(variation of treatment)					
WEAK SENDER COALITION	4,836	.155	.362	0	1
IO SUPPORT	5,214	.398	.49	0	1
IO X WEAK SENDER	4,836	.051	.221	0	1
PUBLIC GOOD	5,214	.224	.417	0	1
Independent variables					
(unrelated to treatment)					
RIVALRY	5,214	.065	.247	0	1
TRADE LINKAGE	4,162	5.601	9.808	0	94.37
DECADE	5,214	1981.513	17.037	1940	2010
t	5,214	1.452	1.594	0	5

4 Results

4.1 Parallel trend diagnostics

The purpose of this section is to test the most important assumption underlying casual inference through DiD models: parallel trends prior to treatment. Figure 3, Figure 4, and Figure 5 show observed means and linear-trends models for the three main explanatory variables (IO SUPPORT, WEAK SENDER COALITION, and PUBLIC GOOD respectively). While the observed means are a simple average of the dependent variable (TARGET AGAINST SENDER) for each explanatory variable and at each point in time (t), the linear-trends model additionally draws on time-series data. Visual inspection of all three graphs gives no indication that the parallel trends assumption would not be met. Furthermore, the graphs already suggest a strong effect of all three variables, especially in the first few years after the adoption of initial measures.

An additional parallel trends test (using *estat ptrends* in STATA 17) gives no indication that pre-treatment trends are not parallel.

Figure 3. *Graphical diagnostics for parallel trends:* IO SUPPORT

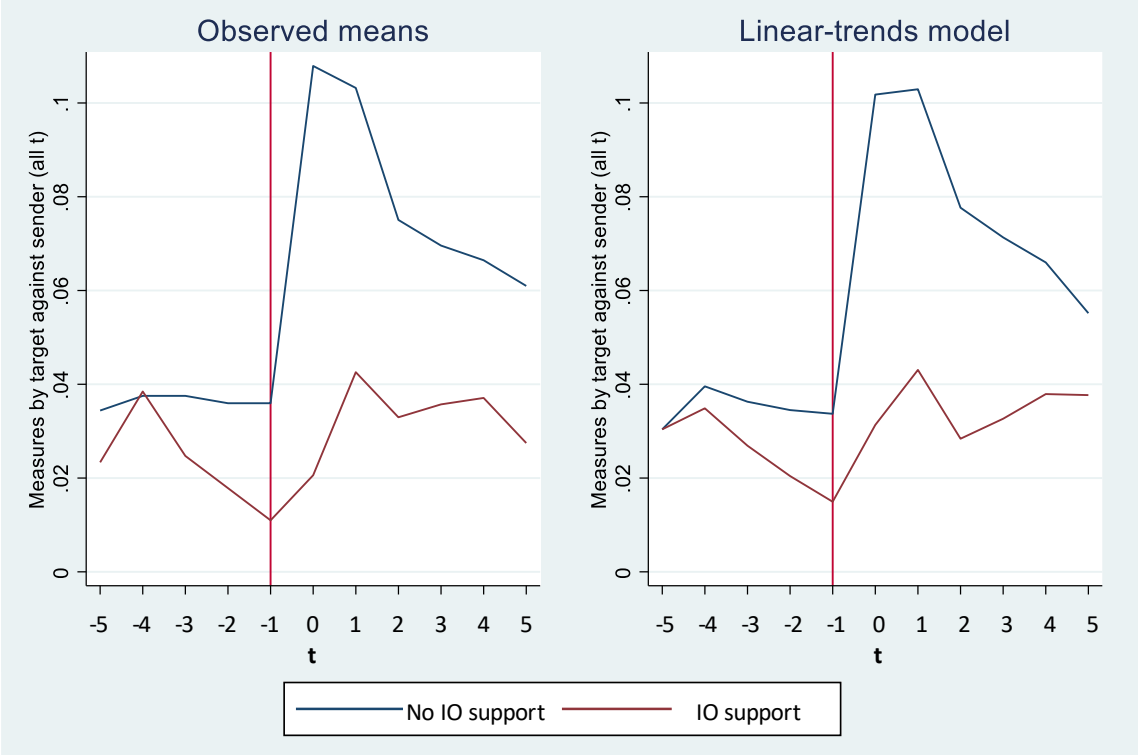


Figure 4. *Graphical diagnostics for parallel trends:* WEAK SENDER COALITION

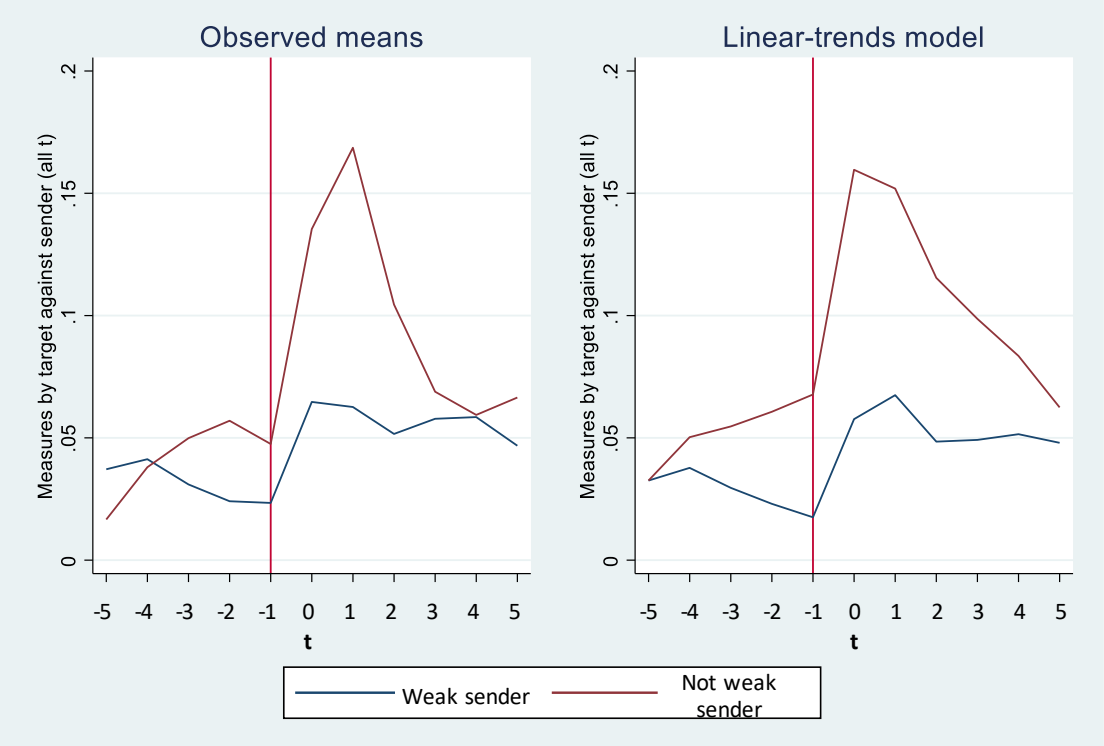
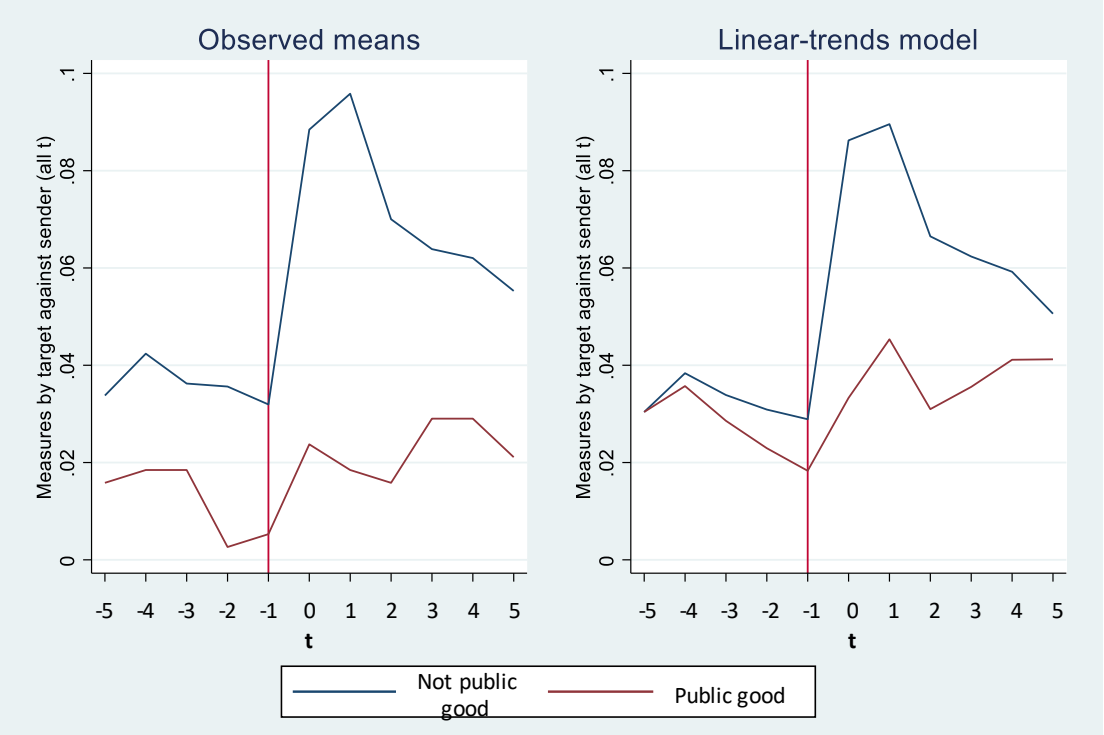


Figure 5. *Graphical diagnostics for parallel trends:* PUBLIC GOOD



4.2 Main results

Table 2 presents the main results of the DiD analyses. All coefficients can be easily interpreted as percent since the dependent variable is binary and the model linear. The constant of models 1 to 7 indicates that the annual likelihood of measures by the TARGET AGAINST the SENDER in panel years during which the INITIAL EPISODE is not ONGOING is about 4%. Model 1 indicates that if the INITIAL EPISODE is ONGOING, this increases the likelihood of measures by the TARGET AGAINST the SENDER by a further 4% (to a total of 8%). Model 2 supports the prediction of H2 and shows IO SUPPORT to be associated with a 5 percentage points (pp) lower likelihood of countermeasures than in cases where the sender coalition lacks this support. Model 3 support the prediction of H1. Relatively WEAK SENDER COALITIONS face a combined annual likelihood of countermeasures by the target of 13% (4%+2%+7%), while sender coalitions that do not fall into this category face measures by the target with an annual likelihood of only 6% (4%+2%). Model 4 includes both the IO SUPPORT and the WEAK SENDER COALITIONS variable. Their effect sizes barely change.

Model 5 adds the interaction term to test the prediction of H3 that relatively WEAK SENDER COALITIONS disproportionately benefit from IO SUPPORT. The results support this prediction. The effect size of the WEAK SENDER COALITIONS variable increases to 11%. The interaction term indicates that the support of an IO makes up for almost the entire economic weakness of the sender coalition as the involvement of an IO reduces the likelihood of countermeasures by 10 pp. With the inclusion of the interaction term, the coefficient of the IO SUPPORT variable is to be understood as the base rate effect of IO support that applies to both relatively strong and weak senders. The size of this effect is reduced by 2 pp (to -3%) but remains statistically significant at the $p<0.05$ level. In sum, the model supports the theory's prediction that both strong and weak senders benefit from IO SUPPORT but that weak senders benefit more.

Model 6 supports the prediction of H4 that punitive economic measures adopted in the pursuit of global public goods are less likely to spark a retaliatory response. In fact, the effect size of -4% is similar to the 4 pp increase associated with the INITIAL EPISODE being ONGOING, indicating that the adoption of initial measures that aim to achieve cooperation on the provision of a global public good are associated with almost no increase in the likelihood of measures by the TARGET AGAINST the SENDER compared to no initial measures being in place.

Model 7 includes all the previously discussed variables. This has little impact on the size and significance of the previously described effects.

A series of robustness tests supports the results. First, the results are robust when limiting the data to the TIES dataset's original 1,412 episodes as opposed to splitting episodes with several senders into separate observations (see *The original data* section). Second, the results are robust when limiting the treatment (INITIAL ONGOING) and the dependent variable (SENDER AGAINST TARGET) to episodes and panels where punitive economic measures were only threatened or only imposed (instead of combining observations of threats and impositions). Third, including the controls RIVALRY and TRADE LINKAGE does not substantially change the results. Fourth, the results are also robust when the definition of what constitutes a WEAK SENDER is changed (see *Independent variables* section for the various alternative codings of the variable). Finally, the PUBLIC GOOD variable remains statistically significant also when capturing only environmental issues or only foreign aid suspensions instead of merging the two.[9]

[9] The full results of the robustness tests are reported in Appendix X.

Table 2. *Difference-in-difference main results; dependent variable: measures by TARGET AGAINST SENDER*

VARIABLES	(1) *BASIC*	(2) *IO*	(3) *WEAK SENDER*	(4) *IO & WEAK SENDER*	(5) *INTERACTION*	(6) *PUBLIC GOOD*	(7) *FULL*
IO SUPPORT (H2)		**-0.046*** **		**-0.048*** **	**-0.028***		**-0.032** **
		(0.010)		**(0.011)**	**(0.011)**		**(0.012)**
WEAK SENDER COALITION (H1)			**0.072*** **	**0.074*** **	**0.113*** **		**0.104*** **
			(0.017)	**(0.017)**	**(0.025)**		**(0.026)**
IO X WEAK SENDER (H3)					**-0.103*** **		**-0.099*** **
					(0.030)		**(0.030)**
PUBLIC GOOD (H4)						**-0.042*** **	**-0.034** **
						(0.010)	**(0.012)**
INITIAL EPISODE ONGOING	0.041***	0.053***	0.023***	0.039***	0.032***	0.044***	0.042***
	(0.006)	(0.008)	(0.006)	(0.008)	(0.009)	(0.007)	(0.010)
EPISODE FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
DECADE FEs	No	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.041***	0.041***	0.040***	0.042***	0.042***	0.038***	0.042***
	(0.001)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Observations	20,922	20,922	20,350	20,350	20,350	20,922	20,350
R-squared	0.007	0.013	0.014	0.016	0.018	0.012	0.019
Number of EPISODES	1,902	1,902	1,850	1,850	1,850	1,902	1,850

Robust standard errors in parentheses; standard errors clustered by EPISODE

*** p<0.001, ** p<0.01, * p<0.05

5 Discussion

The finding that retaliation becomes more likely as the GDP of the target relative to that of the sender increases (H1), is in line with existing economic theory on BCAs. The implications are straight forward: the larger the sending coalition, the less likely retaliation becomes and the higher the chances of achieving meaningful emission abatements. EU efforts to adopt BCAs that are not coordinated with the US might therefore be at particularly high risk of failure, as was the case with the previously discussed 2012 Airline Directive which the EU put on hold after threats of sever retaliation by the US and other large economies. The rise of China and other developing countries means that the total share of the EU and US in world economy is steadily declining. Engaging with these countries (as is already done, e.g. through the Paris Agreement) in efforts to price emissions globally will therefore be a difficult but important task.

Various prominent policy makers and academics are currently advocating for the creation of an IO to manage the world's natural assets and address issues such as climate change. Keohane and Victor (2016) argue that international institutions are essential to allow for deeper cooperation on climate issues as opposed to the shallower cooperation observed thus far. Sir Partha Dasgupta, author of an extensive report on the economics of biodiversity, argues that a new institution is needed to charge fees for the use of common assets, such as the oceans or the atmosphere, in order to internalize externalities (Dasgupta, 2021; Ritchie, 2021). Nobel laureate, William Nordhaus, is a strong proponent of a 'Climate Club' to facilitate collective action on climate action (Nordhaus, 2015, 2021). The finding that the involvement of an IO in the adoption of punitive economic measures significantly reduces the risk of retaliation (H2), provides an additional reason to create an international climate institution as such an institution appears to be better placed than individual actors or loose coalitions to effectively support punitive economic measure in the service of collective action.

The finding that relatively weak senders stand to gain disproportionately from the involvement of an IO (H3) has important implications, even for the climate efforts of actors such as the EU and US. When acting as the senders of sanctions and trade measures in the past, the EU and US were mostly acting from positions of dominance with their GDP far exceeding that of their targets. When it comes to the adoption of BCAs, however, much of the outside world is the target. This makes the EU and US relatively weak senders since even together they account for less than half of World GDP. This relative weakness of any individual large actor further adds to the importance of coordinating efforts of global public good provisions such as emission abatements through dedicated IOs. On a more general level, the results add to the existing international relations literature on why institutions facilitate cooperation and how they can benefit weaker states in particular.

Finally, framing and narrative matter. Proponents view BCAs as possibly the only way to solve the collective action problem posed by global carbon emissions. Opponents, on the other hand, often critique BCAs as economically self-interested and illegitimate protectionism. Depending on whether BCAs are adopted in combination with domestic carbon pricing or without, either side can be correct. BCAs which do not price foreign emissions higher than domestic ones, can be viewed as legitimate ways of avoiding 'carbon leakage' and reducing global emissions. The adoption of BCAs without domestic carbon pricing, on the other hand, would create comparative advantages for domestic firms and therefore indeed be

protectionist.[10] Punitive measures must be used with care and sending states would do well to not abuse them for disguised protectionism. If punitive economic measures are in fact adopted in the pursuit of mutually beneficial cooperation, policy makers should take extra care to be transparent and frame them as such.

[10] The EU plans to introduce the former, whereas the latter was recently considered by parts of the Biden administration (The Economist, 2021).

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