Using Trade Provisions to Make Environmental Agreements More Dynamic

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(accepted for publication in *International Studies Quarterly*)

This paper examines the impact of trade provisions on treaty dynamism. It differentiates between static treaties, which remain unaltered, and dynamic treaties, which generate new commitments, either by bringing about additional rules or attracting new parties. We argue that incorporating trade provisions into multilateral environmental agreements (MEAs) enhances their dynamism. Such provisions can empower interest groups to advocate for new international commitments and can prompt businesses in non-party states to pressure their governments to join the MEA. Analyzing a dataset of 647 MEAs, we find that provisions that restrict trade flows are associated with higher numbers of amendments and accessions. This insight is crucial for resolving the so-called 'ambition/participation dilemma' and designing more adaptable treaties, particularly at a time when there is increasing enthusiasm for using trade measures to set up international climate clubs.

Introduction

Treaties can be either static or dynamic (De Bruyne *et al*. 2020). Static treaties remain unchanged even when the surrounding context evolves. Over time, they may become increasingly inadequate in addressing the issue they were originally meant to tackle. They risk becoming "zombie" institutions (Gray 2018): technically in force but disconnected from their context. By contrast, dynamic treaties are "living legal animals" (Boisson de Chazournes 2009: 293). They are regularly revised and can potentially adapt to changing conditions (Haas *et al*. 1993). Institutional dynamism is particularly important for multilateral environmental agreements (MEAs) given the rapid changes in both the environment and our knowledge of it.

Our conceptualization of MEA dynamism covers two dimensions: (1) RULE-MAKING: whether existing parties to an MEA update their commitments and adopt new rules; and (2) MEMBERSHIP: whether new parties subscribe to the existing set of rules provided for in the MEA. It is sometimes assumed that these two dimensions pose an ambition/participation dilemma (Gilligan 2004; Von Stein 2008; Bernauer *et al*. 2013), whereby designing an MEA that combines ambitious rules with broad membership is challenging.[1] The Paris Agreement, for example, boasts broad membership but entails modest obligations, while the Cartagena Protocol on biosafety has strict rules but a limited number of parties. However, effective MEAs often need both strong rules and broad membership.

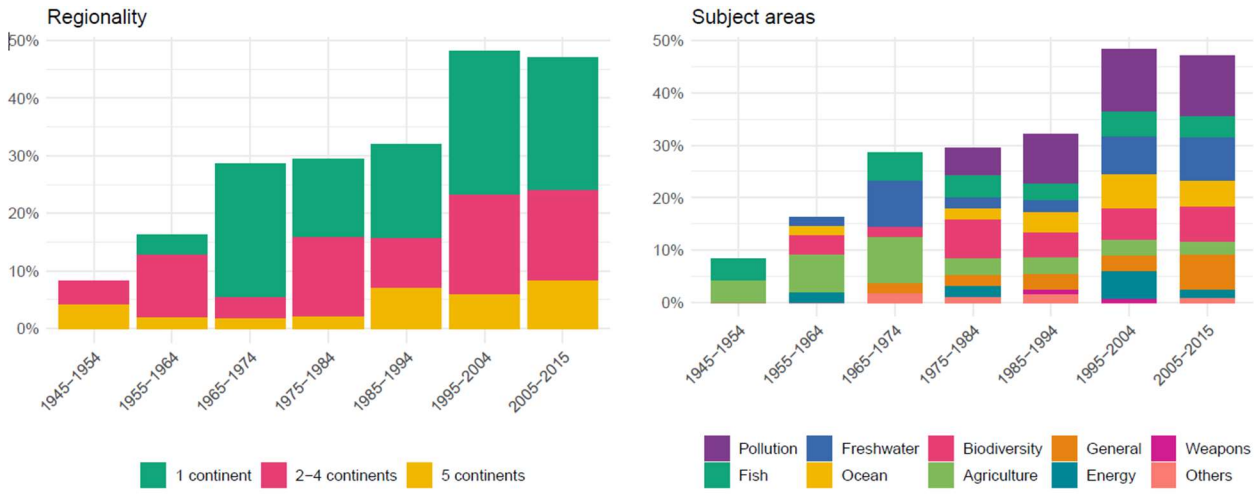
[1] The idea that strict obligations dissuade states from joining an MEA is contested in the literature (Rowan 2021; Farias and Roger 2022). This question, however, is beyond the scope of this paper.

This article takes a different approach by examining the evolution of MEAs and exploring ways to overcome the so-called ambition/participation dilemma over time (Downs *et al.* 1998). Although an MEA may initially lack ambitious obligations or broad membership, it has the potential to gradually gain ambition and membership after its entry into force (Rowan 2021). An example is the Montreal Protocol on Substances that Deplete the Ozone Layer, which has been amended 19 times between 1990 and 2018 to cover an expanding range of controlled substances and has attracted 151 new state parties since it entered into force in 1989 (DeSombre 2000; Parson 2003). Another illustrative case is the 1946 International Convention for the Regulation of Whaling, which has been amended 70 times and joined by 79 new countries. Replicating these successful instances of institutional dynamism is essential to maximize the adaptability of global environmental governance.

In this context, this study asks: what types of provisions enhance the institutional dynamism of MEAs? In other words, what seeds should be planted when an MEA is first negotiated to facilitate its growth in rules and membership over time?

We hypothesize that incorporating trade provisions in MEAs enhances their institutional dynamism. Approximately 36% of all MEAs include at least one trade provision. Their distribution has been relatively constant across environmental issues and world regions in the last four decades (see **Figure 1**). These trade provisions range from export bans on endangered species and import restrictions on polluting goods to the promotion of environmental certifications and facilitated access to natural resources. Several of these provisions offer either privileged trade access or less restrictive trade measures to other parties to the MEA. As a result, they often increase trade flows among members relative to non-members (Morin *et al.* 2023).

Figure 1. Proportion of MEAs with trade provisions across continents and subject areas (1945-2015)



We envision two independent causal mechanisms linking trade provisions to MEA dynamism. Firstly, trade provisions can change the domestic competitive landscape in countries party to the MEA. For instance, they can empower specific interest groups, such as providers of

environmental goods and services, who then advocate for additional international commitments. They may also incentivize business interests that initially lobbied against the MEA to push for additional commitments when they realize they can benefit from the MEA or are forced to comply with its provisions. Secondly, businesses in countries not party to the MEA may face competitive disadvantages due to trade measures, prompting them to urge their governments to join the agreement. In both scenarios, trade provisions favor the incremental expansion of MEAs.

Analyzing a dataset of 647 MEAs, we find evidence supporting our theory. Specifically, provisions that restrict trade are associated with higher numbers of accessions to an MEA. They are also positively associated with more treaty amendments, although this result is more nuanced. These findings are important to defuse the so-called ambition/participation dilemma and design more adaptive MEAs.

Better understanding the effects of MEAs' trade provisions is particularly timely given the recent enthusiasm for climate clubs. In his seminal work, Nobel laureate Nordhaus (2015) argued that a climate club that ties climate commitments to trade privileges would simultaneously provide reassurance for members to enhance their commitments and incentives for non-members to join the club (see also Victor 2015; Keohane *et al.* 2017; Falkner *et al.* 2021). Inspired by this proposal, German Chancellor Scholz encouraged the G7 governments to create a climate club in 2022, arguing that it would increase ambition and pressure non-members (Nienaber and Ainger 2022). In 2023, the European Carbon Border Adjustment Mechanism (CBAM) entered into force to prevent carbon leakage in energy-intensive sectors, becoming one of the first *de facto* intergovernmental climate clubs (Szulecki *et al.* 2022). However, these initiatives progress cautiously, and their potential effectiveness remains highly debated. Policymakers feel they are venturing into uncharted territories and current academic research offers only theoretical models as guidance (e.g. Rowan 2024). By investigating the effects of trade provisions on MEA dynamism, we provide empirical evidence relevant to this discussion. While climate change presents unique challenges and analogies with other environmental issues should be made with caution, MEAs with trade provisions offer real-world examples of how trade provisions can make environmental governance more adaptive.

The remainder of the article is divided into five sections. The first section reviews the literature on MEA design and dynamism. The second introduces our hypotheses on trade provisions. The third presents our data and method. The fourth discusses our results. The last section concludes with policy recommendations on the design of MEAs, particularly related to climate change.

Treaty ambition, participation, and design

This paper investigates institutional dynamism. We consider an MEA dynamic when it generates additional commitments over time. These commitments can come from two sources: either existing parties adopt new rules, or the existing set of rules attracts new parties.

The first dimension of institutional dynamism – increased RULE-MAKING – is well-documented by legal scholars. They have shown that several MEAs and their annexes have been amended to cover, for example, new harmful substances or endangered species (Churchill and Ulfstein 2000; Boisson de Chazournes 2009; Wiersema 2009). It is frequent in environmental governance to initiate international cooperation with a relatively modest agreement that progressively gives rise to ever more ambitious rules. For example, the 1973 Convention on International Trade in Endangered Species of Wild Fauna and Flora and its appendices were amended 22 times to add new protected species to the agreed list (Gehring and Ruffing 2008). Similarly, the International Whaling Commission, established under the International Convention for the Regulation of Whaling, frequently updates catch limits. Another example of increased RULE-MAKING is the protocols to the International Convention for the Prevention of Pollution from Ships. The latter were amended multiple times, including to require new oil tankers to have double hulls, to prohibit the discharge of garbage into the ocean, to ban the discharge of sewage, and to limit emissions of sulfur oxide and nitrogen oxide from ship exhausts (Fitzmaurice 2023).

However, most studies documenting this deepening cooperation are descriptive and do not explain why certain MEAs provide a more fertile regulatory ground than others. The 1950 International Convention for the Protection of Birds and the 1973 Agreement on the Conservation of Polar Bears, for example, have not been amended once even though they were first concluded several decades ago, when the ecological context was quite different from what it has become. A recent study has found that MEAs with a collective body and amendment procedures are more likely to be amended, but these are more enabling than causal variables (Laurens *et al.* 2023).

To be sure, increased RULE-MAKING does not guarantee improved environmental protection. For one thing, delays in RULE-MAKING may be too important to catch up with MEAs' fast-changing environmental conditions (Manulak 2020: 3). Second, new rules may seem satisfactory enough for negotiators to reach a consensus but still fail to make the treaty more effective in addressing the issue at stake. Last, RULE-MAKING might have unintended consequences and worsen the problem at hand. Nevertheless, RULE-MAKING holds the potential to reduce the gap between the text of MEAs and their external political and biophysical conditions and, in turn, make them more adaptive.

The second dimension of dynamism – increased MEMBERSHIP – is explored in studies aiming to explain variation in MEA participation. The Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat has attracted more than 150 accessions since its entry into force in 1975, whereas the 1993 Convention Concerning the Prevention of Major Industrial Accidents has remained staled at 18 parties for the last decade despite being open to accession. Scholars have found several variables associated with the number of MEA ratifications, including economic openness (Egger *et al.* 2011), the influence of powerful parties (Schulze and Tosun 2013), ecological vulnerabilities (Sprinz and Vaahtoranta 1994), domestic institutions (Bättig and Bernauer 2009), and the ratification choices of related states (Perrin and Bernauer 2010). However, most of these studies do not examine the specific design features of MEAs that contribute to increased MEMBERSHIP. To provide treaty negotiators with actionable policy recommendations to make MEAs more attractive, it is necessary to identify specific provisions associated with increased MEMBERSHIP.

A few studies have looked at the attractiveness of certain MEA design features, including funding mechanisms (Carraro *et al.* 2006; Mohrenberg *et al*. 2019), assistance provisions (Bernauer *et al.* 2013), transparency mechanisms (Koubi *et al*. 2020), flexibility clauses (Morin et al. 2022), and differential treatment for developing countries (Farias and Roger 2022). However, most of these studies consider the aggregate number of ratifications from a static perspective, either at the time the MEA is concluded or at the time the analysis was conducted. Few studies explore how certain design features can create a dynamic setting and attract new members over time after the MEA has entered into force.

The existing literature on the design of MEAs provides limited insights into what explains subsequent dynamism. Building on the insights of Koremenos and her colleagues (2003), several studies suggest that the design of MEAs is determined by the specific problem structure they aim to address (Mitchell 2006; Thompson 2010). However, this literature has paid scant attention to the dynamic nature of treaties over time. Treaty design is usually regarded as a dependent rather than an independent variable. Although there are a few exceptions (Gehring 2008; Young 2010; Laurens *et al.* 2023), most studies explain the initial design features of MEAs, as opposed to the consequences of design choices.[2] As Ronald Mitchell and his colleagues argue, too few research projects "assess the effects, rather than the determinants, of variation in [international environmental agreements] features" (2020: 115).

This paper bridges the literature on MEA dynamism with that on MEA design by investigating the consequences of specific design choices on institutional dynamism. It departs from traditional debates on what drives design choices and whether MEAs are generally effective. Instead, it analyzes how certain design features can be the "active ingredients" (Mitchell 2006: 74) of institutional dynamism. In doing so, it combines the precision of the literature on MEA design with the policy relevance of the literature on MEA dynamism.

The trade provisions hypotheses

Several MEAs incorporate trade provisions.[3] These provisions range from quarantine protocols for plants to favoring foreign investment to build infrastructure on a shared river basin. For example, the 1998 Rotterdam Convention mandates proper labeling and notification by exporters of hazardous chemicals and pesticides. The 2010 Nagoya Protocol promotes preferential access to technologies utilizing genetic resources for their original providers. The 2009 Agreement on Port State Measures allows states to refuse docking to vessels involved in unregulated fishing. Other significant MEAs with trade elements include the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the Cartagena Protocol on

[2] Studies looking at treaties other than MEAs have drawn inspiration from neofunctionalism or historical institutionalism to show how institutions change over time and undergo transformations (Fioretos 2011; Copelovitch and Putnam 2014; Voeten 2019).

[3] In fact, some analysts consider MEAs, such as the Basel and the Stockholm Conventions, as trade agreements, even though these MEAs have a very different structure and purpose than traditional preferential trade agreements.

biosafety, the Basel Convention on hazardous wastes, the Stockholm Convention on persistent organic pollutants, and the Minamata Convention on mercury.

Studies have already found that MEAs with trade provisions can have significant and substantial effects on trade flows (De Santis 2012; Aichele and Felbermayr 2013; Kim 2016; Borsky *et al.* 2018; Ederington *et al.* 2022; Morin *et al.* 2023). This paper explores the idea that these trade provisions enhance MEA dynamism, leading to additional parties and/or commitments. We remain agnostic as to whether negotiators strategically incorporate trade provisions with the intention of making MEAs dynamic. We focus instead on the effect of these provisions, and we consider two positive feedback mechanisms.

The first mechanism involves domestic business interests. Trade provisions can change the competitive landscape in country parties to the MEA. Two scenarios are possible here. First, trade provisions may strengthen the economic and political position of some business actors, such as producers of environmental goods, while disadvantaging others, such as producers of polluting goods. In this way, trade provisions alter the relative capacity of different businesses to influence domestic policymaking. These changes in domestic lobbying capacities, favoring environmental businesses and disfavoring polluting businesses, might eventually lead states to double down on their international commitments. If this process occurs in a sufficient number of states, the MEA is likely to be amended to include stricter environmental provisions. This argument aligns with research indicating the significant role of domestic lobby groups and distributional conflicts in shaping international environmental commitments (Aklin and Mildenberger 2020; Colgan *et al.* 2021). It also aligns with Eun et al.'s (2023) findings that firms with greater green product intensity are more likely to engage in environmental lobbying than their "less green" counterparts.

Another plausible scenario related to the domestic-level mechanism is that trade provisions may incentivize companies that initially lobbied against the MEA to push for additional commitments when they realize they can benefit from the treaty or are forced to comply with its trade provisions. Classic studies from the 1990s have established that stricter environmental regulations can turn companies into advocates for these regulations, as the latter provide them with competitive advantages and hurt their foreign competitors (Porter and Linde 1995). These businesses advocating for stricter regulations not only lobby their government but may also put pressure on foreign governments in countries where they are established (Vogel 1997). More recently, Kennard (2020) finds that differences in the anticipated business costs of environmental regulations lead low-cost companies to favor stringent regulations, even if these regulations increase their production costs, as long as they are costlier for their competitors.

An illustrative example of this second scenario is the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer. Its limitations on the production and trade of ozone-depleting substances catalyzed a "fundamental shift in industrial processes [that] would have been inconceivable without international regulation" (DeSombre 2000: 60). Some of the same businesses that had lobbied against the protocol when it was first concluded subsequently developed lucrative substitutes for ozone-depleting substances and, by the early 1990s, championed the strengthening of the protocol to expand their market share. This led to a series of adjustments to the original protocol, including to accelerate the freeze and the complete

phaseout of ozone-depleting substances (DeSombre 2000: 55).[4] We argue that the Montreal Protocol case is a more general story than typically assumed.

Another instance is the 2013 Minamata Convention, which imposes trade restrictions on mercury. These restrictions resulted in reduced global mercury demand, decreased production, and favored the emergence of mercury-free technologies (Sodeno 2023). These industry shifts incentivized several leading companies to push governments to adopt tougher standards on mercury than those stipulated by the Minamata Convention. For example, a coalition of companies producing mercury-free batteries in Japan, Europe, and the Americas proposed to end button battery exemptions in the Minamata Convention (Secretariat of the Minamata Convention on Mercury 2022). Likewise, representatives of the lighting industry encouraged governments to accelerate the implementation of the Minamata Convention and introduce more stringent limits for lamps (Lighting Europe 2013). As a result of this pressure, the European Commission ended multiple exemptions for the use of mercury in lamps in 2021 (European Commission 2021), with several other countries following suit, including Canada and the United Kingdom. In 2024, the European Council adapted its regulation to tackle the last remaining use of mercury in the EU. Similar positive feedback loops fostering further cooperation have been observed in other areas, including political rights (Kartal 2014) and economic integration (Downs *et al.* 1998). On this basis, we hypothesize the following:

H1: *The more an MEA includes trade provisions, the more likely it is to be amended.*

The second mechanism takes place at the international level. Several trade-related provisions discriminate against states that are not party to the MEA.[5] Some of these discriminatory measures are clear and explicit. For instance, the 1989 Basel Convention allows trade in hazardous wastes under certain conditions with other parties but bans trade with non-parties. Other trade provisions might have indirect discriminatory effects. For example, it might be easier for states to legally export alligator leather products or avoid sanctions for illegal ivory trade if they are parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora than if they are not. Even measures that appear to be trade restrictions when compared to trade in regular goods from the same country can be seen as trade privileges when compared to trade of the same goods with other countries. For example, requiring a certificate of origin for the import of certain biological materials from other parties to an MEA is a trade privilege when the import of similar biological material from non-parties to the MEA is prohibited under any circumstances. In this context, businesses in non-party states may prompt their government to join MEAs to counter such discrimination.

A telling example is the International Convention for the Conservation of Atlantic Tunas (ICCAT), which restricts imports of tuna caught by ships registered in non-member countries. Penalized vessels pressured their governments to join the convention to gain access to the

[4] This acceleration was made easier by the fact that adjustments adopted by a majority of two-thirds of parties are binding on all parties, including those that did not vote in favor of them.

[5] Such discriminatory measures are not necessarily prohibited by World Trade Organization Agreements and might be authorized under GATT Article XX exceptions.

lucrative markets of ICCAT countries (DeSombre 2005). Under such pressure, countries like Belize, Honduras, Panama, Saint Vincent and the Grenadines, and Sierra Leone reformed their fisheries practices and became ICCAT members.

Similarly, the Montreal Protocol prohibits the import of ozone-depleting substances from non-member nations. The objective was to "stimulate as many nations as possible to participate in the protocol, by preventing non-participating countries from enjoying competitive advantages and by discouraging the movement of CFC production facilities to such countries" (Benedick 1991: 91). Studies have found that these trade measures created sufficient incentive for several countries relying on ozone-depleting substances to join the protocol (Werksman 1992).[6] Obviously, ICCAT and the Montreal Protocol might not be representative of the hundreds of existing MEAs with trade provisions. This anecdotal evidence nevertheless leads us to expect that trade provisions boost membership numbers. Thus, our second hypothesis is the following:

H2: *The more an MEA includes trade provisions, the more parties accede to this MEA following its entry into force.*

These two processes operate independently. It is conceivable that trade provisions mainly impact interest groups within parties to the MEAs, leading to additional rules while having little effect on third parties and not yielding additional accessions. Conversely, the opposite is also possible: a set of trade provisions can attract new accessions to an MEA without necessarily encouraging a higher degree of ambition for the same MEA. What both processes have in common is their increasing returns as trade provisions gradually shift the political economy landscape in favor of MEAs. They contribute to a form of "sequential" (Down *et al.* 1998), "incremental" (Abbott and Snidal 2004), or "catalytic" (Hale 2020) cooperation.

Data and Method

We test our two hypotheses on 647 MEAs concluded between 1945 and 2015.[7] We obtained the full text of these MEAs, as well as information on their parties and amendments, from the International Environmental Agreements Database Project (IEADB, Mitchell 2002-2024), supplemented by additional searches where necessary. This collection of MEAs is the most exhaustive in this field.

The simplest way to capture the trade-related content of an MEA is to count all trade provisions it includes. We then assume that a higher number of trade provisions proxies for deeper trade regulation. Data on the number of trade provisions included in MEAs come from Morin *et al.* (2023), who identified 42 types of trade-related provisions. They also differentiated

[6] Beron *et al.* (2003) contest the idea that trade provisions made the Montreal Protocol more attractive for accession. This paper does not provide new evidence regarding the Montreal Protocol in particular but contributes to this literature by extending the analysis to 647 MEAs.

[7] Because one of our dependent variables is the number of accessions to an MEA, we drop from the original sample of 651 MEAs the four MEAs that are explicitly closed to accession.

MEA trade provisions according to whether they are of a trade-restricting or trade-liberalizing character.

Trade-restrictive provisions seek to restrict certain imports or exports. For instance, the 2000 Cartagena Protocol on Biosafety introduces a complex procedure requiring exporters of living modified organisms to obtain prior informed consent of the importing state, making trade in living modified organisms more burdensome than for other food and agricultural products. Another example is the 1991 Bamako Convention, which prohibits imports of hazardous and radioactive waste.

Trade-liberalizing provisions intend to encourage trade flows. For example, an agreement on fisheries concluded in 1994 between small island states of the South Pacific includes a most favored nation clause: "fishing vessels of the Parties may gain access to the waters within the Arrangement Area on terms and conditions no less favorable than those granted by the Parties to foreign fishing vessels under bilateral and multilateral access arrangements" (article 2(c)). The 2011 Protocol on Sustainable Tourism between East European countries includes several trade-liberalizing provisions dealing with the "harmonization of policies aiming at sustainable tourism planning, development and management in the Carpathians" (article 4).

Among the 42 types of trade provisions, 22 are trade-restrictive and 20 are trade-liberalizing.[8] To better account for the fact that different provisions may have complementary or substituting relationships, we use two indices of trade restriction and trade liberalization. Each index is constructed to range between zero and one, where a higher number indicates a greater level of trade restriction or liberalization, respectively. The formulas for creating the indices are listed in Appendix A. MEAs can be both trade-restrictive and trade-liberalizing at the same time, so the two concepts are not mutually exclusive.

Of the 647 MEAs in our sample, 234 contain at least one type of trade-related provision, with up to 16 out of the 42 potential provision types included in one treaty. 63 MEAs contain at least one trade-restrictive provision (max. 10), and 209 MEAs contain at least one trade-liberalizing provision (max. 13).

For our first hypothesis on the effects of these trade-related provisions on RULE-MAKING, the dependent variable corresponds to the number of amendments added to an MEA during its lifetime up until 2015. Amendments are identified with the IEADB's "lineage" variable, which captures additional instruments legally linked to an MEA and, hence, the "evolution of governance efforts by groups of states to address an environmental problem" (Mitchell *et al.* 2020: 105). We exclude protocols to MEAs from this measure of RULE-MAKING, as we consider protocols as standalone treaties that can be amended over time, just like any other MEA.

We analyzed a random sample of 183 amendments and found that most of them clearly improve (60.1%) or likely improve (30.1%) environmental governance, either by increasing

[8] These two categories of trade provisions are also the two main policy options discussed regarding the creation of environmental clubs.

environmental protection or by bolstering governing institutions. Only 2.2% of the amendments appear to lessen environmental protection, while 7.7% seem neutral. Nevertheless, all amendments could be seen as a form of institutional adaptation. Even those that reduce environmental protection may be considered more favorable than formally terminating the MEAs or allowing their political marginalization.

To be sure, amendments are not the only option available to countries to flesh out the rules of an MEA. Other institutional choices notably include COP decisions and resolutions.[9] However, current data limitations prevent us from including these alternative instruments in a large-N analysis. Still, formal amendments are typically more difficult to negotiate and more binding on the parties and are therefore rarer. We thus have reasons to believe that a positive effect of MEA trade provisions on amendments would likely extend to other types of RULE-MAKING instruments. In total, 103 MEAs were amended at least once, with up to 69 amendments for one MEA (the International Convention for the Regulation of Whaling).

For our second hypothesis on MEMBERSHIP, the dependent variable corresponds to the number of countries acceding to an MEA. We consider a country's signature of the MEA as an accession if it occurs after the entry into force of the MEA. When country signature dates are unavailable, we use the ratification date or the date of entry into force for that country. We assume that states signing an MEA after its entry into force did not participate in its original negotiations.[10] A total of 257 MEAs had at least one country acceding, with the maximum number of accessions for a single MEA being 169 (the UNESCO Convention for the Protection of the World Cultural and Natural Heritage).

In both analyses, we control for the duration of the agreements, because a longer existence naturally implies a greater likelihood of both amendments and accessions.[11] We also control for the general depth of the agreements in all estimations since agreements that include more trade-related provisions are likely to be more ambitious in general. We measure depth with an index of non-trade-related economic regulation in an MEA: restrictions on the production of specific goods, the extraction of specific natural resources, the selling of specific goods, the consumption of specific goods, the transportation of specific products, and the construction of specific infrastructure. Each type of provision is captured by a dummy variable indicating whether the MEA comprises such a regulation. The former five types enter with double weight, and restrictions on construction activities enter with single weight into the index.[12] For the

[9] Another example is the ever more ambitious Nationally Determined Contributions (NDCs) submitted by Parties to the Paris Agreement, which make this MEA dynamic in a "bottom-up" way independent of how many annexes or amendments are added to it.

[10] This is a reasonable assumption. For example, the Bamako Convention was negotiated between 12 African states between 1989 and 1991. All of them had signed (but not necessarily ratified) the convention when it entered into force in 1998. None of the 17 countries that signed the convention at a later stage were part of the original negotiating group.

[11] An alternative approach would be to divide the number of amendments and accessions by the duration of the agreements and use these per-year variables as the dependent variables. This yields similar results, and we thus stick to the more directly interpretable aggregate values controlling for duration.

[12] Our results are robust to this specific depth index design, e.g., compared to an equal weighting / count variable of the six types of provisions.

estimations, we standardize depth and duration to have a mean of zero and a standard deviation of one, so that the coefficients for both variables can be interpreted as the association with one standard deviation of depth and duration.

Our hypotheses go beyond exogenous explanations of treaty dynamism, which crucially contributes to our understanding of the phenomenon. However, investigating the effects of internal sources of dynamism (in this case, specific types of provisions) necessarily raises concerns about potential omitted variables. Under certain conditions, it may be the case that drafters use trade provisions precisely to boost the dynamism of a treaty. In other words, confounding factors may simultaneously explain the inclusion of trade provisions, the adoption of amendments, and increased membership. To address this endogeneity challenge inherent to the study of institutional design, we carefully consider the problem structure of each MEA with various robustness tests.

First, we include control variables on the characteristics of the MEAs and their original members. The country-level variables include the average GDP per capita at the time of original signature as a proxy for the average development level, and the combined absolute GDP for the aggregate market size of the original members. These GDP-related variables are all in logs of constant 2015 US dollars and the data comes from the World Bank World Development Indicators. Other country-level variables include the average trade share of merchandise exports and imports as a percentage of overall GDP (World Bank), the average level of domestic environmental regulation (Yale Environmental Performance Index), and the average level of democracy (Polity IV dataset). All these country-level variables could be associated with stronger links between trade and environmental regulation on the one hand and treaty dynamism, on the other hand.

We also consider whether MEA signatories had trade agreements in place between them (data from the DESTA database, Dür *et al.* 2014). Trade agreements could increase the demand for trade regulation in MEAs. At the same time, stronger trade relations could impact power dynamics within the business community, favoring more or less polluting firms. These shifts could, in turn, increase or decrease demand for amendment and accession. The sign of the expected effect is thus unclear ex ante.

As for MEA characteristics, we control for the MEAs' subject area and the involvement of the United States or the European Union as an original signatory. We also control for whether the MEAs include a funding mechanism, provide technical assistance for developing countries, allow for differential treatment of developing countries, or have a compliance or enforcement mechanism in place, as all these design features may be correlated with the intensity and direction of trade-regulation and affect the likelihood of amendments and/or accessions. We also consider that only a subset of MEAs explicitly provide for the adoption of amendments (Bélanger & Morin 2024).

When looking at accessions, we control for the number of original signatories. This is relevant for two reasons: a higher number of original members could make an MEA more attractive to join, but more non-members imply more potential new members. Thus, the direction

of the expected effect is unclear ex-ante. As the first effect is likely to be particularly important when there are a few original members while the second effect is likely to be particularly relevant when there are numerous original members, we include the squared term of the number of original members to account for the expected non-linear effect. **Table B 1** in Appendix B lists the summary statistics of all variables used in the estimations.

In both analyses, our independent variable of interest is the time-invariant trade content of MEAs. Therefore, we estimate the relationships in the cross-section. We use the five above-mentioned measures of MEA trade content: the absolute number of trade-related provisions, the number of trade-restrictive provisions, the number of trade-liberalizing provisions, the trade-restrictive index, and the trade-liberalizing index.

Both dependent variables (amendments and accessions) are count variables. The data shows some overdispersion compared to a Poisson distribution, but we also operate in a relatively small sample with many zeros (particularly for amendments), which makes a negative binomial regression unfit. Recent scholarship shows that Poisson-Pseudo Maximum Likelihood (PPML) (Santos Silva and Tenreyro 2006) outperforms negative binomial models in such a setting (Correia *et al.* 2020; Helms and Leblang 2022: 7; Santos Silva and Tenreyro 2022). We therefore apply a PPML estimator. The respective regression equations read as follows:

For H1: $\log(\textit{Amendments}) = \alpha_1 + \beta_1 * \textit{TradeContent} + \gamma_1 * X + \varepsilon_1$,

For H2: $\log(\textit{Accessions}) = \alpha_2 + \beta_2 * \textit{TradeContent} + \gamma_2 * X + \varepsilon_2$,

where *TradeContent* corresponds to the various measures of our independent variable for MEA i, and X is a vector of control variables. β_j is our estimated coefficient of interest for amendments and accessions, respectively. The PPML estimator is robust to heteroskedasticity, with the respective heteroskedasticity robust standard errors, ε_j, reported in all estimation results.

Results

We begin by estimating the baseline regressions, which only include the depth and duration of MEAs for both amendments and accessions as control variables. We use different specifications of the explanatory variable of interest, that is, the number of trade provisions and index-based measures of MEA trade content. The results of the baseline estimation for amendments are shown in **Table 1**.

Consistent with hypothesis 1, higher numbers of trade provisions are associated with more amendments (column 1). The results in columns 2 and 3 show whether this effect is primarily driven by restrictive or liberalizing provisions, either captured by their simple count (column 2) or the respective index (column 3). In both specifications, the results indicate that the relationship between trade provisions and amendments appears to be driven more by restrictive than by liberalizing provisions.

Table 1: Baseline estimation for RULE-MAKING (amendments)

	(1) Amendments	(2) Amendments	(3) Amendments
No. Provisions	0.151***		
	(0.054)		
No. Restrictive		0.160**	
		(0.073)	
No. Liberalizing		0.137*	
		(0.080)	
Restrictive Index			2.223*
			(1.174)
Liberalizing Index			1.877
			(1.286)
Depth	0.411*	0.410*	0.408*
	(0.216)	(0.218)	(0.229)
Duration	0.742***	0.737***	0.721***
	(0.255)	(0.263)	(0.262)
Constant	-0.761***	-0.756**	-0.724**
	(0.291)	(0.297)	(0.291)
No. Observations	647	647	647

Robust standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

The results of the baseline estimation for accessions are presented in **Table 2**. In line with our second hypothesis, a greater number of trade provisions are associated with an increase in accessions (column 1). Here, this effect appears to be solely driven by restrictive provisions, which can be measured either by their simple count (column 2) or a restrictiveness index (column 3). As the restrictiveness and the liberalizing indices provide the most accurate measure of the trade content of MEAs, we use them as explanatory variables in all subsequent estimations.

As for the main control variables, the results indicate that deeper agreements tend to have more amendments, but not more accessions. Agreements that have been in place for a longer period naturally have more amendments and accessions.

The results are also robust to other estimation methods. While the PPML regression is more appropriate for our sample, a negative binomial regression could be a natural alternative in the presence of overdispersion (Cameron and Trivedi 1998). **Table C 1** and **Table C *2*** in Appendix C show the results of the negative binomial regression for amendments and accessions, respectively. The coefficients of interest show similar point estimates, but the results for restrictive and liberalizing trade provisions and their respective indices are statistically

insignificant for amendments. Since amendments often have many zeros, we prefer the PPML regressions and report these in the rest of the paper.

Table 2: Baseline estimation for MEMBERSHIP (accessions)

	(1) Accessions	(2) Accessions	(3) Accessions
No. Provisions	0.157***		
	(0.041)		
No. Restrictive		0.217***	
		(0.043)	
No. Liberalizing		0.049	
		(0.075)	
Restrictive Index			3.252***
			(0.683)
Liberalizing Index			0.458
			(1.117)
Depth	-0.066	-0.071	-0.095
	(0.103)	(0.105)	(0.102)
Duration	0.326***	0.294***	0.293***
	(0.069)	(0.071)	(0.071)
Constant	1.838***	1.873***	1.871***
	(0.124)	(0.124)	(0.123)
No. Observations	647	647	647

Robust standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

In the results reported in **Table 1** and **Table 2**, we control for the duration that the respective MEAs have been in place to account for time. Since none of the MEAs in our sample have been discontinued, we also control for general, linear time trends in amendments and accessions. To capture non-linear developments in these variables, we include squared and cubic terms of the duration as sensitivity analysis. The results for both amendments and accessions are reported in **Table C *3*** in the Appendix. The squared and cubic terms are relevant in their own right but are unrelated to the effect of the trade-restrictive index, for which the results remain the same.

To even better capture different evolutions over time, we also estimate the effect of trade provisions on treaty dynamism in a panel. The level of observation is then still the individual MEAs, but we include MEAs with yearly observations. The dependent variable is therefore the number of amendments and accessions each year. We cannot include MEA-fixed effects because the main explanatory variables (capturing the trade-related content of the MEAs) do not vary over time. However, we can include year-fixed effects. As the estimator, we use the fixed effects PPML estimator by Correia et al. (2020) and cluster standard errors at the MEA level. The results of this analysis are reported in **Table C *4*** and **Table C *5*** in the Appendix for RULE-MAKING (H1) and

MEMBERSHIP (H2), respectively. They are almost identical to the results in the cross-section. We therefore report the more straightforward cross-sectional results in the following.

Extensions to the baseline model

In the first set of extensions to the baseline results, we control for the characteristics of the MEAs' original members. **Table 3** shows the results when including the additional control variables separately (columns 1-5) and jointly (column 6) in the estimations for amendments (H1). As many of the country data are unavailable for all countries in the main sample for the respective years, the sample sizes are smaller in these estimations.

The results of the full model (column 6) show that the overall market size within an MEA is associated with a higher number of amendments. Given the market size, the relevance of trade for original members has a small positive effect. Original members' income levels, environmental protection levels, and democracy levels are associated with more amendments to the MEAs, but this is all explained by the greater economic power behind them. Most importantly, when controlling for any of these country characteristics – or all of them – the impact of trade provisions on subsequent amendments remains unchanged.[13]

Table 3: Estimations for RULE-MAKING including control variables for original members

	(1) Amend	(2) Amend	(3) Amend	(4) Amend	(5) Amend	(6) Amend
Restrictive index	3.395***	2.420***	2.386*	2.025	3.118***	2.027***
	(0.747)	(0.704)	(1.228)	(1.252)	(0.774)	(0.739)
Liberalizing index	1.936	0.943	1.866	1.819	2.016	1.234
	(1.220)	(1.320)	(1.293)	(1.295)	(1.240)	(1.308)
Av. GDP p.c.	0.300***					0.557
	(0.094)					(0.354)
Total GDP		0.503***				0.550***
		(0.127)				(0.164)
Av. EPI			0.011*			-0.033
			(0.006)			(0.029)
Av. Polity				-0.008		-0.061
				(0.018)		(0.046)
Av. Trade					0.010	0.014*
					(0.008)	(0.008)
Depth	0.126	0.117	0.396*	0.437*	0.176	0.173
	(0.124)	(0.123)	(0.234)	(0.242)	(0.115)	(0.122)

[13] When controlling for the level of democracy (column 4), the result for the restrictive index becomes statistically marginally insignificant, although at a merely slightly lower point estimate. However, in the more precise full model that includes the level of democracy, it is statistically highly significant (column 6).

Duration	0.460***	0.735***	0.673**	0.735***	0.599***	0.997***
	(0.102)	(0.116)	(0.277)	(0.270)	(0.168)	(0.230)
Constant	-0.721***	-15.279***	-1.334***	-0.648**	-1.220***	-15.341***
	(0.230)	(3.625)	(0.390)	(0.291)	(0.320)	(4.925)
No. Observations	633	633	647	614	595	563

Table 4 depicts the results when including control variables on country characteristics when estimating the correlates of accessions (H2). Almost the same characteristics that influence amendments are also related to more accessions. In the full model (column 6), the total market size explains most of the association of the other control variables with more accessions to MEAs. Given market size, MEAs between countries that score high on trade openness also have more accessions. Additionally, MEAs between less democratic countries attract more accessions, taking into account all other country characteristics. The inclusion of these country-level variables does not qualitatively affect the estimated relationship between the restrictive index and accessions. Therefore, the results suggest that the more trade-restrictive MEAs are, the more likely they are to attract accessions, independent of these characteristics of the original members of the MEAs.

Table 4: Estimations for MEMBERSHIP including control variables for original members

	(1) Accessions	(2) Accessions	(3) Accessions	(4) Accessions	(5) Accessions	(6) Accessions
Restrictive index	3.586***	2.636***	3.483***	3.155***	3.281***	2.364***
	(0.656)	(0.345)	(0.677)	(0.702)	(0.679)	(0.373)
Liberalizing index	0.615	-1.691	0.447	0.361	0.533	-1.697
	(1.110)	(1.097)	(1.118)	(1.116)	(1.113)	(1.033)
Av. GDP p.c.	-0.000**					0.000
	(0.000)					(0.000)
Total GDP		0.902***				0.951***
		(0.081)				(0.086)
Av. EPI			0.013***			-0.003
			(0.004)			(0.026)
Av. Polity				0.000		-0.122***
				(0.013)		(0.038)
Av. Trade					0.003	0.010**
					(0.005)	(0.004)
Depth	-0.165	-0.204**	-0.113	-0.083	-0.107	-0.159*
	(0.109)	(0.093)	(0.105)	(0.103)	(0.103)	(0.090)
Duration	0.307***	0.787***	0.241***	0.288***	0.464***	0.870***
	(0.071)	(0.087)	(0.074)	(0.072)	(0.113)	(0.155)

Constant	1.826***	-24.710***	1.092***	1.923***	1.747***	-25.945***
	(0.123)	(2.412)	(0.276)	(0.146)	(0.296)	(3.026)
No. Observations	633	633	647	614	595	563

Robust standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

In addition to the country characteristics reported here, we also control for the level of trade liberalization through trade agreements among the original MEA members. To create this variable, we count the number of country pairs within an MEA that have at least one trade agreement signed between them. We include this as an additional control variable and report the results in **Table C 6** in the appendix. More trade agreements between original MEA members are associated with fewer amendments and accessions. However, the results on trade provisions in the respective MEAs are practically unaffected, indicating that the level of trade regulation between member countries through trade agreements does not confound our main findings.

We also control for other characteristics of the MEAs themselves that may be correlated with trade provisions, amendments, and accessions, thereby alleviating the risk of endogeneity. We begin by looking at the subject areas of the MEAs, as agreements on certain subject areas may likely include more trade-related provisions. The underlying data identify ten of such subject areas, with the most prevalent being agreements on pollution (140 MEAs), fisheries (108), freshwater (86), oceans (83), and biodiversity (81). The results for both amendments (column 1) and accessions (column 2) are depicted in

Table 5. They reveal notable differences between agreements of different subject areas in terms of the number of amendments and accessions.[14] The few MEAs on energy (28 MEAs) and security (5 MEAs) do not have any amendments. Controlling for the subject area reduces the point estimates for both amendments and accessions. For accessions, the results still show a significant effect of trade-restrictiveness. This suggests that even within subject areas, more trade-restrictiveness leads to more dynamism in terms of MEMBERSHIP. However, the finding for amendments becomes statistically insignificant (although still positive). This implies that it is MEAs in specific subject areas, such as biodiversity, pollution, and agriculture, that include a higher number of trade(-restrictive) provisions and are often amended. Therefore, we cannot determine whether it is the trade content or other characteristics of the subject areas that contribute to the increased RULE-MAKING dynamics. On the other hand, MEMBERSHIP tends to be more dynamic in more trade-restrictive MEAs, even within a given subject area.

[14] Note that the estimated constant in the baseline regressions for amendments is negative, resulting in most estimated constants for the different subject areas also being negative, and vice versa for accessions. The differences between the subject areas are statistically significant in many (though not all) cases, as evident from the comparison of standard errors.

Table 5: Estimations on RULE-MAKING and MEMBERSHIP, controlling for MEAs' subject areas

	(1) Amendments	(2) Accessions
Restrictive index	0.879	2.347***
	(1.372)	(0.758)
Liberalizing index	1.859	1.313
	(1.152)	(1.193)
Pollution	0.319	2.566***
	(0.390)	(0.191)
Fish	-1.316***	0.724***
	(0.411)	(0.247)
Freshwater	-1.893***	-1.074**
	(0.433)	(0.472)
Ocean	-0.777**	2.389***
	(0.382)	(0.289)
Biodiversity	-0.397	1.707***
	(0.321)	(0.265)
Agriculture	-0.997***	1.671***
	(0.364)	(0.278)
General	-3.084***	0.777**
	(0.810)	(0.338)
Others	-1.275	2.434***
	(0.911)	(0.340)
Energy		1.710***
		(0.523)
Weapons		2.855***
		(0.428)
Depth	0.454**	-0.019
	(0.192)	(0.103)
Duration	0.770***	0.426***
	(0.205)	(0.082)
No. Observations	647	647

Robust standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Next, we include further MEA characteristics as control variables. The results for the estimation on RULE-MAKING are depicted in **Table 6**. In terms of MEA characteristics, we therefore control for whether the EU (column 1) or the US (column 2) is an original signatory, whether a funding mechanism is in place (column 3), and whether provisions related to technical assistance (column 4) or differential treatment for developing countries (column 5) are included in the MEA. Column 7 includes all of these control variables simultaneously. The estimations for the results reported in column 6 consider only a subset of MEAs (424) that include specific amendment procedures. While some (16) of the 223 MEAs that do not include an amendment procedure were

amended nonetheless, they show too little variation in terms of trade restrictiveness to make statistical interference from interacting the restrictiveness index with the incorporation of an amendment procedure. To investigate whether these associations drive the results reported above, we only report the findings in column 6 for the sub-sample of MEAs that include an amendment procedure.

Regarding the explicit control variables, the results (focusing on those of the full model in column 7) indicate that treaties in which the EU and/or the US are original signatories exhibit more amendments, these being powerful countries likely to be able to adapt MEAs in their interest.[15] Given their original membership, MEAs with a funding mechanism are less dynamic in terms of RULE-MAKING. Technical assistance appears not to influence the likelihood of amendments. Most importantly, controlling for any or all these characteristics still results in point estimates similar to those shown above for the effect of trade-restrictive content on later amendments, albeit slightly reduced. Although in some estimations, these become marginally statistically insignificant, the full model still yields a statistically significant effect of trade restrictiveness on dynamism in terms of RULE-MAKING. The same is true for the sample of MEAs with an explicit amendment procedure (column 6).

Table 6: Estimations for RULE-MAKING including control variables for treaty characteristics

	(1) Amend	(2) Amend	(3) Amend	(4) Amend	(5) Amend	(6) Amend	(7) Amend
Restrictive index	1.913	1.536	2.405**	2.143*	1.969	1.817**	1.915*
	(1.288)	(1.093)	(1.199)	(1.202)	(1.295)	(0.917)	(1.115)
Liberalizing index	0.883	2.498*	1.747	1.680	1.958	0.886	1.355
	(1.315)	(1.328)	(1.271)	(1.264)	(1.315)	(1.452)	(1.245)
EU	1.214***						1.074**
	(0.376)						(0.455)
US		1.476***					1.417***
		(0.326)					(0.365)
Funding			-0.582				-1.002**
			(0.410)				(0.428)
Assistance				0.201			-0.264
				(0.365)			(0.411)
Diff. Treat.					0.836*		-0.122

[15] These MEAs also tend to be the ones that include differential treatment for developing countries, which explains the difference in the findings on that between columns 5 and 7.

					(0.453)		(0.533)
Depth	0.373	0.385*	0.416*	0.397*	0.382	0.467***	0.374
	(0.238)	(0.226)	(0.229)	(0.227)	(0.245)	(0.181)	(0.243)
Duration	0.877***	0.632***	0.696***	0.747***	0.753***	1.034***	0.705**
	(0.291)	(0.240)	(0.263)	(0.273)	(0.268)	(0.229)	(0.277)
Constant	-0.993***	-1.336***	-0.683**	-0.767**	-0.771**	-0.392	-1.422***
	(0.379)	(0.254)	(0.294)	(0.338)	(0.303)	(0.325)	(0.314)
No. Observations	647	647	647	647	647	424	647

In columns 1 through 5 of **Table 7**, we report the results of the estimations for accessions with the same treaty-specific controls. The possibility to amend should (and does) not affect the likelihood of accessions. Instead, the number of members is likely to make a difference for MEMBERSHIP dynamism: more original members could indicate a more attractive MEA and more peer pressure on other countries to join. However, as MEMBERSHIP increases, there are fewer countries "left" to join. To account for this potential non-linearity, we include the number of original members as well as a squared term of that number in the regressions (column 6).

Most of the relationships presented so far are similar for amendments and accessions. This suggests that trade-restrictive agreements are generally more dynamic. Another interpretation could be that RULE-MAKING and MEMBERSHIP are interlinked, and that more amendments to an agreement also increase the likelihood of accessions, because they indicate a more lively and timely agreement. To test this interpretation, we include amendments as an additional control variable in the estimation using accessions as the dependent variable. The results are reported in column 7 of **Table 7**. Column 8 presents the full model, including all control variables simultaneously.

The results of the full model (column 8) show that given all other characteristics, none of the treaty characteristics analyzed before affect the likelihood of accessions. Only the membership of the US as a powerful actor appears to slightly incentivize countries to join an MEA. Larger MEAs in terms of membership attract more accessions but this effect decreases as membership increases, as expected. Agreements with more amendments are also more likely to gain new members. None of the control variables, except for membership size, qualitatively affect the estimate for trade-restrictive content. Even when we account for the fact that larger agreements are also more trade-restrictive, the effect of trade restrictiveness given membership remains strongly significant, which confirms the robustness of our results. [16]

[16] The reduced point estimate shows that the number of original members explains part of the association between trade restrictiveness and accessions. However, not only is it still significant and substantial in size, but it is also unclear to which extent agreements with an intermediate number of original members that happen to contain more trade-restrictive provisions attract more accessions, or if it is their trade-related content that drives the accessions.

Table 7: Estimations for MEMBERSHIP including control variables for treaty characteristics

	(1) Access	(2) Access	(3) Access	(4) Access	(5) Access	(6) Access	(7) Access	(8) Access
Restrictive index	3.078***	3.054***	2.787***	2.917***	3.249***	1.543***	3.182***	1.200***
	(0.611)	(0.428)	(0.681)	(0.731)	(0.715)	(0.338)	(0.589)	(0.448)
Liberalizing index	-0.765	0.107	0.598	-0.380	0.334	-2.015*	0.279	-2.888***
	(1.200)	(1.115)	(1.196)	(1.263)	(1.090)	(1.082)	(1.055)	(1.120)
EU	1.047***							0.151
	(0.234)							(0.282)
US		1.681***						0.519*
		(0.209)						(0.265)
Funding			0.907***					0.477
			(0.307)					(0.332)
Assistance				0.719**				0.219
				(0.286)				(0.286)
Diff. Treat.					0.823**			0.362
					(0.356)			(0.297)
Original Members						0.083***		0.069***
						(0.007)		(0.008)
Orig. Members ^2						-0.000***		-0.000***
						(0.000)		(0.000)
Amendments							0.048***	0.036***
							(0.005)	(0.004)
Depth	-0.152	-0.172*	-0.100	-0.127	-0.137	-0.063	-0.208**	-0.227***
	(0.099)	(0.103)	(0.101)	(0.098)	(0.100)	(0.089)	(0.097)	(0.085)
Duration	0.396***	0.166**	0.348***	0.389***	0.310***	0.340***	0.191***	0.313***
	(0.081)	(0.073)	(0.078)	(0.088)	(0.074)	(0.086)	(0.067)	(0.094)
Constant	1.675***	1.147***	1.761***	1.694***	1.825***	0.612***	1.786***	0.403**

	(0.146)	(0.170)	(0.132)	(0.148)	(0.131)	(0.152)	(0.118)	(0.168)
No. Observations	647	647	647	647	647	647	647	647

Robust standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Next, we discuss the enforceability of MEAs as another potential characteristic that can be expected to be associated with trade restrictiveness and treaty dynamism alike. Enforceability, however, may not only be correlated with the levels of both trade regulation and dynamism but can also influence their relationship: more enforceable trade-related provisions could accelerate environmental transitions within MEA member countries and, in turn, increase the demand for amendments to the respective MEAs as they are likely to put greater pressure on non-members to accede to the MEA with enforceable provisions. We do not have data on the degree of obligation of individual provisions, but we know whether MEAs have an enforcement or compliance mechanism in place. To analyze the relationships laid out above, we not only include this dummy variable as an additional control but also interact it with the restrictive and liberalizing trade indices, respectively. The results are depicted in **Table *8*** (column 1 for RULE-MAKING and column 2 for MEMBERSHIP).

In both estimations, the point estimate for the restrictive index is positive as is the point estimate when the index is interacted with enforcement. For RULE-MAKING (column 1), however, the trade-restrictive index is only associated in a statistically significant manner with amendments when the MEAs are enforceable. In other words, the positive effect of trade-restrictive provisions we find in the main analysis on the number of amendments only holds for MEAs with an enforcement or compliance mechanism. For MEMBERSHIP (column 2), the relationship is significant, independently of enforceability. One plausible explanation for this slight difference could be that non-enforceable MEAs with trade-restrictive provisions have fewer tangible effects on domestic power dynamics than on incentivizing non-members to join. Put differently, if an MEA does not include an enforcement mechanism, it is less likely to meaningfully empower environmentally friendly firms at the expense of polluting firms through its trade provisions. At the same time, the identical MEA can still generate perceived benefits to non-members and thus attract them to accede to the MEA. Indeed, the fact that non-enforceability is irrelevant to the benefits of MEAs perceived by non-members can be seen as strengthening our overall argument.

Table 8: Estimations with enforcement interactions, RULE-MAKING and MEMBERSHIP

	(1) Amendments	(2) Accessions
Restrictive index	1.445	2.925***
	(1.340)	(0.835)
Restrictive X Enforcement	2.699*	1.605
	(1.601)	(0.995)
Liberalizing index	1.436	-0.010
	(1.533)	(1.464)

Liberalizing X Enforcement	0.636	-1.096
	(4.217)	(2.205)
Enforcement	-0.400	0.207
	(0.677)	(0.337)
Depth	0.426*	-0.094
	(0.231)	(0.104)
Duration	0.702***	0.277***
	(0.262)	(0.072)
Constant	-0.674**	1.884***
	(0.296)	(0.129)
No. Observations	647	647

Robust standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Lastly, the regional span of an MEA may also impact both trade provisions and the dynamism of the MEA, in addition to the relationship we hypothesized. To account for this, we include as additional controls dummy variables indicating whether a treaty is regional (spanning only countries from one continent, which is the case for 334 MEAs), pluriregional (2-4 continents, 221 MEAs), or multiregional (5 continents, 92 MEAs). We also interact these dummy variables with the restrictive and liberalizing indices to investigate whether their effects are conditional on regionality. It is important to note that the relatively small remaining number of MEAs per type of regionality makes it challenging to draw statistical inferences. Nonetheless, we report the results in **Table C *7*** in Appendix C for RULE-MAKING (column 1) and MEMBERSHIP (column 2). For amendments, given less overall variation, the results for the trade-restrictive index by each type of treaty regionality lose their statistical significance. However, the picture for both aspects of dynamism is notable: trade restrictiveness is positively associated with treaty dynamism for regional and multiregional agreements but not (or much less) for pluriregional ones. This suggests that the results presented above are driven by and therefore particularly relevant for regional and multiregional agreements.

Overall, we find support for our two hypotheses on RULE-MAKING and MEMBERSHIP. Both analyses show that a higher trade content in MEAs is associated with increased institutional dynamism. Inference for RULE-MAKING delivers less clear-cut and more nuanced results, which is partially driven by the fact that MEAs in some subject areas comprise more trade-related content and also exhibit more amendments. The results for MEMBERSHIP, on the other hand, are very robust and show that the trade content of MEAs is associated with more accessions. The effect for both RULE-MAKING and MEMBERSHIP is mostly driven by trade-restrictive provisions, as opposed to trade-liberalizing provisions. In the case of amendments, this may be explained by the fact that these provisions have more immediate effects or are more economically impactful than trade-liberalizing provisions. Trade-restrictive provisions might be more harmful to polluting firms and generate greater changes in the domestic composition of interest groups.

In the case of accessions, one possible explanation is that trade-restrictive and trade-liberalizing provisions communicate different signals to non-party countries and these countries do not react similarly to such signals. Liberalizing provisions favor trade between parties. There is little interest for any state in formalizing a trade-liberalizing concession in a treaty and extending this privilege to all states, including non-parties. Restrictive provisions, for their part, can create similar discriminatory effects against non-parties. Non-parties are likely to face trade measures that are even more restrictive than those imposed on parties. For example, an MEA might prohibit exports of specific goods to non-parties, while only imposing conditions for exports to other parties. In sum, trade-liberalizing provisions create a positive club good (trade flows increase more among parties than with non-parties) whereas trade-restrictive provisions create a negative club good (trade flows decrease less among parties than with non-parties). In line with findings from behavioral economics and the loss aversion argument (Kahneman and Tversky 1979), it may be the case that non-party countries (or their domestic interest groups) react more strongly to the potential losses generated by trade-restrictive provisions than to the potential gains generated by trade-liberalizing provisions in MEAs.

Conclusion

This paper finds that trade-restrictive provisions in environmental agreements can dissipate the so-called 'ambition/participation dilemma' by favoring institutional expansion over time, both in terms of ambition and participation. It also provides evidence that MEAs have consequences for both domestic and international political economies. First, MEAs with trade provisions can contribute to changing the composition of domestic interest groups and increase support for additional environmental commitments. The relationship between trade provisions and subsequent amendments, especially when the MEA is enforceable, supports the idea that state preferences are unstable and can be reoriented by changes in domestic power dynamics. Second, MEAs that restrict trade with non-parties change their interest calculation and provide incentives for accession.

These findings are particularly instructive for the current debate on what the main obstacles are to a transition toward decarbonization. It has long been assumed that states are caught in the suboptimal equilibrium of a prisoner's dilemma. According to this well-established view, states are not willing to pay a heavy price for decarbonization if their foreign competitors can free ride on their efforts and enjoy the benefit of a more stable climate without paying their fair share. Nordhaus' (2015) proposal to create climate clubs aims to address this free-rider problem. He argues that a hypothetical agreement imposing trade penalties on non-parties would incentivize reluctant states "to participate in agreements with high levels of abatement" (2015: 1347). More recently, scholars have pointed out that the prisoner's dilemma has been greatly overestimated as an explanation (Aklin and Mildenberger 2020). Instead, the main obstacle to decarbonization might be distributive conflicts between owners of assets that accelerated climate change and owners of assets that are vulnerable to climate change (Colgan *et al.* 2021). If so, the way to accelerate the energy transition is not through the conclusion of climate clubs but through the disruption of domestic political systems that give power to owners of assets that exacerbate climate change.

This debate on the value of climate clubs suffers from a lack of empirical studies. Since no climate clubs currently exist, at least not in the form envisioned by Nordhaus (2015), the literature mainly relies on theoretical inquiries, game theory, and agent-based models (e.g., Kemfert 2004; Lessmann *et al.* 2009; Hovi *et al.* 2019). However, MEAs with trade provisions provide analogous institutional setups and might be instructive for the design of climate clubs. Even though climate change is a *sui generis* problem due to its scale, it would be ill-advised to move forward on the creation of climate clubs without looking at the experience of existing MEAs and identifying design elements that are most likely to generate the expected benefits.

Our findings based on various MEAs are consistent with a middle-ground argument: both domestic and international political economies matter. MEAs can simultaneously pressure other jurisdictions to join in the effort and create within parties favorable political economy conditions to raise their environmental ambitions. In sum, although no one should attempt to kill any number of birds by throwing stones at them, treaty negotiators should consider more frequently incorporating trade provisions in MEAs to simultaneously alter both domestic and foreign interests.

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A. Appendix A

For the two indices, we sum the dimensions and divide them by the sum of all weights such that the respective index values are between 0 and 1. We assign a weight of 4 to provisions that we expect to directly and substantially affect trade flows with non-parties, a weight of 3 to provisions that we expect to directly and substantially affect trade flows, a weight of 2 to provisions that we expect to more indirectly affect trade flows, and a weight of 1 to all other (in many cases broader and more general) trade provisions in MEAs.

A.1 Liberalizing Index

Dimension 1.1: Liberal principles

Indicators	*Weight*	*No. of MEAs*
General commitment toward liberalized trade	1	120
Environmental measures should not hamper trade	1	19

Sum of the indicators. Score of this dimension between 0 and 2.

Dimension 1.2: Non-discrimination in trade

Indicator	*Weight*	*No. of MEAs*
Most-favored-nation treatment	3	15
National treatment	3	22
Other references to non-discrimination in trade	1	105

Sum of the indicators. Score of this dimension between 0 and 7.

Dimension 1.3: Non-limitation of trade

Indicator	*Weight*	*No. of MEAs*
Non-prohibition or non-limitation of importations	3	127
Non-prohibition or non-limitation of exportations	3	69

Sum of the indicators. Score of this dimension between 0 and 6.

Dimension 1.4: Promotion of trade

Indicator	*Weight*	*No. of MEAs*
Ecotourism	1	24
Trade in environmental goods or services	1	20
Promotion of ecolabels or certifications	1	24
Emissions trading schemes	1	12

Sum of the indicators. Score of this dimension between 0 and 4.

Dimension 1.5: Promotion of a liberal market economy

Indicator	*Weight*	*No. of MEAs*
Access to natural resources is facilitated	2	323

Liberalize foreign investment	2	43
Restrict subsidies	2	4
Restrict monopolistic practices	2	4
Liberalize public procurement	2	9

Sum of the indicators. Score of this dimension between 0 and 10.

Dimension 1.6: Acknowledgment of international trade commitments

Indicator	*Weight*	*No. of MEAs*
Cooperation with GATT-WTO	2	1
Reference to GATT-WTO	1	31
Cooperation with another trade institution	2	18
Reference to another trade institution	1	378

Highest indicators. Score of this dimension between 0 and 2.

A.2 Restrictive Index

Dimension 2.1: Restrictive principle

Indicator	*Weight*	*No. of MEAs*
Inappropriateness to relax environmental measures to encourage trade or investment	3	10

Score of this dimension between 0 and 3.

Dimension 2.2: Import restrictions

Indicator	*Weight*	*No. of MEAs*
Prohibition on import without a permit	3	14
Other import prohibition	3	67
Importer can require information	3	54
Importer can require quarantine	2	49
Other import restriction of general application	3	137
Ad hoc refusal of importations	2	38
Non-tariff duties or import taxes	3	7

Highest indicators. Score of this dimension between 0 and 3.

Dimension 2.3: Export restrictions

Indicator	*Weight*	*No. of MEAs*
Prohibition to export without a permit	3	26
Other export prohibitions	3	40
Exporter must notify the importer	2	17
Information requirement for exporter	2	121
Other export restrictions of general application	3	123
Ad hoc refusal of exportations	2	20
Export taxes	3	4

Highest indicators. Score of this dimension between 0 and 3.

Dimension 2.4: Trade with non-members

Indicator	*Weight*	*No. of MEAs*
Regulation of imports from non–parties	4	23
Regulation of exports to non-parties	4	32

Sum of the indicators. Score of this dimension between 0 and 8.

Dimension 2.5: Restrictions on a liberal market economy

Indicator	Weight	No. of MEAs
Access to natural resources is restricted	2	30
Foreign investment is restricted	2	3
Monopolistic practices are authorized	2	1
Public procurement is protected	2	0
Subsidies are authorized	2	1

Sum of the indicators. Score of this dimension between 0 and 10.

B. Appendix B

Table B 1: Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Accessions	647	7.885626	21.8211	0	169
Amendments	647	0.7897991	4.178563	0	69
No. Provisions	647	1.255023	2.073316	0	17
No. Restrictive	647	0.309119	1.201248	0	10
No. Liberalizing	647	0.5455951	1.094883	0	13
Restrictive Index	647	0.0243935	0.0883145	0	0.6086956
Liberalizing Index	647	0.0248791	0.0570727	0	0.7096774
Depth	647	0.7913447	1.453528	0	8
Duration	647	28.17465	16.9552	1	72
Av. (log of) GDP p.c.	633	8.751012	1.189432	5.931106	10.8914
Total GDP (log)	633	28.13425	2.283949	21.88186	32.12574
Av. EPI	647	55.86051	15.60559	27.75	81.15
Av. Polity	614	4.312946	5.552725	-9	10
Av. Trade	595	53.34471	18.47031	12.97354	161.3266
EU	647	0.1452859	0.3526615	0	1
US	647	0.2534776	0.4353385	0	1
Funding	647	0.0850077	0.279109	0	1
Assistance	647	0.2225657	0.4162908	0	1
Diff. Treatment	647	0.0370943	0.1891391	0	1
Original Members	647	17.47604	29.20122	3	194
Amendment Procedure	647	0.2194745	0.4142108	0	1
Enforcement	647	0.049459	0.2169922	0	1
Trade agreement	647	0.4303985	0.3551198	0	1

C. Appendix C

Table C 1: Baseline for RULE-MAKING, Negative Binomial estimation

	(1) Amendments	(2) Amendments	(3) Amendments
No. Provisions	0.192**		
	(0.094)		
No. Restrictive		0.148	
		(0.116)	
No. Liberalizing		0.267	
		(0.171)	
Restrictive Index			2.237
			(1.764)
Liberalizing Index			2.648
			(3.519)
Depth	0.218	0.214	0.241
	(0.155)	(0.155)	(0.159)
Duration	0.710***	0.729***	0.669***
	(0.168)	(0.171)	(0.168)
Constant	-0.728***	-0.759***	-0.665***
	(0.170)	(0.178)	(0.173)
No. Observations	647	647	647

Robust standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table C 2: Baseline for MEMBERSHIP: Negative Binomial estimation

	(1) Accessions	(2) Accessions	(3) Accessions
No. Provisions	0.175**		
	(0.069)		
No. Restrictive		0.219**	
		(0.099)	
No. Liberalizing		0.094	
		(0.127)	

Restrictive Index			3.557**
			(1.408)
Liberalizing Index			-0.288
			(2.534)
Depth	-0.133	-0.124	-0.143
	(0.112)	(0.113)	(0.113)
Duration	0.480***	0.465***	0.437***
	(0.143)	(0.145)	(0.143)
Constant	1.797***	1.824***	1.858***
	(0.126)	(0.133)	(0.128)
No. Observations	647	647	647

Robust standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table C 3: RULE-MAKING and MEMBERSHIP, Controlling for Squared and Cubic Duration

	(1) Amendments	(2) Accessions	(3) Amendments	(4) Accessions	(5) Amendments	(6) Accessions
Restrictive index	2.218*	3.187***	2.243**	3.195***	2.690***	3.182***
	(1.143)	(0.617)	(1.138)	(0.622)	(0.900)	(0.617)
Liberalizing index	1.872	0.391	1.877	0.407	1.504	0.366
	(1.289)	(1.070)	(1.294)	(1.074)	(1.219)	(1.069)
Depth	-0.000	-0.001***	0.398**	-0.074	0.411**	-0.064
	(0.001)	(0.000)	(0.190)	(0.106)	(0.164)	(0.106)
Duration	0.413**	-0.069	0.585	1.146***	8.594***	3.803***
	(0.198)	(0.106)	(0.411)	(0.279)	(2.744)	(1.311)
Duration^2	0.841	1.936***			-0.013***	-0.005**
	(0.795)	(0.483)			(0.004)	(0.002)
Duration^3			0.000	-0.000***	0.000***	0.000
			(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.633	3.231***	-0.789	2.364***	7.822***	5.350***
	(0.958)	(0.448)	(0.510)	(0.224)	(2.705)	(1.479)
No. Observations	647	647	647	647	647	647

Robust standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table C 4: Panel PPML estimates, RULE-MAKING

	(1) Amendments	(2) Amendments	(3) Amendments
No. Provisions	0.142**		

	(0.059)		
No. Restrictive		0.150**	
		(0.073)	
No. Liberalizing		0.131	
		(0.082)	
Restrictive Index			2.125*
			(1.200)
Liberalizing Index			1.711
			(1.242)
Depth	0.382**	0.381**	0.380**
	(0.168)	(0.169)	(0.175)
Constant	-3.770***	-3.768***	-3.749***
	(0.242)	(0.243)	(0.241)
Year FE	Yes	Yes	Yes
No. MEAs	647	647	647
No. Observations	19377	19377	19377

Robust standard errors clustered on MEA-level in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table C 5: Panel PPML estimates, MEMBERSHIP

	(1) Amendments	(2) Amendments	(3) Amendments
No. Provisions	0.158***		
	(0.038)		
No. Restrictive		0.203***	
		(0.040)	
No. Liberalizing		0.079	
		(0.070)	
Restrictive Index			3.154***
			(0.651)
Liberalizing Index			0.683
			(1.050)
Depth	-0.025	-0.029	-0.046
	(0.095)	(0.097)	(0.094)
Constant	-1.401***	-1.386***	-1.382***

	(0.120)	(0.120)	(0.120)
Year FE	Yes	Yes	Yes
No. MEAs	647	647	647
No. Observations	19377	19377	19377

Robust standard errors clustered on MEA-level in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table C 6: Trade agreements

	(1) Amendments	(2) Accessions
Restrictive index	2.211*	3.411***
	(1.179)	(0.581)
Liberalizing index	1.853	0.477
	(1.269)	(1.046)
Trade agreements	-0.939***	-1.493***
	(0.309)	(0.203)
Depth	0.388*	-0.133
	(0.236)	(0.105)
Duration	0.579**	0.079
	(0.278)	(0.075)
Constant	-0.357	2.405***
	(0.338)	(0.141)
No. Observations	647	647

Robust standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table C 7: Results for RULE-MAKING and MEMBERSHIP, by and Controlling for Regionality

	(1) Amendments	(2) Accessions
Restrictive index X Regional	2.256	2.362*
	(2.222)	(1.368)
Restrictive index X Pluriregional	-2.559	1.768
	(3.138)	(1.607)
Restrictive index X Multiregional	1.156	1.655***
	(1.076)	(0.470)
Liberalizing index X Regional	2.252	2.871
	(2.413)	(2.868)

Liberalizing index X Pluriregional	2.658*	-1.188
	(1.478)	(1.609)
Liberalizing index X Multiegional	1.157	-0.777
	(3.046)	(1.239)
Regional	-1.872***	0.077
	(0.349)	(0.196)
Pluriregional	-0.402**	1.664***
	(0.193)	(0.197)
Multiregional	0.342	3.488***
	(0.569)	(0.133)
Depth	0.492**	-0.023
	(0.226)	(0.099)
Duration	0.741***	0.296***
	(0.237)	(0.067)
No. Observations	647	647

Robust standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01