Does institutional proliferation undermine cooperation? Theory and evidence from climate change

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November 25, 2020

Supporting information for online publication

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A Global climate governance dataset

The global climate dataset is designed as a complement to existing work on international and transnational climate governance research. International climate research has tended to focus on the the United Nations-led climate governance process (see Gupta (2014), Bodansky et al. (2017), and Kaya and Schofield (2020) for examples). A recent boom of transnational climate research focuses on the contributions of public and private non-state actors to governing climate change outside the UN climate process (see Bulkeley et al. (2014), Andonova et al. (2017), and Hale (2020) for examples). However, the literature has largely overlooked the activity of *states* in seeking alternative institutional forums for climate governance. To the extent that the literature has engaged with this activity, it has mostly been to highlight how these institutions pale in comparison to idealized climate mitigation "clubs" (Falkner 2016). As a result, we have little systematic understanding of what these institutions are, why they were established, and why states join them. With global governance as a whole increasingly characterized by institutional density, global climate governance offers insights into how dense institutional environments work.

I create a new dataset to study state participation in institutionalized climate cooperation. My dataset tracks climate governance institutions established since 1990 that include states as members. Like international institutions in general, these institutions vary along a number of design dimensions, such as the number of members, the types of members, their legal obligations, and their independence. However, they are all united in their focus on climate change and their inclusion of national governments as members. In contrast to other datasets that select institutions based on certain design features (see e.g., Pevehouse et al. (2004)), these institutions are selected based on their subject matter and types of members.

I track state membership in institutions over time using publicly available documents on institutions' websites. No central depository of all international institutions exists. To identify climate institutions, I rely on existing studies, online databases from the UNFCCC, as well as snowballing from the institutions uncovered. Many of these institutions were identified through the secondary literature on transnational climate governance (Bulkeley et al. 2014), international climate governance (Widerberg and Pattberg 2015), and the United Nations Climate Secretariat's own listings (UN Climate Change 2013). I am confident that this has allowed me to capture close to the full population of climate institutions up to the adoption of the Paris Agreement. The data

collection strategy has also been broadly successful, allowing me to identify the timing of state membership in nearly every climate institution. Of course, it is possible that some institutions have gone unnoticed, but since institutions frequently refer to others in their documents, even if only in passing, I am confident that I have identified nearly all climate institutions that fit my inclusion criteria.

The inclusion criteria for climate institutions were selected to complement existing work in transnational climate governance, except in my case, I redefine the key type of actors as states rather than non-state actors.[1] Specifically, a global climate governance institution must:

(1) have states as members,

(2) meet regularly outside UNFCCC negotiations,

(3) have states join that institution to become members, and

(4) have been established explicitly to pursue governance objectives within climate change.

Each of these criteria are detailed in the paragraphs below. With these criteria, my data on state participation in climate institutions can be easily paired with data on transnational climate governance for future analyses.

First, climate institutions must have states as members, but unlike formal international organizations, states do not need to be the only type of members permitted. Transnational schemes that include states along with non-state actors (firms, non-governmental organizations, intergovernmental organizations, sub-national governments, etc.) are eligible for inclusion. The Global Gas Flaring Reduction Partnership is an example where national officials meet with representatives from the World Bank and oil companies to discuss best practices in gas flaring at oil extraction sites.[2] However, initiatives with only non-state actors are not included in my dataset (such as the C40 Cities Climate Leadership Group) or partnerships between secretariats of international organizations and firms (such as the UN Principles on Responsible Investment). Limiting the range of cases to institutions with state members is important for testing my theoretical expectations about the drivers of state membership.

Second, the institutions in my dataset must be organized around climate change but also go beyond the UNFCCC to meet regularly outside the COPs. Intra-COP negotiating groups, such as the

[1] Hale and Roger (2014) provide a thorough set of criteria for inclusion in their transnational climate governance dataset, which I used as a reference in considering my own population of cases.

[2] The World Bank estimates that roughly 145 billion cubic meters of gas were flared in oil production in 2015, leading to 350 million tonnes (Mt) of CO_2eq being emitted into the atmosphere, roughly Argentina's annual emissions in 2015, the world's 25th largest emitter or 0.7% of annual global GHG emissions. World Bank 2016.

Umbrella Group, or cross-cutting diplomatic groups, such as the G77, are not included in my study. In a sense, these negotiating groups constitute the background against which we can evaluate other patterns of organization in climate governance. The Association of Small Island States (AOSIS), by contrast, predates the UNFCCC negotiations and meets regularly outside the COP process, as well as constituting a negotiating group in the COPs. As such, I include AOSIS as a climate governance institution in my dataset.

Third, state membership in the institutions in my dataset must result from governmental decisions to join that particular institution. To join the Climate and Clean Air Coalition, a high-ranking government official needs to submit a statement affirming the organization's principles. In contrast, membership in the Intergovernmental Panel on Climate Change (IPCC) is automatic for state parties to the World Meteorological Organization or the United Nations. Only in the former instance is membership in the institution a choice, and therefore institutions like the IPCC are not included in my dataset.

A related case is when an existing institution develops new climate competencies or when it mainstreams climate considerations into its existing operations. Such institutions are not in the dataset by virtue of this alone because I am interested in how states *choose* to participate in climate governance rather than instances where climate governance is passed on to them. For example, in the early 2000s, the Organization for Economic Cooperation and Development (OECD) created the Climate Change Expert Group (CCXG) as an internal forum on the technical issues in climate change. All OECD members are members of the CCXG by virtue of their membership in the OECD, and so the CCXG is not in the dataset. Similarly, the G20 is not in the dataset, even though the G20 member states adopted rules in 2007 on phasing out fossil fuel subsidies. The OECD and the G20 have developed new competencies in climate change, but they are not stand-alone, purpose-built forums designed to address climate change. By contrast, several international organizations have created new climate institutions where the new institution's membership differs from its parent's. In 2009, the International Energy Agency (IEA) led the creation of the Clean Energy Ministerial (CEM) and only a subset of IEA members are members of CEM. In this case, I treat CEM membership as a choice for IEA members and included the CEM in my study as an instance of states seeking new institutional forums to address climate change.

Finally, the initiatives in question must explicitly pursue governance objectives in relation to

climate change. International rule-making may take the form of public international law, such as treaty law, where parties accept binding international legal obligations (Abbott and Snidal 1998). States or transnational actors may also draft soft law or regulatory standards to meet cooperative goals by weakening any of the precision, bindingness or delegation of hard treaty law (Abbott and Snidal 2000). However, international governance may also take the form of direct operational or financial support for actors and projects, or sharing information or networking different important key actors (Abbott and Snidal 2009). Since many of the initiatives in my study are not treaty-based international organizations, they lack access to hard international law as a way of regulating targets, and must therefore rely on softer forms of governance to steer targets towards goals (Abbott et al. 2015). The governance criteria is more discriminating in the context of TCG, where scholars are interested in separating governance activities from lobbying (Hale and Roger 2014). Defining hard law as a criteria for inclusion would exclude the majority of climate institutions and truncate the dataset in a somewhat arbitrary way. Furthermore, the inclusion of softer initiatives helps re-orient the literature on regime complexity and institutional proliferation away from a narrow focus on rule conflicts and compliance, and toward a broader focus on membership and how states use dense institutional environments.

Figure S-1 demonstrates how these different types of institutional responses to climate change fit together. The UN climate bodies lie at the core of the global response to climate change. These comprise the major UN treaties and other institutions established by or through the UN climate secretariat. Some of these institutions meet the criteria for inclusion in my dataset, such as the Joint Implementation program, where states proactively join and choose to participate in the program—a subset of UNFCCC members choose to manage a portion of their emissions mitigation obligations through the Joint Implementation program, but others decide not to use the program. I include these institutions in my study since they also reflect active state choices to participate in climate governance. However, a number of other UN-emanating institutions do not meet my criteria, as they lack states as members (e.g., the UN Principles for Responsible Investment) or membership is a function of other preexisting institutional memberships (e.g., the IPCC). Since many of the climate institutions emanating from the UN-led process have narrow membership compared to the UNFCCC, I consider their dynamics as comparable, though I do not assume they are identical, to the dynamics of membership in the wider climate environment. The partially overlapping circles in

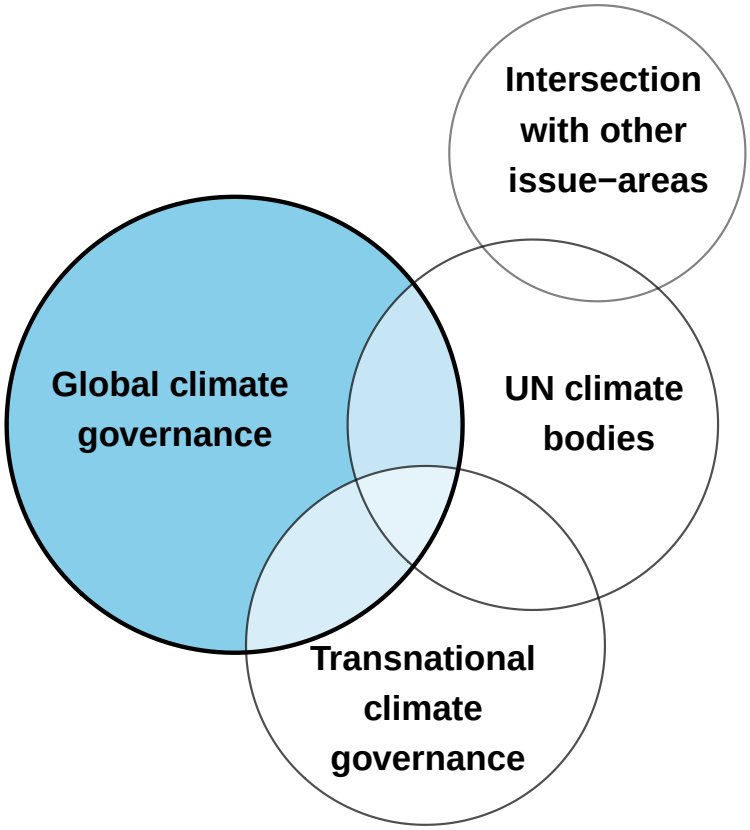

Figure S-1: Varieties of institutions in climate governance

figure S-1 indicate this relationship.

International institutions in areas outside of climate change have increasingly adopted internal rules about sustainability and climate change. This includes the International Maritime Organization's attempts to adopt GHG reduction targets for maritime shipping, which have been under consideration since the late 1990s. Similarly, proposals to enforce rules on climate change by linking climate with the trade regime represent the area of possible overlap between UNFCCC rules and those in other issue-areas. The existence of institutions with overlapping functional scope is often referred to as a regime complex. However, the case of climate governance indicates that this concept is under-specified in practice. There may be a large number of institutions within an issue-area (i.e., high intra–issue-area density) and there may be overlap across issue-areas (e.g., trade and climate), but these are actually two concepts that do not need to move in lock-step. It is possible to have a high degree of overlap across issue-areas with only one institution in each issue-area. It is similarly possible to have high intra–issue-area density but little overlap with other

issue-areas. Climate governance blurs a bit of both. There is a high level of intra–issue-area density and some intersection with other issue-areas, such as the new rules on hydrofluorocarbons in the Kigali Amendment to the Montreal Protocol, though most climate linkages remain speculative. In this study, I treat within climate institutional density only. I consider these institutions as tied together by common reference points. Granted, the ultimate success or failure of international rules on carbon emissions may require some issue-linkage, but it is not important for the research questions in this study to examine every possible issue-linkage.

A.1 List of climate institutions

Table S-1: List of climate institutions

Climate governance institution	Year	Members
Activities Implemented Jointly	1995	51
Adaptation for Smallholder Agriculture Program	2012	43
Alliance of Small Island States	1990	38
Asia Forest Partnership	2002	13
Asia-Pacific Partnership on Clean Development and Climate	2005	7
BioCarbon Fund	2004	14
Bonn Challenge	2011	12
Carbon Partnership Facility	2009	14
Carbon Pricing Leadership Coalition	2015	19
Carbon Sequestration Leadership Forum	2003	22
Cartagena Dialogue	2010	47
Clean Development Mechanism	2001	82
Clean Energy Ministerial	2009	24
Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants	2012	49
Climate Investment Funds (Clean Technology Fund and Strategic Climate Fund)	2008	64
Climate Technology Initiative	1995	11
Climate Vulnerable Forum	2009	20
Congo Basin Forest Partnership	2002	20
Doha Amendment to the Kyoto Protocol	2013	59
Efficient Electrial End Use Equipment Initiative	2008	11
Food Security Climate Resilience Facility	2015	5
Forest Carbon Partnership Facility	2008	61
GEF Climate Window	1992	153
Global Alliance for Clean Cook Stoves	2010	NA
Global Alliance For Climate-Smart Agriculture	2014	24
Global Bioenergy Partnership	2007	23
Global Climate Change Alliance	2008	42
Global Facility for Disaster Reduction and Recovery	2006	49
Global Gas Flaring Reduction Partnership	2002	23
Global Geothermal Alliance	2014	6
Global Methane Initiative	2004	43
Global Research Alliance on Agricultural Greenhouse Gases	2009	45
Global Resilience Partnership	2014	2
Green Climate Fund	2010	NA
International Carbon Action Partnership	2007	14
International Energy and Climate Initiative - Energy+	2010	17
International Partnership for Energy Efficiency Cooperation	2009	15
International Partnership for the Hydrogen Economy	2003	19
International Partnership on Mitigation and Measuring, Reporting and Verification (renamed, Partnership for Transparency in the Paris Agreement)	2010	96
International Renewable Energy Agency	2009	147

International Zero-Emission Vehicle Alliance	2015	4
Johannesburg Renewable Energies Coalition	2002	90
Joint Implementation	2002	32
Kyoto Protocol	1997	190
Least Developed Countries Fund	2002	73
Low Emission Development Strategies Global Partnership	2011	23
Major Economies Forum (formerly, Major Economies Meeting)	2007	16
Mission Innovation	2015	21
Mitigation of Climate Change in Agriculture Programme	2010	3
Partnership for Market Readiness	2011	31
Petersberg Climate Dialogue	2010	43
Prototype Carbon Fund	2000	18
REDD+ Partnership	2010	75
REN21	2005	9
Renewable Energy and Energy Efficiency Partnership	2002	47
SIDS Lighthouses Initiative	2015	32
Soils for Food Security and Climate	2015	30
Special Climate Change Fund	2002	67
Tropical Forest Alliance 2020	2012	8
UN-REDD Programme Fund	2009	60
UNIDO-UNEP Green Industry Platform	2009	29
United Nations Framework Convention on Climate Change	1992	194
Zero Routine Flaring by 2030 Initiative	2015	19

‘NA’ refers to institutions where membership information was unavailable

B Climate ideal point estimation

B.1 IRT modeling considerations

In this section, I outline in more detail some of the modeling considerations in the item response theory (IRT) ideal point estimation.

Modeling membership in climate institutions has a number of advantages over using more naive sum or share measures of membership. As described in text, these more naive measures cannot account for correlations among memberships or dimensions of membership. These measures also imply that every membership is equal, since each institution counts the same in the measure, namely 1 (sum) or $1/J$ (share) where J is the number of institutions. This may be a misleading indicator of participation if institutions do different things or states have differential access to institutions. I discuss heterogeneity in institutions in greater detail in the body of the paper. States might have different access to institutions, such as when an institution is only open to members of another institution. For example, the Efficient Electrical End Use Equipment Initiative is only open to members of the International Energy Agency, and schemes such as Joint Implementation are only open to parties to the Kyoto Protocol. If states have different access to institutions, then the sum will mis-characterize the extent of membership and the share of memberships would be a more suited measure. However, the share is also sensitive to floor and ceiling effects. If eligibility varies widely across countries, then a state could have a 50% membership share as a member of 3 of 6 eligible institutions or 30 of 60, and we would want to account for these vastly different membership in our measures. In practice, most states are eligible for most institutions because climate institutions are rarely explicitly nested within each other. No states are only eligible for a handful of institutions. The minimum number of institutions that a country is coded as being an eligible member of—based on their Annex classification and their other pre-existing memberships, as I explain below—is 45, so empirically the sum and the share measures end up being very similar. Another way access might play a role in structuring membership decisions is if poorer states have less capacity to join institutions, however this can be controlled for in a regression framework.

In practice, I treat most states as eligible for most institutions. For any given institution, states are coded as 1 in years when they are a member, 0 when they are not a member, and missing if the institution has not been created yet or they are not eligible for membership in that institution. The IRT estimation ignores countries that are not eligible when making model predictions and

estimating state- and institution-level parameters. I use eligibility sparingly to minimize adding confirmation bias into the dataset. I have coded all states as eligible for all institutions except in two cases. First, when one institution is explicitly nested within another, then only members of the originary institution are eligible candidates. Second, I divide climate finance schemes into a donors side and a recipients side, where only Annex 2 parties to the UNFCCC are eligible to be donors and only non-Annex 1 parties are eligible as recipients.[3] Nonetheless, non-Annex 2 countries, such as newly industrialized countries like South Korea, are increasingly providing climate finance; if a non-Annex 2 country does provide finance through these institutions, then they are included as members. In figures, I denote these institutions with suffixes: climate finance institutions that have donors (∗_D) or recipients (∗_R); hosts of climate finance projects (∗_H), sellers of mitigation offsets (∗_S) or buyers of these (∗_B).

I considered using more eligibility restrictions, but there are good theoretical reasons not to. There are an enormous number of possible eligibility considerations, each of which is difficult to justify with reference to others. One could imagine coding membership eligibility with a detailed set of instructions and country-level covariates for each institution. For example, states that have relatively little forest cover might not be relevant states for a forest-related climate institution, or states that are not producers of fossil fuels might not be relevant for fossil fuel-related institutions.

However, this actually mis-characterizes the nature of affinity in climate politics. Two states may differ on some structural characteristics (e.g., forest cover), but share others (e.g., vulnerability to climate impacts) and join similar institutions on the basis of the latter. They may also go so far as to reach out and create a new multilateral, perhaps focusing on climate adaptation or some other under-served topic that they prioritize. These new climate governance institutions are easy to set up compared to a formal intergovernmental organization, and therefore, states that are unhappy with their menu of choices can create a new institution more aligned to their purposes. States with true underlying affinity would have very little difficulty in establishing a new network of relevant ministries that meets regularly to coordinate policies. Russia and Ghana both join roughly the same number of climate institutions, yet they share only one climate membership beyond the UNFCCC and Kyoto Protocol. These two states have had plenty of opportunities to join climate institutions that address their shared priority topics, but they have not done so. They could have even created a

[3]Annex 2 countries are essentially the subset of Annex 1 countries that are Western industrialized democracies in 1990.

new climate institution that addressed shared topics had they wanted to. The IRT model estimates their ideal points as being distant to indicate how different their membership portfolios are.

States are positioned in the IRT model based on their shared and divergent membership choices. Regional considerations are not particularly useful since states that are distant may nonetheless have significant resources and interest in governing with actors well outside their region. Norways extensive engagement with forestry governance in developing countries is an example here. Even climate institutions that cluster regionally often have some members from other regions. If states really do not share many features in common, then we should not expect them to join many similar institutions and this is what the IRT model measures.

This points to an advantage of using IRT to study membership in climate governance compared to prominent existing applications to legislative and judicial politics, where the measurement technique was first widely adopted in political science (Poole and Rosenthal 1997; Martin and Quinn 2002; Clinton et al. 2004). Legislative and judicial politics have strong agenda effects stemming from institutional rules and procedures. These rules imply that only a small sample of all possible votes or cases ever reach the stage where they are to be voted on. This creates an estimation problem that resembles conventional problems of sample selection bias, since only a subset of all possible votes are used to estimate actors' preferences.

I expect agenda effects to be weaker in climate governance because of the relatively low cost of establishing new institutions. Since many of these institutions are often not treaty-based, are funded out of the budgets of existing intergovernmental organizations, and have low levels of formality (such as lacking permanent headquarters or secretariats) I argue the costs of establishing a new climate governance institution is low. While establishing new formal international organizations is costly, I do not expect this to be the case for most new climate governance institutions. If a suitable forum is lacking, I expect dissatisfied actors can create new forums that express their preferences more clearly than existing opportunities. The social costs of creating new institutions also fall over time, as it becomes increasingly normal to have many institutions. As new institutions proliferate and states make membership decisions, state ideal points are increasingly revealed by their choices. However, the ability of individual legislators or justices to express their preferences through votes is more limited. Procedural rules restrict the ability of dissatisfied legislators to force a vote on a particular issue if the leaders in the legislature are opposed. The constraints on states in climate

governance are much weaker. Legislative ideal points are estimated based on a systematically biased selection of all possible votes, a point which is rarely acknowledged in the literature.

Since climate governance is not a direct analogue of domestic legislative politics, then other structural elements of legislative politics are also likely to be absent. For example, party discipline is a difficult concept to port into climate politics from the legislative context. In applications of ideal point estimation to legislative politics, we often observe tight clustering of ideal points within parties and a separation of ideal points across parties. This reflects parties constraining legislators' vote choices, but also selection effects where politicians join parties that reflect their ideological preferences. Indeed, one of the reasons why ideal point estimation works so well in the legislative context is that political parties are very effective at constraining an inherently multidimensional politics (i.e., social, economic, cultural, identity politics) into one or two salient cleavages that bundle these disparate topics together (Poole and Rosenthal 1997). The lack of analogous political parties in climate politics implies that the ideal point estimation should be less tightly clustered than in legislative politics, as we see in the data.

The analysis is conducted in the R computing environment using the pscl package developed by Jackman (2017). Institutions with either nearly universal membership or very few members may have large effects on the estimated parameters and such "lopsided" items are usually dropped from the analysis in other contexts. I remove from the sample any institution where fewer than 5 states were members or non-members. For example, the Mitigation of Climate Change in Agriculture Programme has only 3 members and is excluded from the analysis, as is the United Nations Framework Convention on Climate Change, which every state has ratified. There is not enough variation in membership in these institutions to allow them to meaningfully assist in situating states in the international climate governance space. The two-dimensional IRT model predicts membership well—correctly classifying 86.9% of memberships. Lupu (2016, S-7) provides examples of the correct classification percentages for his analysis of 280 UN treaties (84–87% depending on the year), UNGA voting (93.0% over 1991–1996; Voeten (2000)), and the United States House of Representatives (84.4% in 1960; Poole and Rosenthal (1997)). I find broadly similar correct classification percentages across climate memberships. It should be noted that the number of institutions/votes being analyzed differs across samples, from a low of 65 climate institutions, through 180 House votes to 280 UN treaties.

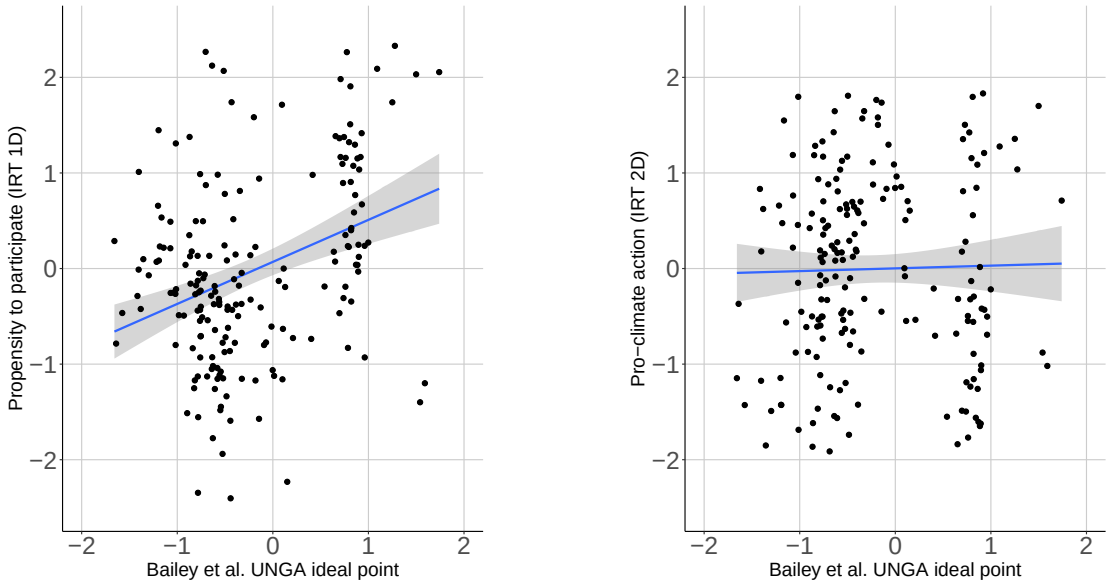

Figure S-2: Climate ideal points and UN General Assembly ideal points are related along the first, pro-global governance, dimension but not related along the second, pro-climate governance, dimension

B.2 IRT output interpretation and validation

Validating the IRT model outputs is crucial, as it is with any application of latent variable models. One way to interpret the outputs is to compare them to other existing variables. Essentially, the ideal points should correlate with concepts they are intended to be similar to and not correlate with concepts they are intended to be dissimilar to. Figure S-2 shows the bivariate relationship between my climate ideal points and Bailey et al. (2017)'s measure of states' ideal points from United Nations General Assembly voting. In the UNGA, states vote to support or oppose resolution pertaining to a wide range of topics, from security to human rights and environmental issues. Bailey et al. (2017) scale states' voting behavior using IRT to create an estimate of states' preferences in global governance generally. I find that this general internationalist disposition is highly correlated with my first dimension climate ideal points, which I have argued capture a more mechanical tendency for some states to participate more actively in global governance. Separate to this, I find that states' second dimension scores—their pro- or anti-climate governance preferences—are unrelated to their UNGA voting. This supports the interpretation that the first dimension climate ideal points relate to general dynamics in global governance, while the second dimension captures a specific climate attribute.

Bivariate plots allow for a visual impression of the relationship between the climate ideal points and other variables, but they cannot represent more complicated relationships across many variables. To understand the determinants of states' climate ideal points, I turn to regression models. If the first dimension scores measure a state's general disposition toward global governance, then these scores should be well predicted by the same variables that predict broader membership in international organizations. Lupu (2016) establishes that total GDP is the main determinant of states' participation in global governance, so this variable should be a strong predictor of first dimension climate ideal points as well. To the extent that the determinants of the second dimension scores are more climate-specific variables, then this will support identifying the second dimension as measuring pro-/anti-climate action preferences.

Table S-2 presents ordinary least squares regression models predicting climate ideal points and broader IO membership.[4] In model S-II, I show that states' first dimension climate ideal points are well-predicted by their total GDP and their broader ratification of international environmental agreements. By contrast, I find no evidence that these scores are related to states' vulnerability to climate impacts, fossil fuel rents, renewable electricity generation, or other more climate-proximate variables. Model S-I shows that the same variables also predict states' broader IO memberships, again validating the first dimension as a measure of states' underlying propensity to participate in global governance. However, model S-III shows that states' second dimension scores are well-predicted by climate-specific variables. States that are more vulnerable to climate change are more likely to be deepeners than fragmenters; same with states that generate more renewable energy. States that rely on fossil fuel rents are more likely to be fragmenters than deepeners. Model S-IV predicts the sum of a state's climate memberships. The model predictions are more mixed, as some elements of membership are determined by climate-specific variables (e.g., vulnerability), while other aspects are driven by more general attributes (e.g., GDP, democratic institutions). This is consistent with the theoretical argument that measuring participation using the sum of a state's climate memberships conflates opposing motivations for membership—to support or to undermine cooperation.

[4]IO membership is taken from Pevehouse et al. (2004).

	S-I IOs	S-II IRT 1D	S-III IRT 2D	S-IV Sum
Vulnerability to climate impacts	0.229	-0.014	0.051*	0.229*
	(0.163)	(0.009)	(0.014)	(0.099)
Renewable electricity generation	0.023	0.000	0.007*	0.009
	(0.021)	(0.001)	(0.002)	(0.013)
IEA ratifications	0.414*	0.008*	0.012*	0.139*
	(0.046)	(0.003)	(0.004)	(0.028)
Domestic environmental NGOs	0.147	-0.010	-0.018	-0.133
	(0.161)	(0.009)	(0.014)	(0.099)
Domestic environmental performance	-0.158	-0.003	-0.005	-0.050
	(0.095)	(0.005)	(0.008)	(0.058)
Democratic political institutions	0.075	-0.013	0.030	0.475*
	(0.327)	(0.018)	(0.027)	(0.200)
Fossil fuel rents (logged)	-0.637	-0.060	-0.119*	-0.500
	(0.694)	(0.039)	(0.058)	(0.424)
GDP (logged)	4.061*	0.294*	0.271*	1.968*
	(0.537)	(0.032)	(0.055)	(0.328)
IRT 1D			-0.115	
			(0.112)	
IRT 2D		-0.051		
		(0.050)		
Intercept	-55.313*	-6.411*	-9.282*	-51.265*
	(18.998)	(1.142)	(1.727)	(11.617)
Adjusted R^2	0.78	0.72	0.38	0.52
N	188	188	188	188

Table S-2: Determinants of ideal points

B.3 Alternative item constraints

In text, I explain that item response theory models are not identified without constraints. Essentially, this implies that rotating (e.g., multiplying the model parameters by -1) or rescaling (e.g., multiplying the model parameters by 2) would yield the same joint posterior likelihood—the value the IRT model attempts to maximize. The solution to this conceptual issue is to use constraints on a subset of discrimination parameters to orient the model (east-west, and north-south) (Jackman 2001). In my case, this fixes the discrimination parameters ($\beta_{j,d}$) of three institutions and lets the ideal points and other institutional parameters move flexibly around them to fit the observed data.

With the constraints used in text, states that join the Clean Energy Ministerial are more likely to score high on the first dimension than low on the first dimension, and their second dimension scores will be unaffected by membership ($\beta_{\text{CEM},d=1,2} = 1, 0$); states that join the International Partnership for Mitigation and Monitoring, Reporting and Verification will be more likely to score low on the second dimension, but their first dimension scores will unaffected by this membership ($\beta_{\text{IPMMRV},d=1,2} = 0, -1$); and finally, states that join the Partnership for Market Readiness will score high on the first dimension and low on the second dimension ($\beta_{\text{PMR},d=1,2} = 1, -1$). With these constraints, states that join many institutions consistently score highly on the first dimension (as opposed to having states that join the most climate institutions scoring at extreme negative values and states that join the fewest climate institutions scoring at extreme positive values); and states that join the IPMMRV and PMR score low on the second dimension, which I use to identify deepeners. I selected these constraints based on the substantive positions of these institutions in climate governance.

I now consider an alternative set of item constraints that are informed by the actual membership of climate institutions. I choose to constrain the discrimination parameters of institutions that I think contain joiners, fragmenters, and deepeners in line with my theoretical argument. This set of item constraints can be thought of as inductive analogues to the deductive constraints above. Specifically, I constrain the Global Facility for Disaster Relief and Recovery to have a positive first dimension discrimination parameter and a null second dimension parameter ($\beta_{\text{GFDRR},d=1,2} = 1, 0$); I constrain the Global Research Alliance on Agricultural Greenhouse Gases to have a positive first dimension discrimination parameter and a negative second dimension discrimination parameter ($\beta_{\text{GRAAGG},d=1,2} = 1, -1$); and I leave the IPMMRV constraints unchanged ($\beta_{\text{IPMMRV},d=1,2} = 0, -1$). I

	$\beta_{j,d=1} = 0$	$\beta_{j,d=1} = 1$
$\beta_{j,d=2} = 1$	IPMMRV IPMMRV	PMR GRAAGG
$\beta_{j,d=2} = 0$	. .	CEM GFDRR

Table S-3: Two sets of constraints on discrimination parameters. Serif type (top row) are the institutional constraints used in-text; Typewriter type (bottom row) constraints are the alternatives.

then re-estimate the IRT model.

The GFDRR is a primarily climate adaptation-oriented forum sponsored in part by Russia and Saudi Arabia—two states that have been persistent laggards at UN climate negotiations. A cynical perspective could note that its members include many countries with high fossil fuel extraction who have much to lose from GHG mitigation and naturally might prefer adaptation measures instead, such as Kuwait, Qatar, Russia, Saudi Arabia, and the United Arab Emirates. However, these countries are members alongside countries with more public commitments to environmental protection, such as Denmark, France, Germany, and the United Kingdom. Positive $\beta_{j,d=1}$ and null $\beta_{j,d=2}$ constraints for GFDRR allows the institution to orient the first dimension while providing little information about the ambition dimension. The Global Research Alliance on Greenhouse Gases was founded in 2009 under New Zealand's leadership to accelerate research, development, and deployment of technologies to reduce the climate impact of agriculture, as well as to increase the resilience of agricultural practices to climate change. Members include the G-7 countries, with other western European countries, plus a diverse cast of developing countries from Latin America, Sub-Saharan Africa and Asia. Pilot programs to measure and reduce the emissions from different kinds of crops ensure that GRA members around the world see value in the partnership, as the most important crops and livestock differs around the world. As the GRA members are among the most engaged in climate governance, a positive $\beta_{j,d=1}$ helps orient the joining dimension and by selecting more tangible projects with strong capacity-building orientations, a negative $\beta_{j,d=2}$ helps orient the deepening and fragmenting dimension.

With these constraints, the first dimension still separates high participants from low participants—joiners—and the second dimension still separates deepeners from fragmenters. Figure S-3 shows that the two set of ideal points are virtually identical. Note in the bottom-left panel, the outlying point

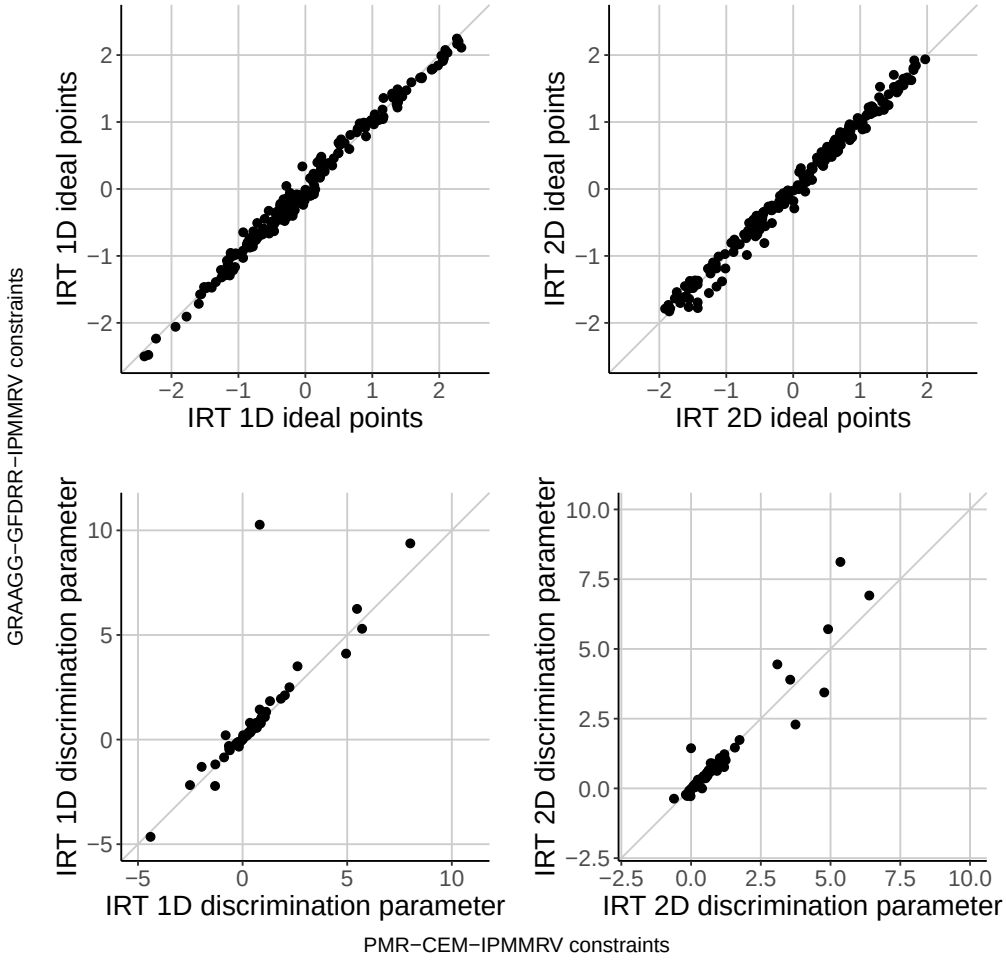

Figure S-3: Ideal points and discrimination parameters are robust to different item constraints. Background diagonal line is $y = x$. Constraints used in text are along the x-axis.

at $\approx (1, 10)$ is the CEM, which when not constrained becomes the most substantial determinant of first dimension scores, consistent the rationale for using it to orient this first dimension in the baseline model. The Pearson correlation between first dimension scores across models is $r_{x,d=1} = 0.96$ and between second dimension scores is $r_{x,d=2} = 0.93$. I take this as strong evidence that the ideal points are not being determined by the choice of item constraints. Furthermore, the correlation among the discrimination parameters is also very high across specifications ($r_{\beta_{j,d=1}} = 0.84$, $r_{\beta_{j,d=2}} = 0.93$). In further tests, not shown, I also establish that the ideal points are not sensitive to the choice of starting seed.

B.4 Alternative samples of climate institutions

There are a number of considerations in selecting the population of climate institutions, which I have outlined above in describing the dataset. While the global climate governance dataset includes climate mitigation, adaptation, and climate finance, this paper focuses on climate mitigation. As a result, one consideration may be that including adaptation initiatives may influence the ideal point estimates and add noise to the relationship with mitigation targets. One way to address this would be to remove the adaptation institutions from the ideal point estimation. As a robustness check on the paper's key findings, I remove the Adaptation for Smallholder Agriculture Program, the Food Security Climate Resilience Facility, and the Global Facility for Disaster Reduction and Recovery from the sample of climate institutions, then re-estimate the ideal points, and finally re-estimate the relationship between participation and cooperation in climate politics. Table S-4 shows that the ideal points from the primary specification and this "no adaptation" sample are highly correlated ($r = 0.986$). Table S-5 then shows that the regression coefficients for the ideal points from the no adaptation sample are nearly identical to those from the baseline model.

Another concern may be that the sample of climate institutions should not contain climate institutions that were created by the United Nations climate negotiations, such as the Clean Development Mechanism, since these institutions may have different membership dynamics than the broader population of climate institutions. Again, I subset the global climate governance dataset to remove these institutions (i.e., Activities Implemented Jointly, the Clean Development Mechanism, and Joint Implementation), re-estimate the ideal points, and then re-estimate the relationship between participation and cooperation. As above, tables S-4 and S-5 show that the results are not sensitive to the presence of these institutions.

The presence of AOSIS may also change the composition of the global climate governance dataset, and with it, the ideal point estimates. AOSIS is a UN climate negotiating group, but also a standalone international institution focused on climate politics. As mentioned above, AOSIS predates the UNFCCC and meets regularly outside the UN climate negotiations. Nonetheless, the inclusion or exclusion of the negotiating groups is more a question of degree than of kind: to what extent does a negotiating group exist solely within the UN negotiations versus having a broader presence in climate governance beyond the UN forums. Including AOSIS without including other UN negotiating groups may truncate the participation of states in other negotiating groups. I

conduct two empirical tests to demonstrate how this inclusion criteria has a very minor effect on the relationships I explore in the paper. First, I exclude AOSIS from the climate institutions dataset, re-run the IRT model to estimate ideal points, and then regress ambition on these alternative ideal points. I find the same relationship. Second, I include all the other UN negotiating groups in the IRT model and regress ambition on these alternative ideal points, and again find the same relationship. I present the correlation across ideal points for these alternative samples of institutions in table S-4 and the regression results in table S-5.

	Ideal points		Discrimination parameters	
Specification	1D	2D	1D	2D
Baseline	1.000	1.000	1.000	1.000
No adaptation	0.986	0.995	0.969	0.917
No UNFCCC	0.991	0.983	0.984	0.985
No AOSIS	0.892	0.969	0.931	0.912
Adding negotiating groups	0.919	0.957	0.947	0.910
No USA	0.965	0.963	0.925	0.862
Alternative constraints	0.994	0.994	0.843	0.949

Table S-4: Table shows the correlation coefficient between the ideal points and discrimination parameters estimated from the baseline specification and six other samples or alternative constraints. State ideal points and institutional discrimination parameters are highly correlated across different sets of IRT models

Criteria	Ideal point	Estimate	Lower bound	Upper bound
Baseline, model VII	1D	-23.65	-35.83	-11.48
Alternative constraints	1D	-24.20	-36.37	-12.03
No adaptation	1D	-25.70	-37.23	-14.17
No UNFCCC	1D	-17.76	-30.81	-4.72
No AOSIS	1D	-24.97	-35.88	-14.07
Adding negotiating groups	1D	-38.74	-48.97	-28.51
No USA	1D	-34.50	-48.64	-20.36
Baseline, model VII	2D	20.53	11.38	29.68
Alternative constraints	2D	22.05	13.17	30.93
No adaptation	2D	20.15	11.31	29.00
No UNFCCC	2D	20.28	11.17	29.38
No AOSIS	2D	24.90	14.17	35.63
Adding negotiating groups	2D	19.58	11.47	27.69
No USA	2D	32.66	20.90	44.43

Table S-5: Ideal point regression coefficients are stable when ideal points are estimated using different inclusion criteria for climate institutions. Regression models are model 7 from in-text, with different inclusion criteria or institutional constraints used to estimate state ideal points. Results are similar excluding the USA from all analyses for consistent samples

B.5 Supplementary ideal point figures

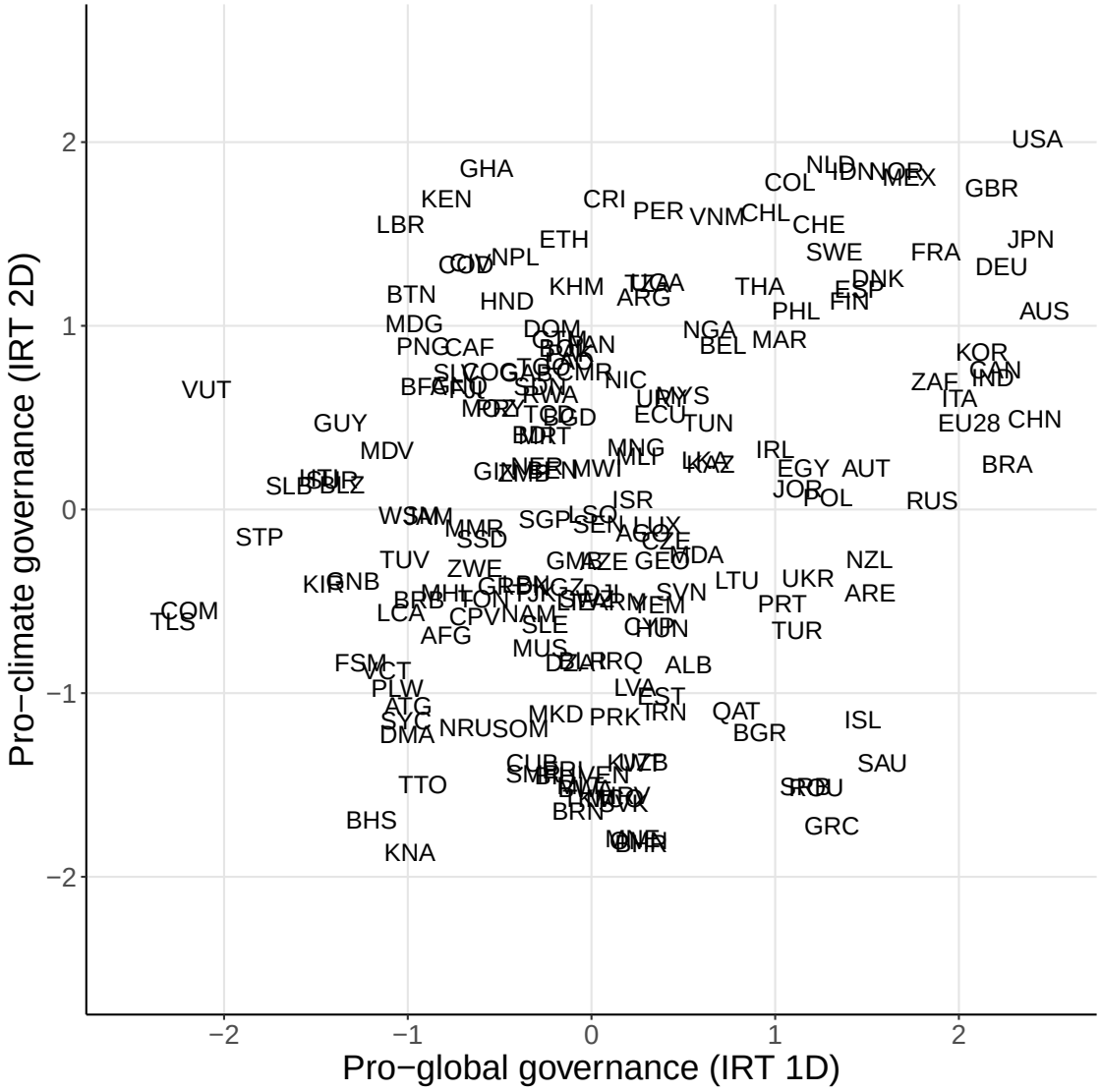

Figure S-4: States' ideal points

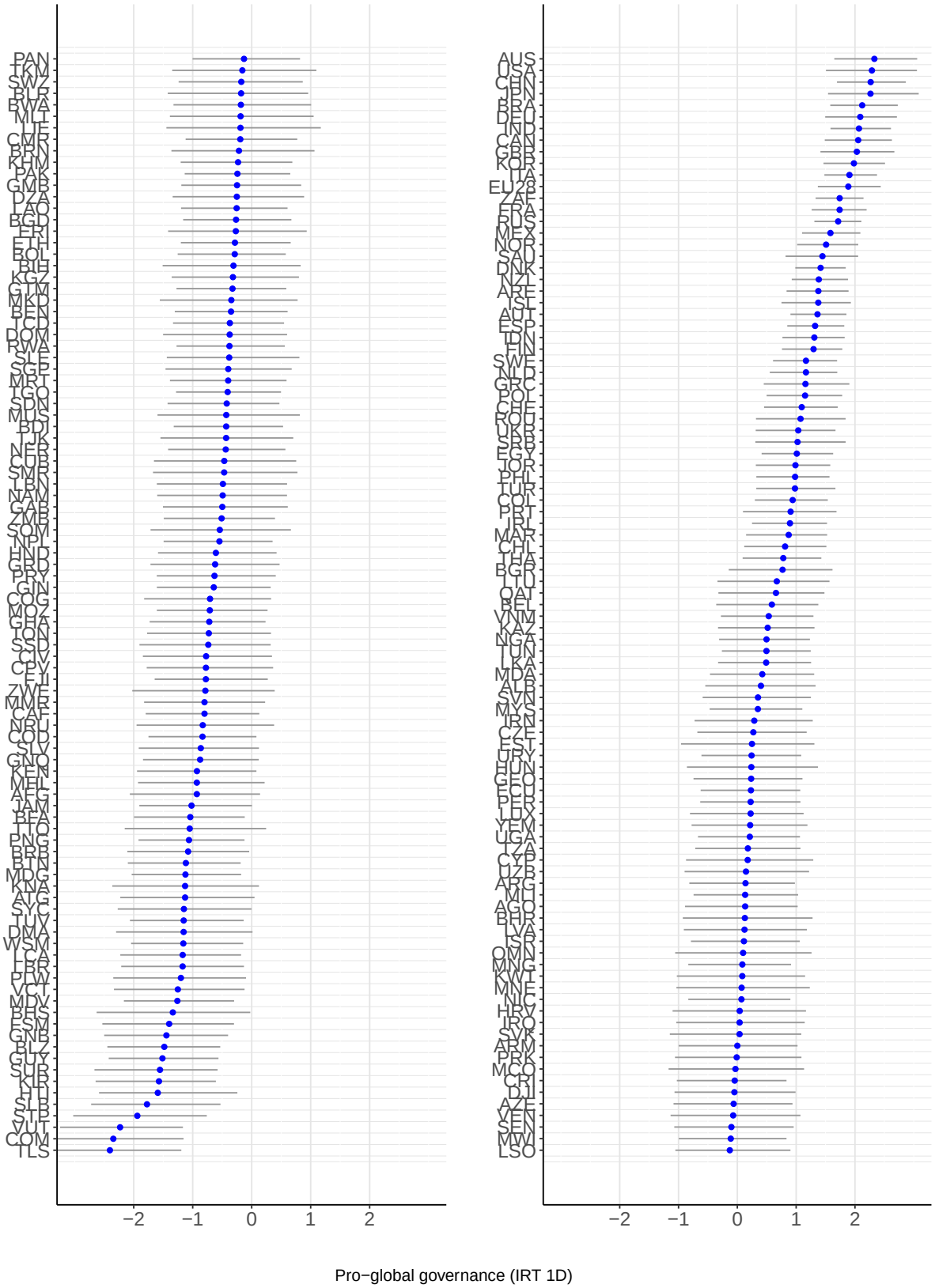

Figure S-5: First dimension ideal points

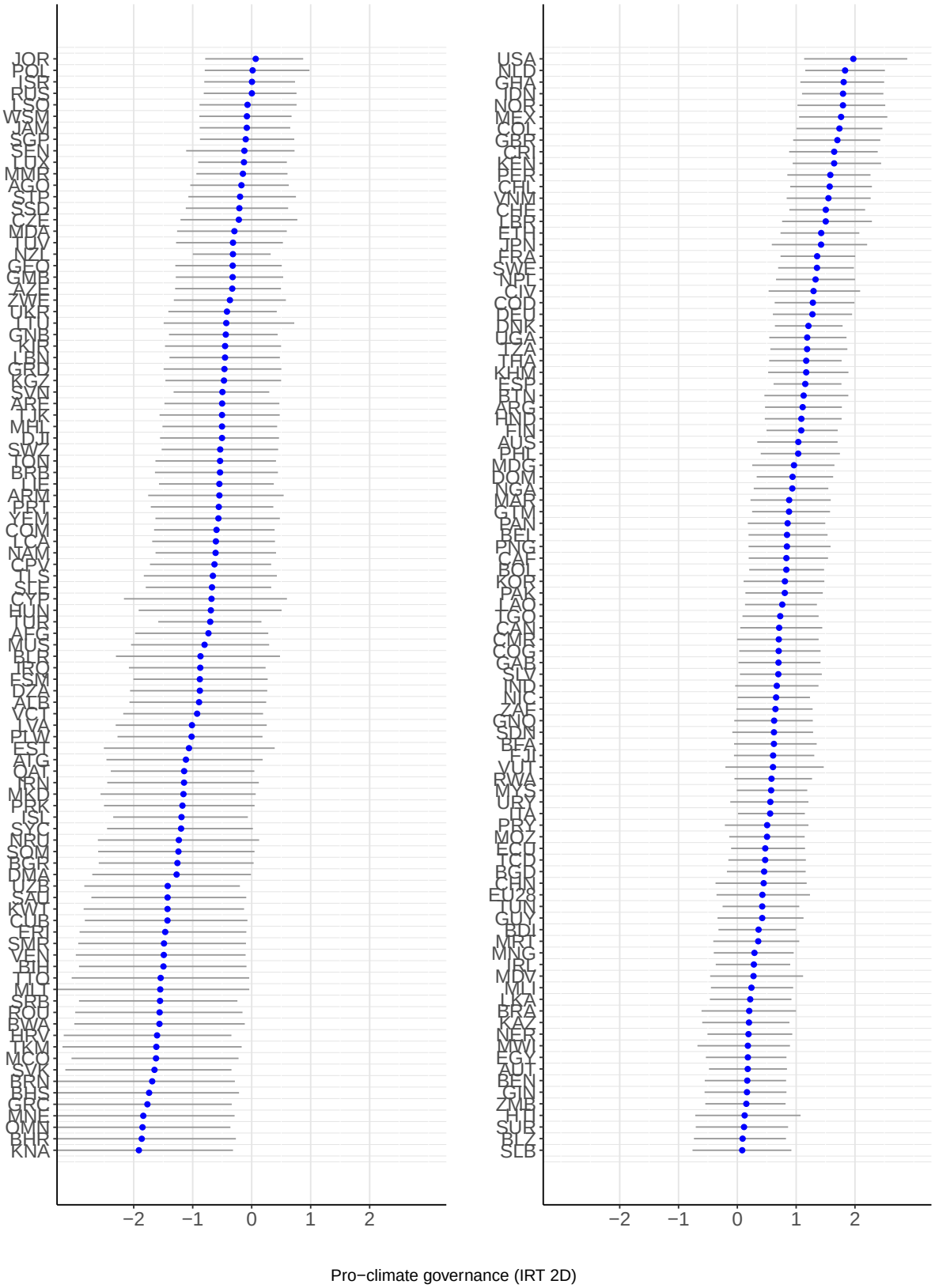

Figure S-6: Second dimension ideal points

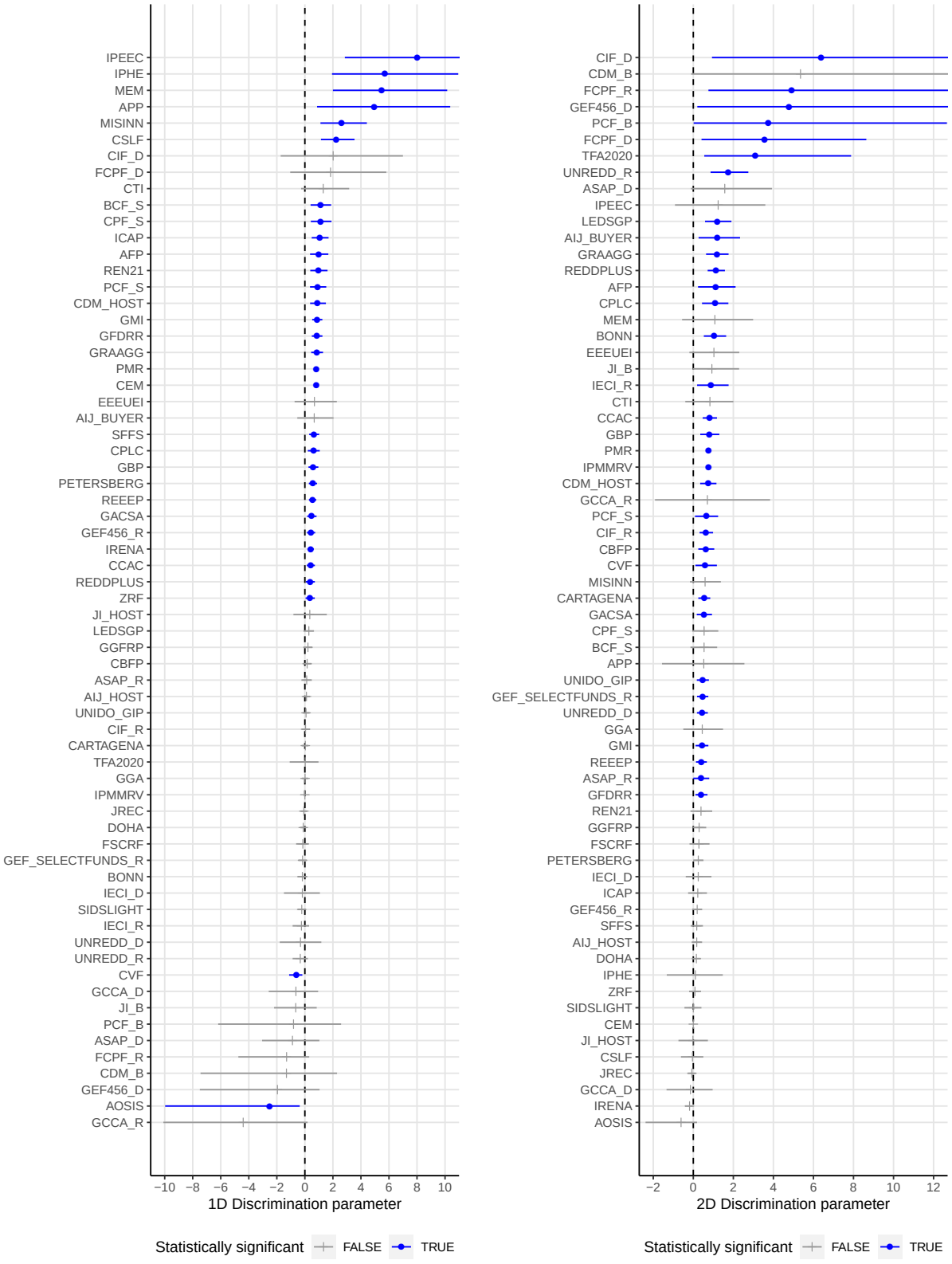

Figure S-7: Discrimination parameters

C Climate policy targets

C.1 Paris targets

Background Countries submitted climate policy targets in documents titled "Intended Nationally Determined Contributions" (INDCs) before meeting in Paris in 2015 to negotiate a new climate treaty. After ratifying the Paris Agreement, a country's "Intended" contribution became its "Nationally Determined Contribution" (NDC). Previous efforts to negotiate climate policy targets multilaterally had failed since the 1997 Kyoto Protocol negotiations. The INDC model reflected a diplomatic compromise that allowed for the greatest number of states to participate in climate policy at the expense of common expectations and obligations. Each country selected their own policy targets. However, many states had reservations about accepting costly mitigation commitments given that there was uncertainty about their counterparts' willingness to contribute as well. Therefore, while the 2014 Lima climate conference outcome document invited parties to include "quantifiable information on the reference point (including, as appropriate, a base year), time frames and/or periods for implementation, scope and coverage, planning processes, assumptions and methodological approaches including those for estimating and accounting for anthropogenic greenhouse gas emissions and, as appropriate, removals," this information was not mandatory (UNFCCC 2014, para. 14). Since governments were not obligated to follow set guidelines or templates, the INDC documents they submitted vary in their content, detail, and stringency. Rowan (2019) provides more information about comparing INDCs.

Comparable targets In measuring target stringency, the key consideration is extracting the absolute GHG emissions target, which is complicated by the different ways targets have been communicated. With "base year" targets, countries announce a percentage reduction from a historical reference year, and the calculation is straightforward—e.g., Canada's 30% GHG emissions reduction from 2005 emissions levels by the year 2030. For "scenario" targets, countries announce a percentage reduction from a projected future emissions level—e.g., Peru's 20% GHG emissions reduction from 2030 levels. These targets are only comparable and quantifiable if they also provide the projected future absolute emissions level in $MtCO_2$. Without this projection—e.g., with Nigeria's 20% reduction target—it is impossible to know whether 2030 emissions are indeed 20% below this projected scenario. When INDCs contain a projected absolute emissions level, they

INDC target	Count
Quantifiable GHG target	112
Non-quantifiable scenario target	35
Non-quantifiable other GHG target	11
No GHG target	29
No INDC	9

Table S-6: Comparability and non-comparability of INDC climate policy targets

can be standardized as with base year targets. Targets are standardized in terms of absolute GHG emissions levels ($MtCO_2$) for comparison to equitable mitigation (Robiou du Pont et al. 2017).

Non-comparable targets An alternative target may index an economy's GHG intensity (GHG emissions divided by GDP)—e.g., Chile's 30% reduction in GHG intensity from 2007 levels by 2030. These "intensity" targets cannot be standardized onto the same scale as base year and scenario targets, since extracting an absolute GHG emissions level entails highly parametric modeling of changes in underlying national economic growth. A final type of target sets a peak year for emissions—e.g., China's pledge to peak its GHG emissions by 2030 and then decline. These "trajectory" targets cannot be standardized onto the same scale as base year and scenario targets, no firm cap accompanies the peak. Conditional on there being enough details in the INDCs, both intensity and trajectory targets can be evaluated ex post, but they cannot be standardized ex ante without additional modeling that changes the nature of the comparison. Countries may communicate multiple types of targets in their INDCs, in which case quantifiable targets are selected.

Table S-6 shows the distribution of comparable and non-comparable targets. Most countries have quantifiable and comparable targets, but many states have non-comparable or even no targets. Note that Robiou du Pont et al. (2017) do not compute equitable mitigation quotas for some countries (e.g., Afghanistan), leading those countries to drop from the analysis.

Conditional targets Some countries also communicated conditional climate policy targets in their INDCs. For example, Paraguay has pledged to reduce its emissions by 10% unconditionally, but will cut them by 20% if the international community provides additional resources for implementing these further reductions. Following Robiou du Pont et al. (2017), I use the average of these two targets—conditional and unconditional—to calculate a country's final absolute emissions target. For

Country	Most ambitious	Country	Least ambitious
Comoros	94.60	Belarus	-88.52
Madagascar	82.45	Maldives	-88.73
Liberia	81.44	Kazakhstan	-92.45
Tanzania	78.75	Georgia	-103.31
Republic of Congo	78.17	Jamaica	-104.00
Eritrea	75.81	Ukraine	-131.25
Côte d'Ivoire	73.11	Mauritius	-140.37
São Tomé & Príncipe	69.69	Mongolia	-149.33
Uganda	69.47	Oman	-152.94
Ethiopia	69.21	Russia	-158.82

Table S-7: Countries with most and least ambitious targets. The ambition variable has a meaningful zero, indicating parity between a country's Paris target and the median of their five equity quotas.

countries with only conditional targets, that conditional level is taken as its target. Since developing countries rely on conditional targets more than developed countries, developing countries' targets are perhaps measured as being more stringent than in practice. There are no objective rules for assessing whether "enough" financial and technical support has been given to developing countries to implement the conditional elements of their targets, though existing climate finance flows are below the goals articulated in the Paris Agreement. If developing countries' mitigation falls short of their targets, they will likely be able to argue justifiably that they missed their target due to insufficient international support. The most and least ambition states are listed in table S-7.

C.2 Cancun targets

The INDCs were not the first time that countries had submitted climate action pledges at the UN-level. Following the unsuccessful treaty negotiations in Copenhagen in 2009, countries agreed to submit pledges outlining their climate policy goals with reference to 2020. These pledges were codified as part of the 2010 UN climate negotiations in Cancun, and form part of the Cancun Agreements adopted at that conference. Just like the Paris INDCs, the Cancun pledges vary in content, detail, and stringency. 73 pledges were submitted, encompassing 100 countries with the European Union's target disaggregated. The World Resources Institute has compiled data on these pledges, including on the type of action each country pledges—GHG target, non-GHG target, or climate-related "actions" (WRI 2015). I create a new Cancun GHG target variable that indicates whether a country pledged a GHG target. Note, these targets are not identical to the "Nationally Appropriate Mitigation Actions" (NAMAs) that developing countries began outlining in 2007 or Annex 1 countries' targets in the 2012 Doha Amendment to the Kyoto Protocol, though countries seem to set roughly consistent goals across instruments.

D Description of variables

D.1 Description of variables

INDC ambition INDC ambition is a continuous variable at the country-level re-coded from original analysis by (Robiou du Pont et al. 2017), who describe equitable mitigation pathways for all countries consistent with the Paris Agreement's goals. Variables are re-coded to express ambition as the percentage difference between a country's GHG target in their INDC and the different benchmarks for equitable mitigation using the CAP, CPC, EPC, GDR, and CER standards, as well as a measure of the median and mean equitable quotas. Source: Robiou du Pont et al. (2017)

Ambition observed A binary variable at the country-level measuring whether a country has a quantifiable GHG target in their INDC. See section C.2 for further sub-coding. Source: WRI (2016)

Cancun GHG target A binary variable at the country-level measuring whether a country proposed a GHG target under the 2010 Cancun Agreements. Source: WRI (2016)

Sum/share of climate memberships A continuous variable at the country-level measuring the number of climate institutions a country was a member of in 2015. Also re-coded as a percentage share of eligible institutions. Source: Original to this paper.

Climate ideal points: joiners, deepeners/fragmenters A continuous variable at the country level measuring state participation in climate institutions. Source: Original to this paper.

IEA ratifications A continuous variable at the country-year level counting the number of international environmental agreements that a state has ratified. Source: Mitchell (2018)

Renewable electricity generation A continuous variable at the country-year level expressing the percentage of a country's electricity that is generated from renewable sources. Source: World Bank (2018)

Vulnerability to climate impacts A continuous variable at the country-year level expressing a country's vulnerability to climate impacts. Source: Notre Dame Global Adaptation Initiative (2018)

Domestic environmental performance A continuous variable at the country-year level measuring a country's domestic environmental quality. Source: Wendling et al. (2018)

Democratic political institutions A continuous variable at the country-year level that combines the Freedom House and Polity IV measures of democratic institutions. Source: Teorell et al. (2019)

Domestic environmental NGOs A continuous variable at the country-year level that counts the number of environmental NGOs operating in a country. Source: Bernauer et al. (2013)

Democratic political institutions A continuous variable at the country-year level expressing the percentage of a country's electricity that is generated from renewable sources. Source: Teorell et al. (2019)

Fossil fuel rents A continuous variable at the country-year level expressing government rents from coal, oil and natural gas as a percentage of GDP, log transformed. Source: World Bank (2018)

D.2 Summary statistics

Variable	Obs.	Mean	St. Dev.	Min.	Pctl(25)	Pctl(75)	Max.
Sum of climate memberships	187	12.5	8.4	3.0	7.0	14.0	43.0
Share of climate memberships	187	22.1	14.1	5.4	12.6	25.0	70.5
IRT 1D: Joiners	187	−0.003	1.0	−2.4	−0.7	0.6	2.3
IRT 2D: Fragmenters → deepeners	187	0.01	1.0	−1.9	−0.7	0.8	2.0
Cancun GHG target	185	0.3	0.5	0.0	0.0	1.0	1.0
Ambition observed	172	0.5	0.5	0.0	0.0	1.0	1.0
Ambition observed (2)	161	0.6	0.5	0.0	0.0	1.0	1.0
Ambition observed (3)	133	0.7	0.5	0.0	0.0	1.0	1.0
Ambition (median)	94	−15.4	58.3	−158.8	−52.0	28.2	94.6
Ambition (mean)	94	−7.7	54.4	−152.0	−40.8	28.2	95.9
Ambition (CAP)	94	−60.2	96.6	−296.8	−119.5	9.4	98.7
Ambition (CPC)	94	−14.7	67.2	−246.3	−55.6	41.5	95.0
Ambition (EPC)	94	−5.4	54.5	−158.8	−37.5	35.6	94.6
Ambition (GDR)	94	−64.3	296.2	−2,696.7	−55.8	14.7	87.1
Ambition (CER)	94	−26.8	65.6	−323.2	−55.8	18.2	61.9
Sum of IEA ratifications	186	50.6	27.4	6.0	34.0	62.8	172.0
Renewable electricity generation	190	30.0	33.2	0.0	0.6	56.4	100.0
Vulnerability to climate impacts	180	45.1	9.7	27.6	37.7	53.6	69.5
Domestic environmental performance	178	64.9	15.3	27.4	53.6	77.5	90.9
Democratic political institutions	190	6.6	3.1	0.0	3.7	9.6	10.0
Fossil fuel rents (as share of GDP, logged)	180	6.6	14.2	0.0	0.0	4.5	74.0

Table S-8: Summary statistics. Missing covariate data is replaced using multiple imputation. "Ambition observed" refers to whether a country's target is quantifiable. Covariates are measured in 2007. "Ambition (GDR)" is subsequently winsorized at the 5th and 95th percentiles to adjust for a small number of outlying observations.

E Supplementary tables

	Model VII	
	Observable	Ambition
1D: Joiners	0.032	-23.557
	(0.172)	(6.260)
2D: Fragmenters → deepeners	0.227	20.544
	(0.125)	(4.667)
Renewable electricity generation	-0.002	0.291
	(0.003)	(0.170)
IEA ratifications	0.016	0.010
	(0.007)	(0.164)
Fossil fuel rents	-0.103	-12.092
	(0.101)	(5.740)
Cancun GHG target	0.950	
	(0.333)	
ρ		0.164
		(0.126)
Intercept	-0.798	-17.671
	(0.405)	(14.808)

Table S-9: Heckman sample selection models estimating the relationship between participation in climate institutions and states' Paris GHG targets. Outcome variable is the percentage difference between a country's INDC target and the median of their five equity quotas. Covariates are measured in 2007 and missing data is accounted for using multiple imputation. Robust standard errors in parentheses. Models contain 172 observations, of which 94 are observed and 78 are censored.

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