

Participation and cooperation in global climate governance



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A thesis submitted for the degree of
Doctor of Philosophy

Hilary 2019
69,095 words

Abstract

International climate politics have seemed stalled throughout much of the past three decades. At least until the 2015 Paris Agreement on Climate Change, states largely failed to adopt new substantive treaties through the United Nations-led climate governance process. However, at the same time and largely unnoticed, states created a vast array of over 60 additional institutions to manage climate change. These new institutions address neglected topics, articulate alternative principles, and convene different sets of actors than the UN-led process. I ask why states have created these outside institutions, why states join these institutions, and how participation in these institutions relates to states' cooperative behavior.

I argue that the UN-led climate process is an inefficient response to climate change that leaves states dissatisfied and searching for other institutional options. However, this dissatisfaction arises from two opposing sources. First, states may be dissatisfied with the slow pace of cooperative progress. These states join new climate institutions that focus on capacity building and supporting ambitious cooperation. By contrast, a second set of states are dissatisfied with the spectre of costly mitigation obligations in a new climate treaty. These states join new climate institutions that focus on negotiations and act to undermine effective cooperation. As a result, dissatisfied states join climate institutions for opposing reasons, and crucially they join different kinds of institutions.

I use a statistical measurement model to recover states' preferences in international climate politics from their memberships in climate institutions. In statistical tests, I then show two important facts. First, state participation in climate institutions is linked to their dissatisfaction. Second, patterns of participation are associated with the ambition of countries' greenhouse gas mitigation targets in the Paris Agreement. These findings help illuminate debates about how states use dense institutional environments, why states join institutions, and the depth of cooperation.

Contents

List of Figures	xi
List of Tables	xiii
List of Abbreviations	xv
Preface	xvii
1 Introduction	1
1.1 Why have states pursued institutional proliferation in climate politics?	3
1.2 What accounts for state membership across climate institutions? . . .	5
1.3 How is participation in climate institutions related to cooperative behavior in the Paris Agreement?	8
1.4 Contributions	10
1.5 Outline	13
2 Dissatisfaction and proliferation in climate politics	17
2.1 Introduction	17
2.2 Climate change as an international cooperation problem	21
2.2.1 Intrinsic features of international climate cooperation	23
2.2.2 Extrinsic features of climate change as an international coop- eration problem	31
2.2.3 Linking intrinsic and extrinsic features to proliferation	38
2.3 Proliferation and dissatisfaction	40
2.3.1 Proliferating to deepen climate cooperation	44
2.3.2 Proliferating to fragment climate cooperation	46
2.4 Proliferation and cooperation	49
2.5 Conclusions	51
3 A hidden world of climate governance	55
3.1 Introduction	55
3.2 The UNFCCC-led climate governance process	58
3.2.1 The United Nations Framework Convention on Climate Change	59

3.2.2	The Kyoto Protocol	61
3.2.3	The elaboration of climate governance through COPs	64
3.3	Varieties of institutionalized climate cooperation	68
3.3.1	A regime complex for climate change?	69
3.3.2	Transnational climate governance	72
3.3.3	Institutional proliferation in global climate governance	73
3.4	Reconsidering state-led climate governance	80
3.4.1	The proliferation pathway	80
3.4.2	Characteristics of climate governance outside the UNFCCC	87
3.5	Conclusion	92
4	Participation in global climate governance	95
4.1	Introduction	95
4.2	Membership in international institutions	97
4.2.1	Why do states join international institutions?	97
4.2.2	Why do states join climate institutions?	100
4.2.3	A revisionist theory of participation: Participation motivated by two types of dissatisfaction	104
4.3	Measuring participation in climate institutions	108
4.3.1	Scaling participation using item response theory	110
4.3.2	Locating states in the climate governance space	115
4.3.3	Identifying the ideal point dimensions by constraining dis- crimination parameters	118
4.4	Determinants of climate ideal points	126
4.4.1	Data and measurement	127
4.4.2	Normal vector analysis	133
4.4.3	Multivariate analysis	137
4.5	Criterion-related validity of climate ideal points	141
4.5.1	Comparison across measures of climate preferences	142
4.5.2	Comparison across measures of international preferences	150
4.6	Conclusion	153
5	Sustaining and shattering 2°C	157
5.1	Introduction	157
5.2	Dense institutional environments	160
5.3	The broader-deeper tradeoff and bottom-up cooperation	166
5.4	The structure of cooperation under the Paris Agreement	172
5.4.1	Negotiations and target-setting at the UNFCCC	172
5.4.2	Pitfalls in comparing Paris pledges	174
5.4.3	Re-scaling INDCs to measure cooperation	178

5.5	Data and method	183
5.6	Results	186
5.7	Conclusion	198
6	Conclusion	201
Appendices		
A	List of climate governance institutions	209
B	State ideal points	211
C	Additional IRT considerations	215
C.1	Strengths and weaknesses of IRT modeling	215
C.2	Discrimination parameters	220
C.3	Alternative item constraints	222
C.4	Ideal points of simulated states	225
C.5	IRT ideal point uncertainty	227
	Works Cited	231

List of Figures

1.1	Institutional proliferation in international climate politics	3
2.1	Cumulative GHG emissions and vulnerability to climate impacts . .	27
2.2	Annual GHG emissions flows and stocks by Annex	36
3.1	Varieties of institutions in climate governance	78
3.2	Cooperation along the convention-protocol pathway	81
3.3	Growth of climate governance over time	83
3.4	Membership in climate governance institutions	84
3.5	Distribution of membership at the state level	85
3.6	Distribution of membership at the institution level	86
4.1	IRT membership predictions in two institutions	114
4.2	Dimensions of participation in climate governance	119
4.3	Second dimension discrimination parameters	125
4.4	Normal vectors	137
4.5	Ideal points and UNFCCC negotiating groups	143
4.6	Predicting UNFCCC negotiating groups with ideal points	144
4.7	Genovese and climate institutional ideal points	146
4.8	Sample selection in submissions to the UNFCCC	147
4.9	Bailer and Weiler negotiating positions and ideal points	149
4.10	Treaty commitment preferences and climate ideal points	151
4.11	UNGA and climate ideal points	152
5.1	Broader-deeper tradeoff	169
5.2	GHG trajectories and PRIMAP quotas	181
5.3	Distribution of INDC ambition	182
5.4	Robustness of outcome stage ideal point coefficients	194
5.5	Lagged covariates	196
B.1	Scatterplot of ideal points	211
B.2	First dimension ideal points	212
B.3	Second dimension ideal points	213

C.1	First dimension discrimination parameters	220
C.2	Second dimension discrimination parameters	221
C.3	IRT outputs are robust to alternative item constraints	224
C.4	Ideal points of simulated states	226
C.5	Distribution of regression coefficients for re-sampled ideal points . .	228

List of Tables

2.1	Elements of the cooperation problem	31
2.2	UNFCCC Annex classifications	35
2.3	Theoretical expectations about institutional proliferation	51
3.1	Key moments in UN-led climate governance	65
3.2	Characteristics across climate governance	88
4.1	Summary of theoretical expectations from expressive theory	104
4.2	Summary statistics for membership regressions	132
4.3	Normal vector analysis of climate ideal points	134
4.4	Predicting participation in climate institutions	139
5.1	Inputs to the PRIMAP equity quotas	180
5.2	Summary statistics for targets regressions	185
5.3	Associations between participation and targets	188
5.4	Participation in climate institutions and states' Paris GHG targets .	191
A.1	List of climate governance institutions	209
C.1	Regression outputs for re-sampled ideal points	229

List of Abbreviations

CDM	Clean Development Mechanism: institution created by the Kyoto Protocol enabling developed countries to support and earn credit for mitigation in developing countries
CO_{2,eq}	Carbon dioxide equivalent: conversion of a basket of GHGs into equivalent warming potential of carbon dioxide (CO ₂), the main GHG
COP	Conference of the Parties to the UNFCCC: annual UN climate conference
GHG	Greenhouse gases: polluting gases that cause climate change
IEA	International environmental agreement
INDC	Intended Nationally Determined Contribution: documents containing states' Paris pledges
IPMMRV	International Partnership on Mitigation and Monitoring, Reporting and Verification: a climate institution focused on supporting transparency in climate policy
IRT	Item response theory: a statistical measurement model
MEF	Major Economies Forum on Energy and Climate: a climate institution focused on networking among the largest economies and GHG emitters
PMR	Partnership for Market Readiness: a climate institution focused on designing domestic carbon markets
PRIMAP	Research unit based at the Potsdam Institute for Climate Impact Research that produced the emissions pathway data that I develop into my measure of ambition
TCG	Transnational climate governance: transborder networks of sub-national, public, and private actors supporting climate action
UNFCCC	United Nations Framework Convention on Climate Change: main international climate institution

Preface

In the year I started the DPhil, the world breached a grim marker: average annual atmospheric concentrations of CO₂ exceeded 400 parts per million for the first time in human history. Over 190 countries also signed the Paris Agreement and began what I believe is the most exciting period of climate history. Setting new climate records has become a common occurrence and will continue to be for decades, even with the full implementation of the Paris Agreement. Indeed, last week saw the first day that atmospheric concentrations of CO₂ were above 415 parts per million. Record high global temperatures and atmospheric CO₂ concentrations seem abstract, but their effects are increasingly apparent on political, social, economic, and ecological systems around the world. Climate change is not a problem for the future; it is here now. At the same time, climate change is not simply the product of a historical legacy of industrialization in the nineteenth and twentieth centuries. Roughly half of anthropogenic CO₂ emissions have been released in the past thirty years—a period when we had with full knowledge that CO₂ concentrations affect our climate.

But there is still plenty that we do not know, particularly on the political and social side. Will societies abate their greenhouse gas emissions, how and to what extent? How will societies adapt to climate impacts, and will they do so equitably? Which societies will do more to contribute to collective climate governance? What particular social and political factors condition mitigation and adaptation decisions? In its own small way, I have written this thesis to help move these questions forward.

Climate change is a collective predicament—one that we have entered into together and will have to wrestle with together as well. Though the DPhil bears my name only, the work reflects the positive contributions of a number of individuals and institutions. Duncan Snidal has seen every iteration of this project and has been incredibly supportive throughout. He is a tremendous scholar in his own right, but my overall impression from his supervision is the feeling of being constantly surprised by the diversity of the points he raised, implications he noticed, and improvements he suggested. This thesis clearly reflects his influence on me, even though he has always encouraged me to find my own voice.

I have benefited immensely from Oxford's deep intellectual community. Many have read and commented on parts of my thesis, but a group of absolute gains maximizers, many of whom are Duncan's students, have provided insightful feedback

throughout: Kate Guy, David Hageböling, Tuuli-Anna Huikuri, Miles Kellerman, Claire Peacock, Anette Stimmer, and Jeff Wright. At Oxford and beyond, Andy Eggers, Tom Hale, Walter Mattli, Jen Allan, Josh Busby, Yon Lupu, and Charlie Roger have provided invaluable outside perspectives on this work and the bigger questions in which it is embedded.

I would not have been able to complete the DPhil without the institutional and financial support of the University of Oxford's Department of Politics and International Relations, the Oxford Q-Step program, the Cyril Foster Fund, my college, Christ Church, and especially lately, the Climate Econometrics program at Nuffield College. I am extremely grateful for the vote of confidence they have given me and the opportunities to pursue my ideas. Lady Margaret Hall Boat Club has been my main escape value and I would like to thank everyone who has made rowing so enjoyable and refreshing.

Alexa Zeitz has been my greatest champion throughout the DPhil. Her curiosity and drive have constantly inspired me to aim higher. I am truly grateful for her partnership. I would not be here without her.

Lastly, my deepest thanks are to my family: my parents, Gina and Ken, my brothers, Chris and Teddy, and my aunt, Donna. Sadly, my grandmother, Dorothy, my aunt, Linda, and my uncles, Neil and Shelly, passed away before I was able to show them what their support yielded. My family has always valued curiosity and conversation, and I am so thankful to have inherited this from you.

Norham Gardens, Oxford

May 16, 2019

1

Introduction

Amitav Ghosh begins *The Great Derangement* by evoking an experience of being caught off guard by a sudden change in our surroundings: “Who can forget those moments when something that seems inanimate turns out to be vitally, even dangerously alive?”¹ We make assumptions about our surroundings. Things that are constant are presumed to be inert. But every so often, there is a break in the world we have mapped around us and we are forced to rethink how it works. In these situations, we feel the world, as Ben Lerner puts it, “rearrang[e] itself” around us: “What before felt like the only possible world [becomes] one among many.”² The same feeling of realizing that a floating log is in fact an alligator is to discover that human behavior is capable of changing the atmosphere, as it is to register that human interaction is capable of managing this change. In 2015 in Paris, a governance process long thought to be stalemated, intractable, even inanimate, turned out to be vitally alive. Over 190 states agreed to a new international treaty to manage emissions of greenhouse gases into the atmosphere, a new treaty with nearly universal participation and substantive implications. Whereas nearly two decades had passed since the United Nations-led multilateral climate negotiations shrugged, the beast started to slowly turn its head.

¹Ghosh 2016, p. 3.

²Lerner 2014, pp. 32, 9.

And yet, I argue the cooperation embodied in the Paris Agreement was not surprising, if one had been looking in the right places. United Nations-led climate governance had seemed torpid since the early 2000s, as states failed to enact new, more deeply substantive climate treaties. However, climate governance activities outside the UN-led process flourished during this time. Outside the UN-led process, myriad public and private transnational initiatives pursue climate action, the activities of an array of non-environmental international organizations increasingly intersect with climate concerns, and states are members of over 60 different purpose-built climate institutions. Just as we would have been less surprised had we already been looking for that surprising thing, had we been looking elsewhere in climate governance, then we might not have been startled by the outcome in Paris. There is a world, or rather there are worlds, of climate governance outside the annual meetings of the United Nations Framework Convention on Climate Change (UNFCCC).

Since the early 1990s, the global politics of climate change has undergone dramatic institutional proliferation, defined as the increase in the number of international institutions operating within an issue-area (see figure 1.1).³ Climate governance was never meant to end in Rio in 1992 with the signing of the UNFCCC, but no one would have predicted the extent of proliferation in the past decades. Climate is now a very dense institutional environment within global politics. States must navigate a complex governance landscape, dotted with a range of different institutional forms, actor types, and functional scopes. They must make membership decisions with respect to over 60 different climate institutions. I build a new dataset to study these climate institutions. These institutions are described in detail in chapter 3 and are listed in appendix A.

I interrogate this new landscape of climate governance in this study. I pursue three linked research questions related to institutional proliferation, participation, and cooperation in climate governance. Why have states pursued institutional proliferation so forcefully in climate politics? What accounts for state membership decisions across this wide range of climate institutions? And how is participation in

³Raustiala 2013.

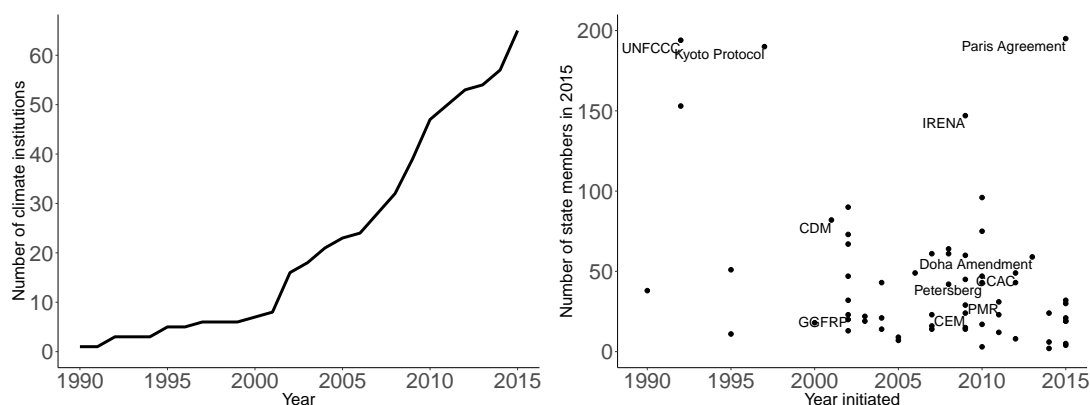


Figure 1.1: Institutional proliferation in international climate politics. Left panel depicts the rapid growth of climate institutions over time. Note the steady institutional proliferation beginning the early 2000s, as multilateral climate negotiations stall (see chapter 3). Right panel depicts state membership in climate institutions based on the year an institution was established. Most climate institutions have limited membership compared to the major climate treaties and the participation of individual states varies considerably. A list of these climate institutions is provided in the appendix as table A.1 on page 209.

these institutions related to states' cooperative behaviour, particularly greenhouse gas emissions mitigation?

1.1 Why have states pursued institutional proliferation in climate politics?

I argue that institutional proliferation in climate change stems from two linked issues within climate governance: first, the nature of the cooperation problem and second, how states have elected to address it at the United Nations-level. A set of intrinsic features of climate change as an international cooperation problem condition actors to look to a multitude of institutional forums to meet demands for gains from cooperation. Climate change is riven with deep preference heterogeneity and is highly multidimensional. States have divergent preferences over the pace of greenhouse gas (GHG) emissions mitigation, the extent of collective mitigation, and finally the allocation of remaining GHG emissions consistent with any temperature target across countries. States that are more vulnerable to the impacts of climate change demand faster climate action and more demanding temperature targets. States that are less vulnerable or that have greater capacity to respond to climate

impacts prioritize other issues in international and domestic politics. Mitigating climate change also raises serious contentious politics over the allocation of mitigation obligations. Developed countries bear the brunt of the responsibility for the existing stock of GHG emissions in the atmosphere, but developing countries' GHG emissions now account for a majority of annual emissions flows and are forecast to grow in the near- and medium-term. However, developing countries by their very nature are less well positioned to bear the costs of mitigation and demand considerable financial assistance from developed countries to support sustainable development objectives. States may be differentially positioned along these axes of contention.

Climate change is also best characterized as a set of interlocked substantive topics, rather than a single mitigation calculus.⁴ Provisions must be made for supplying climate finance, building institutional capacity for domestic climate action, adapting to climate impacts, and supporting climate science. Even within mitigation, different sources of GHG emissions demand different policy responses, and the design of climate policy is highly complex. States must manage emissions from diverse sectors of the global economy, establish new markets for carbon trading, and catalyze investment in green technologies. It is no wonder that the UN-led process struggles to handle all of these issues. As a result, states have increasingly looked to other institutional venues to support cooperation.

At the same time, design elements of the UN-led international climate governance process have pushed states to seek alternative institutional venues. The UNFCCC has over 190 members, but has been locked into consensus decision-making rules.⁵ Given the preference heterogeneity outlined above, consensus decision-making rules lead policy measures to be adopted slowly and to converge to the policy demands of recalcitrant actors who prefer less mitigation.⁶ The UNFCCC's outdated membership structure reifies and separates developed and developing countries, heightening distributional conflict and contributing to stalemate. Between the adoption of the Kyoto Protocol in 1997 and the Paris Agreement in 2015, most of the UN-led climate

⁴Keohane and Victor 2011.

⁵Bodansky, Brunnee, and Rajamani 2017.

⁶Downs, Roche, and Barsoom 1998; Stone, Slantchev, and London 2008.

governance process was characterized by stasis and strife. This stasis is despite the fact that the original design of multilateral climate governance envisioned a series of sequential deals that would ratchet up cooperation over time.⁷ The UN climate treaties are partial solutions to the underlying issues and need to be elaborated subsequently to address climate change effectively.

Preference heterogeneity and multidimensionality are features of many problems in international cooperation, however not every issue-area develops a dense array of institutions. Instead, I argue that it is the combination of preference heterogeneity and multidimensionality with design features of the UNFCCC that conditions institutional proliferation. These twin features—intrinsic and extrinsic features of extant climate governance—lead states to pursue climate cooperation in other venues, outside the UNFCCC. Organizing minilaterally in purpose-built forums has been an operating solution to the UNFCCC’s dysfunction. This has led to a distributed climate governance architecture. I conceptualize governance as the ensemble of institutional activity to manage global climate change. It is distinct from participation in international institutions, which I take to be specific state membership in climate institutions, and cooperation which I take as related to specific GHG emissions reductions. These concepts are refined in subsequent chapters.

1.2 What accounts for state membership across climate institutions?

This general explanation for institutional proliferation struggles to explain the particular pattern of institutional proliferation in climate change. Specifically, state participation across climate institutions varies considerably. Some states are members of over 40 climate institutions, while others have ratified only the UNFCCC and Kyoto Protocol. What accounts for state membership decisions across diverse climate institutions? I argue that state membership in climate institutions reflects states’ differing perspectives on the pace of cooperative progress

⁷Benedick 1998.

in the UN-led international climate negotiations. States' divergent assessments of climate governance *drive* the proliferation of climate institutions, inversely to how preference heterogeneity stalls progress at the UNFCCC.

Theories of institutional proliferation argue that dissatisfaction with the distribution of benefits from cooperation in existing forums motivates states to create new institutions to re-capture some of these benefits.⁸ However, the nature of this dissatisfaction is under-theorized. Climate politics highlights that states have preferences over the pace and depth of cooperative adjustments and these preferences lead states to pursue different strategies within institutional proliferation. When multilateral institutions establish common obligations for members, some states may prefer to coordinate at more or less intrusive levels of cooperative adjustments.⁹ In climate politics, some states would prefer to move on GHG mitigation at a quicker pace than the UNFCCC currently adopts, whereas other states fear the compliance costs of quicker GHG mitigation. Each type of state may draw on non-UNFCCC institutions to shift the evolution of multilateral climate cooperation in its favour. Ambitious states establish and join climate institutions to accelerate multilateral GHG mitigation objectives, while laggards join rival climate institutions to fragment and obstruct cooperative progress on mitigation. States use outside institutions to alter the trajectory of climate governance. This argument runs counter to arguments based on the fit between domestic political factors and international institutions that suggest states already disposed to cooperate in climate change will join more climate institutions.¹⁰ I argue instead that states may participate extensively to support or to undermine cooperation in climate change. In addition, these types of states can be distinguished based on their particular patterns of institutional memberships.

Understanding participation in climate institutions, therefore, requires attention to how states may be dissatisfied with the pace of cooperative progress within climate negotiations, but from opposite perspectives. First, states may be dissatisfied with

⁸Benvenisti and Downs 2007; Shaffer and Pollack 2009; Colgan, Keohane, and van de Graaf 2012; Jupille, Mattli, and Snidal 2013; Morse and Keohane 2014; Lipsy 2017; Kellerman 2019.

⁹Alesina and Grilli 1993; Downs, Roche, and Barsboom 1998; Stone, Slantchev, and London 2008.

¹⁰See, e.g., Simmons 2009.

cooperative progress that proceeds too slowly. Until 2015, there was hardly any progress on the elaboration of mitigation obligations at the UNFCCC.¹¹ In response, ambitious states increasingly shifted climate governance activities outside the UNFCCC and into new, purpose-built climate institutions to handle elements of climate change. These forums are problem-oriented and focus on building national capacities to implement climate policy. States established new institutions to pool resources in navigating emergent carbon markets (e.g., World Bank Carbon Finance Unit's Prototype Carbon Fund), fund mitigation activities in developing countries (e.g., Asia-Forest Partnership), and pursue low-cost, high leverage technological solutions (e.g., Global Gas Flaring Reduction Partnership). Of course, these institutions have not all been successful in driving deep decarbonization, but they were created over the past two decades to build national and international capacity to support ambitious mitigation goals. Institutional proliferation can be a strategy of separating concrete topics within climate governance into stand-alone forums with narrower membership that allow motivated actors to pursue cooperative gains unencumbered by climate laggards.¹² States established these new non-UNFCCC institutions to guide the evolution of climate multilateralism toward greater ambition. I call these states *deepeners*, in reference to their efforts to deepen the substantive ambition of international climate politics.

However, these new capacity-building institutions are only one side of the proliferation story. States that are unwilling to enact deeply substantive GHG mitigation policies see any signs of progress on mitigation as threatening. The UNFCCC's consensus-based decision-making rules empower recalcitrant states to obstruct action in this forum; however, for states that fear the costs of any new mitigation obligations, creating new forums is a strategic move to counter any forward momentum in climate governance.¹³ I refer to these states that are dissatisfied with cooperative progress that proceeds too quickly as *fragmenters*. Fragmenters have created a set of negotiating forums that challenge the UNFCCC's centrality as the main negotiating

¹¹Victor 2011; Hale, Held, and K. Young 2013; Gupta 2014.

¹²Downs, Roche, and Barsoom 1998; Johnson and Urpelainen 2012.

¹³Benvenisti and Downs 2007; Drezner 2013.

1.3. *How is participation in climate institutions related to cooperative behavior in the Paris Agreement?*

venue and duplicate existing functions of the UNFCCC (e.g., Major Economies Forum, Asia-Pacific Partnership on Clean Development and Climate).¹⁴ These institutions act as staging grounds for new norms and principles that fragmenters seek to feed back into the UNFCCC negotiating process. Their non-UNFCCC forums articulate alternative rules and principles to structure climate governance, such as governing through non-binding legal instruments, and relaxing the differentiation of developed and developing countries that implies large historical emitters need to go first on mitigation.¹⁵ By cultivating an appearance of engagement with climate governance, recalcitrant governments may alleviate pressure from domestic, transnational and international actors to ramp up their ambition. Fragmenters raise a number of stumbling blocks and convoke alternative constituencies advocating weaker and softer mitigation objectives. They oppose the principles established in the UNFCCC and use institutional proliferation to shape the evolution of climate multilateralism to match their preferences for slower and less mitigation.

1.3 How is participation in climate institutions related to cooperative behavior in the Paris Agreement?

Accordingly, participation in climate governance may be driven by two logics: one related to deepening climate governance by creating additional operative forums, and another related to fragmenting climate governance by creating additional obstructionist forums. Dissatisfied deepeners may participate in new multilateral institutions to accelerate multilateral cooperation, while dissatisfied fragmenters may participate to slow cooperation. Extensive participation in climate institutions may therefore be associated with stronger or weaker cooperative behavior depending on a state's motivations for joining non-UN climate forums. I argue each type of dissatisfied state will establish and join different types of climate

¹⁴Karlsson-Vinkhuyzen and Asselt 2009.

¹⁵Vihma 2009.

institutions. I demonstrate empirically that states sort themselves by type through their membership decisions across climate governance.

The concept-pair of deepeners and fragmenters helps us to reconcile diverging perspectives in the literature on whether overlapping institutions support or undermine cooperation. I argue that institutional proliferation as such does not influence cooperation, but individual states use dense institutional environments to pursue their goals. Attention to states' motivations for participating in dense institutional environments helps us understand their cooperative behaviour.

If this lens of contested climate governance is an accurate representation of participation decisions, then simply counting a state's institutional memberships in climate change may misrepresent the nature of participation. Different types of institutions serve different purposes and arise from different data generating processes. Therefore, I develop a new measure of participation that accounts for the different membership patterns of different kinds of dissatisfied states. Specifically, I model state membership decisions using a statistical measurement model based on item response theory.¹⁶ The measurement model takes all states' observed climate membership data and estimates a set of country-level parameters and institution-level parameters to predict membership outcomes across states. These country-level parameters ("ideal points") are scores for participation and measure the extent to which a state is a deepener or a fragmenter.

I link participation decisions in climate institutions to cooperative behavior in climate governance via the 2015 Paris Agreement on Climate Change. I conceptualize cooperation in climate politics as states' efforts to reduce their GHG emissions. Cooperation is not simply membership in climate institutions. The Paris Agreement offers a unique lens into the willingness of states to undertake costly cooperative policy reforms since states selected their own policy targets in the form of Intended Nationally Determined Contributions. These policy documents outline national governments' pledges to reduce their GHG emissions. I create a new measure of equitable GHG mitigation for each country that is derived from research by

¹⁶For uses of item response theory in international politics, see, e.g., Fariss 2014; Hollyer, Rosendorff, and Vreeland 2014; Bailey, Strezhnev, and Voeten 2017; Fariss 2018.

climate scientists.¹⁷ I show in statistical tests that states' patterns of participation in climate institutions, as measured using my climate ideal points, predict the ambition of states' GHG mitigation targets in the Paris Agreement on Climate Change. Specifically, states that have pledged more stringent GHG emissions reductions targets joined climate institutions focused on capacity-building and the implementation of climate policy and they join fewer institutions focused on networking and negotiations. Deepeners have more ambitious targets than fragmenters. By contrast, there is no relationship between the sum of states' climate memberships and the ambition of their GHG targets. This demonstrates the importance of distinguishing the motivations behind states' participation choices, and the added value of my new climate ideal points.

1.4 Contributions

This research makes contributions to the study of climate politics, international institutions, and international cooperation. For those interested in climate politics, I provide a conceptual map of the international institutions that address climate change. I distinguish the subset of climate institutions with state members as a coherently bounded set of cases, and address how these relate to and differ from other treatments of climate governance, such as the intersection of climate change with other issue-areas and transnational climate governance.¹⁸ I create a new dataset of state membership in climate institutions, gathering for the first time the full range of climate institutions. Second, I use this new dataset to create new measures of state preferences in climate change. I use this measure to examine the determinants of participation in climate governance and how participation relates to the ambition of states' international climate policy. Future studies could use this measure to re-consider constellations of affinity in climate politics. Finally, I develop a new measure of the ambition of states' GHG emissions targets and provide the first systematic analysis of the stringency of states' Paris targets.

¹⁷Robiou du Pont et al. 2017.

¹⁸Keohane and Victor 2011; Bulkeley, Andonova, Betsill, et al. 2014.

For scholars of international institutions, I argue that greater attention should be paid to membership in international institutions at the level of the issue-area (e.g., climate change) rather than focusing of membership in individual institutions (e.g., the Kyoto Protocol). Specifically, I show that *patterns* of institutional memberships are informative of states' preferences, rather than cruder quantities like a state's sum of memberships. In my applied chapters, I demonstrate the payoffs that shifting the level of analysis has for understanding state behavior. Secondly, I crystallize arguments about why states join international institutions,¹⁹ and specifically about the role of dissatisfaction in conditioning institutional proliferation.²⁰ Consistent with existing theory, I consider that states join institutions to shape the evolution of multilateralism, but I argue that these efforts come from opposing sides. I demonstrate that membership patterns are consistent with the fact that some states join to support cooperation and others join to undermine it. Linking these two points contributes to debates that view international institutions as screening devices that separate states by type.²¹ While existing theory argues that individual institutions separate states by type using costly membership criteria, I demonstrate that states may separate themselves by type in dense institutional environments through their patterns of memberships.

Finally, I contribute to two debates about international cooperation. Scholars have recently taken an interest in whether institutional proliferation supports or undermines international cooperation.²² In this study, I show that when states create new institutions that advance implementation and capacity-building those states display more cooperative behavior. By contrast, membership in new institutions that focus on networking is associated with less cooperative behaviour. This finding helps unpack how states use dense institutional environments. Finally, I advance the literature on the broader-deeper tradeoff in international cooperation.²³ Measuring

¹⁹Mansfield and Pevehouse 2006; Simmons 2009.

²⁰Benvenisti and Downs 2007; Shaffer and Pollack 2009; Colgan, Keohane, and van de Graaf 2012; Jupille, Mattli, and Snidal 2013; Morse and Keohane 2014; Lipsky 2017; Kellerman 2019.

²¹von Stein 2005; L. Martin 2017.

²²Alter and Meunier 2009; Biermann et al. 2009; Kelley 2009; C. Davis 2009; Orsini, Morin, and O. Young 2013.

²³Alesina and Grilli 1993; Downs, Rocke, and Barsoom 1998; Stone, Slantchev, and London 2008.

cooperative behavior has been a longstanding problem, since institutions often prescribe common targets for all members and these targets may not be substantively demanding. I show that when states select their own policy targets—as in the Paris Agreement on Climate Change—we can measure states’ willingness to contribute to collective action. Rather than considering whether international cooperation is shallow or deep in general, we can identify the depth at which individual states cooperate. Future work on international cooperation should consider cooperative policy adjustments in terms of levels more directly.

Climate change, and environmental politics more broadly, has been understudied by political scientists.²⁴ While there are no doubt many reasons why this is the case—for example, environmental politics is rarely taught in graduate courses and is rarely published in top political science journals—a more subtle reason may stem from a widespread perception of a lack of progress within climate politics. In this respect, the missing climate scholarship is akin to Martin Wight’s famous analysis of the lack of “international theory” historically.²⁵ Wight attributes the paucity of reflection on international affairs to it being “the realm of recurrence and repetition”: states had made little progress in outlawing violence throughout history and there was little to study besides the exercise of raw Realpolitik. Similarly, states had failed to produce many positive climate achievements since the 1990s and observers could hardly be faulted for overlooking climate change as an exciting area of research.

The Paris Agreement upends this narrative. It constitutes a major breakthrough in international climate politics, even if it will not be enough on its own to keep global temperature rise below 2 °C.²⁶ Climate politics is vitally alive. National and sub-national governments have never been as active in designing and implementing climate policy. The Paris Agreement is interesting as a major new element of the architecture of climate politics. However, it also has novel design elements that are interesting on their own terms for scholars of international politics. The Paris Agreement allows states to set their own policy targets, has a mechanism for

²⁴Green and Hale 2017; Katz-Rosene 2018.

²⁵Wight 1960.

²⁶Rogelj, den Elzen, et al. 2016.

surveying counterparts' policies, provisions to link the treaty to other international institutions, and mechanisms for review and elaboration that could be sources of endogenous institutional change. I hope this research helps foster greater awareness of the importance of climate change, but also of the unique design elements of climate cooperation that should interest curious observers of global politics.

1.5 Outline

This study is organized in four chapters. In chapter 2, I develop my theoretical argument in greater detail. My analysis starts by examining the nature of the cooperation problem in climate change, highlighting how both structural features of climate change and institutional features of the UNFCCC have hindered states from reaching an effective solution. Some states are dissatisfied with what they perceive to be a low payoff outcome, but others are interested in delaying collective mitigation obligations for as long as possible. I then argue that these two opposing preferences condition states to create and join new climate institutions to pull international climate politics in the directions they prefer. I develop the logic of deepeners, who seek to accelerate climate action, and fragmenters who seek to undermine it. I conclude by outlining how these states join different kinds of climate institutions and how this then matches their cooperative behavior in the Paris Agreement.

States have created a vast array of institutions to govern climate change, but these have mostly gone unremarked in the literature. As such, most readers will be unfamiliar with them. Accordingly, in chapter 3, I provide a map of the diffuse institutional landscape in climate politics. Since I understand these institutions as related to the UN-led process, I outline how the UN has attempted to manage international climate negotiations from the early 1990s. I then discuss two similar literatures on overlapping institutions in climate change, but that differ from the units I study—specifically, transnational climate governance and the intersection of climate change with other issue-areas, a topic sometimes referred to as regime complexity. I conclude this chapter with a descriptive overview of the growth of

outside climate institutions over time, their varied membership, and how their characteristics match and diverge from those embodied in the UNFCCC.

In chapters 4 and 5, I take more detailed looks at membership in climate institutions and states' targets in the Paris Agreement, respectively. I situate the arguments in these chapters with reference to existing theoretical debates about why states join international institutions and how membership in international institutions relates to cooperation. In my membership chapter, I link my theoretical argument about dissatisfaction to state participation in climate institutions. I argue that participation ought to be conceptualized at the level of the issue-area. I build on this argument to develop country-level scores for participation based on states' patterns of participation across 65 climate institutions. In statistical tests, I evaluate the drivers of state participation in climate institutions.

In my targets chapter, I close the theoretical argument by linking participation back to cooperation. I highlight how the opposing perspectives of deepeners and fragmenters on the pace of cooperative progress match arguments in the literature about the consequences of overlapping institutions. I exploit a novel element of the Paris Agreement's institutional design to measure states' willingness to contribute to GHG abatement. I derive three expectations about how participation in climate institutions relates to the ambition of these targets and then evaluate these expectations with statistical tests. I show that state participation in climate institutions is highly associated with the stringency of their Paris commitments, but that this is only apparent with the correct specification of participation. This chapter provides evidence for how states use dense institutional environments.

I use original and diverse data to support these arguments. I build a new dataset of state membership across 65 climate institutions. Where previous studies have examined the determinants of the ratification of the UN climate treaties,²⁷ I broaden the analysis to consider the entire set of climate institutions. I develop new measures of participation in this dense institutional environment that contribute to our understand of affinity in international politics. I also use qualitative evidence

²⁷von Stein 2008.

to validate the interpretation of my new measure of climate preferences and to facilitate the exposition of new concepts. I build on data from climate scientists to create the first measure of the stringency of states' Paris GHG targets. To do so, I create new data on the quantifiability and comparability of states' targets, in the process uncovering how states may use the vagueness of the Paris system to their advantage. I use statistical models to estimate the drivers of participation, and then to estimate how participation relates to cooperation.

2

Dissatisfaction and proliferation in climate politics

Contents

2.1	Introduction	17
2.2	Climate change as an international cooperation problem	21
2.2.1	Intrinsic features of international climate cooperation	23
2.2.2	Extrinsic features of climate change as an international cooperation problem	31
2.2.3	Linking intrinsic and extrinsic features to proliferation	38
2.3	Proliferation and dissatisfaction	40
2.3.1	Proliferating to deepen climate cooperation	44
2.3.2	Proliferating to fragment climate cooperation	46
2.4	Proliferation and cooperation	49
2.5	Conclusions	51

2.1 Introduction

In climate governance, negotiators convene all year round in different, seemingly overlapping institutions. In the year between the 2017 and 2018 annual United Nations climate conferences, state representatives met to discuss climate change at the One Planet Summit, the Petersberg Climate Dialogue, the Ministerial on Climate Action, the Global Climate Action Summit, the UN Framework Convention

on Climate Change (UNFCCC)'s intersessional meeting, an emergency UNFCCC preparatory meeting in Bangkok, as well as in various other tangentially related forums, such as the Group of 7, Group of 20 and ozone convention meetings. Negotiators spent nearly every week on airplanes criss-crossing the troposphere, buoyed up by record-high concentrations of carbon dioxide. Furthermore, these meetings are additional to a host of ongoing dialogues that take place within, by my count, over 60 extant climate governance institutions with state members.

Consider the case of France, which hosted the 21st Conference of the Parties to the UNFCCC in 2015 and presided over the landmark Paris Agreement. In addition to their membership of the UNFCCC, the French government is also a member of thirty-four other climate governance institutions. As officials in the French ministry of foreign affairs negotiated draft text for a new climate treaty, their counterparts in other departments had spent the better part of two decades meeting with government officials from other countries in transgovernmental networks, activists from civil society organizations and representatives from business associations in transnational governance initiatives, as well as preparing behind the scenes for other high-level political meetings between heads of states in other informal intergovernmental institutions. Treatments of climate politics tend to focus on the high-level UN climate conferences and new pieces of climate treaty law.¹ In this study, I seek to demonstrate that these climate institutions outside the UN-led process are important for climate politics and help us understand the phenomenon of institutional density that increasingly characterizes diverse issue-areas of world politics.

In this chapter, I detail my theoretical argument about institutional proliferation in international climate politics. Recasting climate change through the lens of institutional proliferation draws attention to the hidden range of institutionalized cooperation outside the United Nations-led climate governance process. Studies of international climate politics tend to focus on the annual United Nations climate conferences and the outcome documents they produce. However, this obscures how states have chosen to govern climate change, which includes working through

¹For an early text making this point, see Hoffmann 2011.

over sixty other purpose-built climate institutions. This broader institutional environment converges with and diverges from the UN-led process, helping us better understand cleavages between and affinities among states in international climate politics. These outside climate institutions also help shape the evolution of climate cooperation. They build capacity for climate action, convoke new constellations of states, and introduce new norms and ideas for how to govern the climatic commons. These new climate institutions have also left their imprint on treaty design. While the Paris Agreement partly resembles earlier climate treaties, it also reflects characteristics of the new climate institutions that have been established outside the UNFCCC.

I organize this chapter around three linked theoretical questions. First, why have states created such a dense set of institutions to manage climate change? I argue that institutional proliferation is a response to intrinsic features about climate change as a cooperation problem combined with extrinsic features related to the institutional design of the UNFCCC. Climate change was always going to be a difficult problem to address due to the collective action required, the divergent preferences of key actors, and the underlying uncertainties involved. However, the main multilateral institution tasked with governing climate change—the UNFCCC—was not enabled to succeed either. Its bifurcated internal membership structure drove an enduring wedge between developed and developing countries and its consensus decision-making rules hindered progress on elaborating new agreements. The pace of cooperation at the UNFCCC therefore left states dissatisfied. In response, states took many topics within climate change out of the UNFCCC and began to address them in purpose-built, smaller membership climate institutions.

However, this general argument says little about the particular manifestation of institutional proliferation that climate change has experienced. States have created over 60 different climate institutions and state membership varies substantially across these. Therefore, my second research question asks, what accounts for state membership decisions across diverse climate institutions? To answer this, I build on the theoretical answer to my first question. Proliferators seek more

favorable cooperative outcomes and use new institutional forums to pull cooperation toward their preferences. However, the nature of this dissatisfaction must be further elaborated. If states were left dissatisfied by the pace of cooperative progress at the UNFCCC, this was actually for two reasons. Some states were dissatisfied with cooperative progress that proceeded too slowly. However, other states have been fearful of the sovereignty costs of accepting binding mitigation obligations. They have obstructed progress at the UNFCCC, where the consensus decision-making rules grant them an outsized influence, but they also use outside institutions to articulate rival principles to structure climate governance that better reflect their preferences. They use new climate institutions to fragment climate governance. Accounting for these two motivations helps explain patterns of state membership in climate institutions.

Finally, how is participation in climate institutions related to states' cooperative behavior in climate politics? If state membership in climate institutions stems from their perspectives on the pace of cooperative progress at the UNFCCC, then states' cooperative behavior should be associated with their patterns of institutional memberships. I argue that participation in climate institutions is associated with states' GHG mitigation targets in the Paris Agreement on Climate Change, but that neither the sum nor the share of climate memberships captures this relationship. If participation is driven by two opposing motivations that I identify—dissatisfaction with cooperative progress that proceeds too slowly or too quickly—then extensive participation could be associated with both efforts to deepen and to fragment climate governance. Simply counting each state's climate memberships conflates these two motivations. Instead, states' patterns of climate memberships are more reflective of their underlying preferences. States sort themselves by type and their patterns of institutional memberships are associated with their cooperative behaviour. States with more ambitious targets have different patterns of climate memberships than states with less ambitious targets. Specifically, states that have pledged more stringent GHG emissions reduction targets join climate institutions focused on capacity-building and the implementation of climate policy and they

join fewer institutions focused on networking and negotiations. State behavior across climate institutions helps us to better understand how states use dense institutional environments.

2.2 Climate change as an international cooperation problem

Climate change represents one of the most dramatic and challenging issues in international politics. Climate change is dramatic since its consequences will play out on a global scale, over a long period of time, and will impact a wide range of human and non-human activities. It is challenging for these same reasons. Its drivers and impacts are distributed unevenly across many actors, sites, and time periods. This problem structure conditions a fractious international climate politics, yet calls for a concerted global response. The global institutional response to climate change, however, has not been flawless. In some ways, prevailing governance practices exacerbate elements of the underlying cooperation problem and hinder reaching an effective solution.

The primary institution responsible for addressing climate change was established as the United Nations Framework Convention on Climate Change (UNFCCC) in 1992. This treaty established the basic principles and goals of international climate governance, provided a structure within which to elaborate future climate rules, and created a small bureaucracy to support state interaction. States continue to use the UNFCCC. They meet annually for major climate conferences and negotiate new international treaties under the UNFCCC's auspices. However, climate governance is also spread across many other international institutions, even if the UN-led process should be considered the core. States now meet in separate institutional forums to craft principles on the design of domestic carbon pricing, develop accounting rules for emissions from forestry, and to support research, among other things. Instead of centralizing governance activities at the UNFCCC, states have parceled out different elements of the larger cooperation challenge across distinct international climate institutions. In principle, states could pool their resources

and centralize these governance activities under the auspices of the United Nations climate secretariat. Yet, through their extensive use of outside institutions, states have chosen a different route. *Why have states pursued institutional proliferation in international climate politics?*

I argue that institutional proliferation is a response to intrinsic features of climate change as a cooperation problem combined with extrinsic features related to the institutional design of the UNFCCC. Structural features of climate change were always going to make the problem difficult to manage. Climate change is highly multidimensional and striated by preference heterogeneity. States disagree at very deep levels over how to manage future climate change. This disagreement is manifest most starkly in legal mitigation obligations for states, but mitigation itself contains several inter-linked issues. Some of these issues can be, at least partially, uncoupled from the broader international response managed by the UN and addressed in newly created outside institutions by interested states. Moving issues outside of the UNFCCC helps skirt some of the institution's own deficiencies. The UNFCCC adopts decisions by consensus and it is difficult to reach consensus among over 190 states with very different interests. The UNFCCC endeavors to sequence cooperation over time by elaborating a set of increasingly stringent GHG mitigation targets, but recalcitrant states have held back collective progress. This sequential design always leaves extant cooperation a poor substitute for what ambitious states consider an effective global response. These states have been able to circumvent some of the UNFCCC's problems by separating priority topics into new standalone climate institutions.

The combination of these intrinsic and extrinsic features accounts for the extent of institutional proliferation within climate change. Preference heterogeneity contributes to stasis in multilateral negotiations at the UNFCCC, but it means different coalitions of states share overlapping interests on auxiliary topics that can be addressed through other forums. The fact that states can coordinate on carbon pricing or climate change-resilient agriculture without endangering multilateral rules on mitigation drafted at the UNFCCC means that it is viable for states to

craft into these outside climate institutions. States can use these new institutions to build capacity to implement ambitious climate action in the future. Ultimately, non-UNFCCC climate cooperation helps shape the evolution of multilateral climate politics. These institutions reshape constituencies in international climate politics and are the sources of new principles, some of which have come to inform the structure of multilateral rules adopted at the UNFCCC. Organizing minilaterally in purpose-built forums has been an operating solution to the UNFCCC's dysfunction. In this section, I first unpack the structural elements of the cooperation problem and then the design elements of the problem. In section 2.2.3, I tie these together to explain how the combination of intrinsic and extrinsic features condition institutional proliferation. I list the different intrinsic and extrinsic elements of the problem in table 2.1.

2.2.1 Intrinsic features of international climate cooperation

Climate change is a multidimensional policy challenge that can be disaggregated into a set of simpler components. Robert Keohane and David Victor note that climate change should be considered four related topics: GHG mitigation, adaptation to climate impacts, capacity building to address climate change, and the provision of scientific information about climate change and policy solutions.² Similarly, Joshua Busby has argued that the climate regime must supply five key functions. It must provide scientific information, support raising collective ambition, elaborate additional rules to support the implementation of existing agreements, mobilize finance and technology transfer for mitigation and adaptation, and coordinate individual efforts to ensure effectiveness.³ These different topics call for different policy solutions. For instance, the types of institutional provisions that support mitigation obligations will differ from those that support accumulating useful scientific information. This is a broad array of tasks, which increases the complexity of climate negotiations.

²Keohane and Victor 2011.

³Busby 2017.

However, both Keohane and Victor and Busby's levels of decomposition mask broader multidimensionality within each of these topics. Within mitigation, for example, consider that GHG emissions arise from many economic sectors and sources—from electricity generation to transportation, as well as agricultural and land use practices and industrial processes. Different policy solutions are appropriate for different sectors. While negotiating a large number of topics simultaneously creates opportunities for linking issues and expanding the bargaining range, it also increases the complexity of any cooperative agreement.⁴ As I argue in the next section, the UNFCCC is poorly designed to handle such a wide array of topics. This multidimensionality means that states are able to make progress on separate topics at quicker speeds among interested subsets of states, but that they must use outside forums to do so.

Despite its multidimensionality, the foundational cooperation challenge in climate change is the mitigation of GHG emissions. Mitigation is often considered a global public goods problem, where decentralized decision-making leads to underinvestment in mitigation relative to a Pareto-optimal level. Climate mitigation has public goods qualities in that the benefits of lower atmospheric concentrations of GHGs are not excludable from those who do not contribute to mitigation.⁵ Collective action problems in providing public goods arise when (1) an agent's utility derives from its own contribution as well as the contributions of others, and (2) when their utility is greater whenever they choose to not contribute to the public good rather than to contribute. It is well-known that this problem structure encourages free riding, leads to inefficient social outcomes, and that institutions may help actors improve upon a status quo with decentralized decision-making. Institutionalized cooperation may contribute to solving a public goods game by defining the content of cooperation and defection,⁶ lengthening the shadow of the future,⁷ creating

⁴Sebenius 1983.

⁵Strictly, public goods are non-excludable and non-rival.

⁶Garrett and Weingast 1993.

⁷Axelrod and Keohane 1985.

reputational incentives,⁸ or by using inducements to enforce an agreement.⁹ Adding enforcement mechanisms raises a state's sovereignty costs of acceding to mitigation obligations, and states that doubt their ability to meet to strict mitigation targets may prefer non-participation to sanctions for poor performance.

The public goods climate game is aggravated by the large number of actors involved.¹⁰ Over 190 states participate in crafting international climate policy, though each state does not contribute equally to GHG emissions. A larger number of actors increases preference heterogeneity, hinders monitoring, and creates more opportunities for free riding. Following the logic of *k*-groups,¹¹ Victor has argued that a core group of high emitting states could cut through some of the heterogeneity of the universal membership UN negotiations and craft an effective, separate mitigation agreement.¹² Solutions to public goods games are also threatened when it is difficult to observe or measure counterparts' compliance.¹³ GHGs are emitted from many economic processes and are difficult to measure accurately. This makes it difficult to determine whether other states are complying with their stated mitigation obligations. The monitoring challenge leads to additional uncertainty about the behavior of counterparts that weakens the ability of states to cooperate in the climatic commons. This focus on reducing the number of actors as a means of supporting effective climate cooperation structures much of the existing research on institutionalized climate cooperation.

James Fearon has demonstrated that many international issues characterized by enforcement problems are also characterized by distributional problems, where actors have divergent preferences over the content of cooperation.¹⁴ Fearon's insight is that, in order to enforce an agreement, states must first negotiate the terms of an agreement. International cooperation is difficult when actors disagree over

⁸Guzman 2008.

⁹von Stein 2013.

¹⁰Barrett 2003.

¹¹Schelling 1978; Snidal 1985b.

¹²Victor 2011, see also Nordhaus 2015; Falkner 2016a.

¹³Koremenos, Lipson, and Snidal 2001.

¹⁴Fearon 1998.

the substance of cooperation or when cooperation creates winners and losers.¹⁵ Within climate change, distributional conflict is structured by three interlinked preferences with respect to mitigation. States' varying contributions to climate change and their vulnerability to its impacts mark and position them differently with respect to mitigation.

First, since states vary in their vulnerability to the impacts of climate change, there is distributional conflict over the *level* of mitigation activities. This is generally discussed in terms of temperature targets, where atmospheric concentrations of GHGs (e.g., 430–480ppm, 480–530ppm, etc.) have a known probabilistic relationship with global mean temperature (e.g., +1.5 °C, +2 °C, etc.). States that are more vulnerable to the impacts of climate change should prefer to keep atmospheric GHG concentrations at lower levels (i.e., less global warming) than states that are less vulnerable to the impacts of climate change, all else being equal.

Consider any targeted atmospheric GHG concentration as creating a relatively fixed quota of future GHG emissions that states can emit. Second, the relatively fixed quota of GHG emissions consistent with any temperature target creates additional distributional conflict over the *allocation* of future GHG emissions across states consistent with this quota. Since mitigation is costly, states bargain for more generous allocations of future GHG emissions. Since states vary in the extent to which they depend on GHG-emitting fossil fuels for domestic economic processes, states that depend more heavily on fossil fuels for government revenue, electricity generation, or other industrial processes will demand a more generous national allocation. Furthermore, developing countries seek more generous allocation consistent with GHG-led developmental objectives.

Distributional conflict over the allocation of future GHG emissions intersects with equitable mitigation. Some countries are responsible for a larger share of the total stock of historical GHG emissions and under most equity frameworks ought to be responsible for larger contemporary mitigation.¹⁶ However, assigning responsibility for historical GHG emissions is not unproblematic, since the scientific evidence

¹⁵Krasner 1991; Drezner 2007; Buthe and Mattli 2011; Shaffer and Pollack 2013.

¹⁶Kartha et al. 2018.

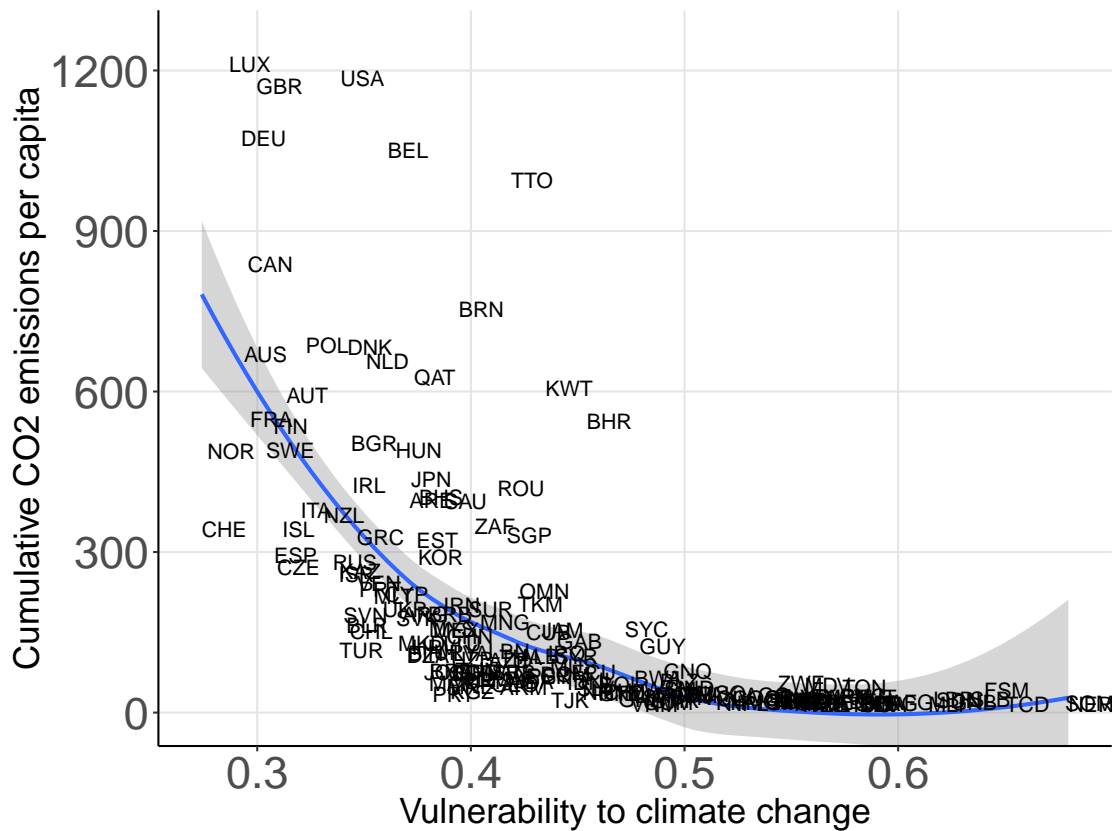


Figure 2.1: Cumulative GHG emissions per capita and vulnerability to climate impacts. States with fewer GHG emissions per capita throughout history are the most vulnerable to the impacts of climate change.

linking the emissions of greenhouse gases to climate impacts was characterized by greater uncertainty prior to roughly 1970. This problem is attenuated somewhat by the fact that pre-1970 emissions are small relative to contemporary flows. Indeed, half of all anthropogenic GHG emissions have been emitted in the past 30 years. Nonetheless, this problem is compounded by the fact that some countries with relatively low historical and contemporary per capita emissions (e.g., China and India) have experienced the fastest absolute emissions growth in recent years. In a cruel twist, countries that have contributed the least to climate change are the most vulnerable to its impacts (see figure 2.1). The interplay of historical and contemporary GHG emissions amplifies distributional conflict over the allocation of future GHG emissions in any cooperative agreement.

Finally, for a fixed level of GHG emissions, states also vary in their time

preferences with respect to mitigation. Actors are generally taken to discount the future in two ways. Actors have a pure rate of time preference (also referred to as utility discounting), where they value a good less the further away in time that it will be realized. For elected national governments, inter-temporal policy-making appears to be especially difficult.¹⁷ Actors also recognize the opportunity costs of mitigation in the present compared to in the future.¹⁸ If economies continue to grow in the future, then the same mitigation policies will be relatively cheaper in the future in wealthier societies, where more resources are available to allocate between mitigation and non-mitigation activities. The preference for spending in the present versus in the future is analogous to the real rate of return on capital. Countries prefer to delay mitigation into the future, all else being, but this should be particularly strong among poorer countries where resource constraints are more binding in the present. Taken together, these two factors suggest there is distributional conflict over the *timing* of mitigation action: do we address climate mitigation in 1995, now, or in 2050? These two discount rates can be understood as two sets of normative questions: how much to value future generations relative to the present, and how much to rely on future generations to enact stringent mitigation policies relative to more moderate ones in the present.

Two kinds of uncertainty about the state of the world amplify considerations of timing emissions mitigation. Essentially, there is uncertainty about the costs and benefits of mitigation. The effectiveness of any policy intervention in terms of reducing GHG emissions at relatively low costs remains unclear. Domestic mitigation policy relies on a handful of complex policy instruments, such as carbon taxes, emissions trading schemes, direct regulation, and subsidies. Empirical studies of abatement costs often yield a wide range of costs within a type of intervention (e.g., the cost of a solar photovoltaic subsidies is in the range of \$140–2100/ton of abated CO_{2,eq})¹⁹ and some of these costs exceed estimated global- and country-

¹⁷Jacobs 2011.

¹⁸Nordhaus 2010, pp. 169–171.

¹⁹Gillingham and Stock 2018, p. 59.

level social costs of carbon, making them prohibitively expensive.²⁰ If the costs of mitigation in the present are high, governments may choose to delay mitigation policies until abatement costs fall relative to the social cost of carbon or better estimates of abatement costs are available.

Finally, substantial obstacles arise in modeling climate impacts.²¹ If states face uncertainty about the severity of a problem, then they will attempt to resolve uncertainty and delay costly action. Uncertainty about the impacts of climate change—globally and cross-nationally—can therefore amplify collective action problems.

The true damage function relating changes in atmospheric GHG concentrations to social and economic impacts is unknown. Changes in the climate system will have impacts on a number of different and interrelated natural and human processes, such as economic growth, labor productivity, agricultural output, disease transmission, and migration.²² Modeling these interrelationships is challenging. Existing studies have found the damage function to be concave—in that both high and low temperature deviations from local averages depress economic output.

Econometric models identify the effect of temperature shocks on social and economic outcomes through unit and time fixed effects, such that only annual within-unit variation in temperature (and precipitation) is used to predict damages.²³ However, the range of observed climate shocks differs substantially from forecasted temperature increases under moderate and weak mitigation.²⁴ Changes in the mean global temperature also change the maximum of annual country-level temperature anomalies to include hotter years than have ever been observed. Therefore, forecasting the impact of global warming relies on extrapolations outside observed values. The range of temperature shocks—variation in annual temperature compared to the national mean—under 2 °C of warming will also be well outside the range

²⁰On global- and country-level social costs of carbon, see Ricke et al. 2018.

²¹Pindyck 2013.

²²Mora et al. 2018.

²³Dell, Jones, and Olken 2014; Burke, Hsiang, and Miguel 2015; Burke and Emerick 2016; Pretis et al. 2017; Burke, M. Davis, and Diffenbaugh 2018.

²⁴Hsiang et al. 2017, figure S14.

of observed shocks. Essentially, we do not have historical data from areas of the future distribution of temperature under climate change to assess impacts. Compared to identify the effect of climate change using fixed effects econometric models, integrated assessment modeling makes stronger assumptions about the links between temperature and outcomes within economic sectors to forecast the impacts of climate change on economic growth, though their forecasts produce very large confidence intervals that do little to address the underlying uncertainty about climate impacts.²⁵ It is also difficult to account for adaptation in existing econometric models, which may dampen climate impacts.²⁶ However, it is also difficult to account for tipping points and non-linearities in the climate system that may make the observed historical relationship between temperature shocks and social and economic impacts invalid.²⁷ Climate impacts will be different across space, and getting the right resolution for forecasting climate impacts is data- and computationally-intensive. This uncertainty was much greater in the 1990s and 2000s—the period during which climate negotiations stalled. If the costs of inaction are imprecisely characterized, this may prompt policymakers to delay action.

Mitigation is therefore characterized by high preference heterogeneity and distributional conflict over the timing of mitigation actions, the allocation of mitigation costs across countries, and the level of collective mitigation to undertake. Together, these linked structural elements of climate change as a cooperation problem impede states from making quick progress on binding, substantive mitigation targets (see table 2.1). Providing public goods when actors have bedrock disagreement over the urgency of the problem and can point to numerous uncertainties as reasons for inaction is a recipe for stalemate. This has been the fate of climate politics since the early 1990s. However, these structural features are not the whole story. Instead, these inherent aspects of climate change as an international cooperation problem intersect with elements of the institutional design of the UN-led response to condition proliferation. I now turn to these design elements.

²⁵Stern 2007, ch. 6.

²⁶Burke and Emerick 2016.

²⁷Wagner and Weitzman 2016.

STRUCTURAL FEATURES	INSTITUTIONAL FEATURES
Multidimensionality	Consensus decision-making rules
Public goods	Bifurcated membership structure
Distributional conflict	Large membership
Uncertainty about policy effectiveness	Sequential approach to cooperation

Table 2.1: Elements of the cooperation problem. Structural features of climate change as a problem requiring international cooperation make it difficult to address in decentralized world politics. Institutional features of the design of the UNFCCC have also protracted negotiations and hindered timely climate cooperation. Together these two types of factors have led states to pursue institutional proliferation within global politics, rather than either set of factors on their own. Structural and institutional factors are not necessarily paired in rows.

2.2.2 Extrinsic features of climate change as an international cooperation problem

This set of cooperation problems would pose a challenge to any international organization tasked with solving them; however, the institutional response centered at the United Nations is particularly ill-suited to the task at hand. Numerous design features of climate cooperation erect additional challenges to managing climate change. The UNFCCC has universal membership, divisive demarcations among its members, operates with consensus decision-making rules, and endeavors to sequence cooperation over time. These design features amplify preference heterogeneity, heighten dimensionality and drag the pace of collective mitigation down to the policy preferences of the lowest common denominator (see table 2.1).

I consider the UN-led climate governance process to consist of the UNFCCC, the UN climate secretariat, the annual UN climate conferences, and the additional treaties that have emanated from the annual UN negotiations. The 1992 United Nations Framework Convention on Climate Change is an international, legally binding treaty with over 190 members (“Parties” to the treaty). The UNFCCC lays out broad principles to guide the elaboration of rules in international climate politics, including strong differentiation in the expectations and obligations of developed and developing countries.²⁸ States that have ratified the UNFCCC meet annually at Conferences of the Parties (COPs) to discuss the implementation of existing

²⁸Bodansky, Brunnee, and Rajamani 2017, ch. 5.

obligations and negotiate further rules to manage global climate change. The UNFCCC's secretariat provides administrative support for these meetings. Under its auspices, states negotiated the 1997 Kyoto Protocol, its 2012 Doha Amendment, and the 2015 Paris Agreement on Climate Change. The UN climate secretariat has also facilitated the creation of a range of other related bodies that "serve to advance the implementation of the Convention, the Kyoto Protocol and the Paris Agreement,"²⁹ such as the Green Climate Fund. Many of these bodies hold their annual meetings during the annual COPs, such as the meetings to discuss implementation of the Kyoto Protocol, which has the effect of partially centralizing international climate governance in the United Nations-led process. I consider the UNFCCC, its annual COPs, and the climate secretariat together as the UN-led climate governance process. It is, at least historically, state-centric and organized through a set of formal international legal agreements.

Like many international institutions, the United Nations climate secretariat has a limited budget and limited technical expertise to assist states. It has not been delegated powerful capabilities with which to enforce bargains and cudgel states toward agreements. This absence of hard institutional powers is also a choice of states not to empower the UN to do so. Partly, this stems from the institution's unwieldy membership: over 190 states are members, they have heterogeneous interests, and they prioritize different topics.

At the same time, the UNFCCC has additional design features that harden these differences to the detriment of cooperative progress. It bifurcates internal membership into developed and developing country factions through the use of inflexible legal annexes. It persists with consensus decision-making rules because it has failed to adopt alternative rules. It intends to sequence cooperation over time from shallow beginnings to more deeply substantive commitments in the future, which leaves present bargains incomplete solutions while conditioning actors to expect more from the institution in the future. Together, this set of *extrinsic* design features worsen the macro-cooperation problem. These features stem from the

²⁹UN Climate Change 2019a.

design of the UNFCCC in the early 1990s and from how the climate has been governed historically. The initial negotiations over the UNFCCC produced a set of compromises, which have not been resolved in the intervening decades. UN-led climate governance's design features contribute to stalemate in the international negotiations and have pushed states to seek out new forums for cooperation outside the UNFCCC. I now address these design features in turn.

The design of the UNFCCC follows the successful design of the international ozone regime.³⁰ The ozone regime is widely considered one of the most effective international environmental regimes and its negotiations heavily informed the structure of the early climate treaties—such as, the use of membership annexes, emissions reductions targets, technical processes, and its overall legal structure.³¹ Depletion of stratospheric ozone concentrations shares some features with climate change as an international cooperation problem in that they are both air pollution problems that call for emissions mitigation, but the two issues depart along a number of other dimensions.³² Ultimately, this has meant that using the ozone template in the climate negotiations has not yielded similarly effective governance outcomes.

Following the model of the ozone regime, the UNFCCC is a broad framework convention that outlines the regime's general objectives, principles, and decision-making rules.³³ In itself, the UNFCCC is a relatively weak document. It imposes only minor and hortatory obligations on signatories and lacks procedures for inducing compliance. Its obligations relate to reporting and do not contain binding emissions mitigation targets. The mitigation obligations are prescribed by subsequent protocols and amendments, such as the 1997 Kyoto Protocol and the 2012 Doha Amendment. In its ideal form, the UN-led climate regime is designed to sequence cooperation over time by elaborating increasingly stringent, binding

³⁰Parson 2003.

³¹Skjaereth 1992; Benedick 1998; Gupta 2014.

³²Sandler 2017.

³³On the use of framework conventions to structure international cooperation, see Abbott and Snidal 2004.

mitigation obligations for an increasing number of greenhouse gases and countries—the model of the ozone regime.³⁴ However, agreement on these additional governance instruments has been difficult. Deadlock over the negotiation and implementation of governance instruments has been the norm for most of the climate regime’s existence.³⁵ Nonetheless, this “dynamic” feature of the UNFCCC—its vocation for subsequent elaboration and deepening—is a useful feature and holds promise for crafting broad and ambitious international climate policy in the ever-receding future.³⁶ Yet, the failure to adopt increasingly urgent mitigation targets frustrates states who are interested in halting climate change.

Framework conventions, by intention, have large membership and the UNFCCC is no exception.³⁷ The treaty’s universal membership makes the UNFCCC’s annual Conference of the Parties (COPs) the focal forum for climate governance. New climate treaties are negotiated under the principles of the UNFCCC and the guidance of its permanent secretariat. The treaty’s universal membership ensures that all nations are represented in negotiations. However, the participation of over 190 countries in a single set of negotiations vastly increases the dimensionality of the negotiations. While a high number of topics being negotiated simultaneously may create additional opportunities for linking issues, it also increases the complexity of any negotiation package. Benjamin Bagozzi has shown by analyzing speeches at the COPs that some of the problems of dimensionality that have impeded agreement are a direct product of the large number of actors included in the negotiations.³⁸ If climate change is already highly multidimensional, the universal membership of the COP negotiations heightens this complexity by allowing each topic’s constituents to play up that topic’s importance in negotiations.

Observers of climate governance might note that the UNFCCC already has certain internal country groupings that could limit the dimensionality of negotiations,

³⁴Schiele 2014, Bodansky, Brunnee, and Rajamani 2017, pp. 85–94.

³⁵Depledge 2006.

³⁶On sequencing cooperation over time using framework conventions, see A. Chayes and A. H. Chayes 1995; Brunnee and Toope 1997; Downs, Danish, and Barsoom 2000; Abbott and Snidal 2004.

³⁷Chasek, D. L. Downie, and Welsh Brown 2010, pp. 22–23.

³⁸Bagozzi 2015.

ANNEX I + ANNEX II	ANNEX I ONLY	NON-ANNEX I
Australia	Belarus	All other countries
Austria	Bulgaria	
Belgium	Croatia	
Canada	Czech Republic	
Denmark	Estonia	
European Union	Hungary	
Finland	Latvia	
France	Liechtenstein	
Germany	Lithuania	
Greece	Romania	
Iceland	Russian Federation	
Ireland	Slovak Republic	
Italy	Slovenia	
Japan	Ukraine	
Luxembourg	Poland	
Monaco		
Netherlands		
New Zealand		
Norway		
Portugal		
Spain		
Sweden		
Switzerland		
Turkey		
United Kingdom		
United States of America		

Table 2.2: Country classifications as laid out in Annexes I and II of the 1992 UNFCCC. Annex II countries correspond to 1992 OECD members, and Annex I countries add Eastern European and former Soviet states that were undergoing transitions to market economies in the 1990s. All countries not listed in Annex I are non-Annex I countries. These are developing countries, but many have experienced rapid economic growth since the early 1990s, when the Annex classifications were set.

namely the country demarcations in the Annexes of the 1992 Convention (see table 2.2). While the UNFCCC has universal membership (196 states have ratified the treaty), the annexes mark out three primary classes of membership: Annex 1, Annex 2, and non-Annex 1. Annex 2 members include the advanced market-oriented economies, as defined by their membership in the Organization for Economic Cooperation and Development (OECD) in 1992; Annex 1 members add to this group a number of “economies in transition,” defined as Eastern European and former Soviet states transitioning to market economies in the early 1990s; while non-Annex

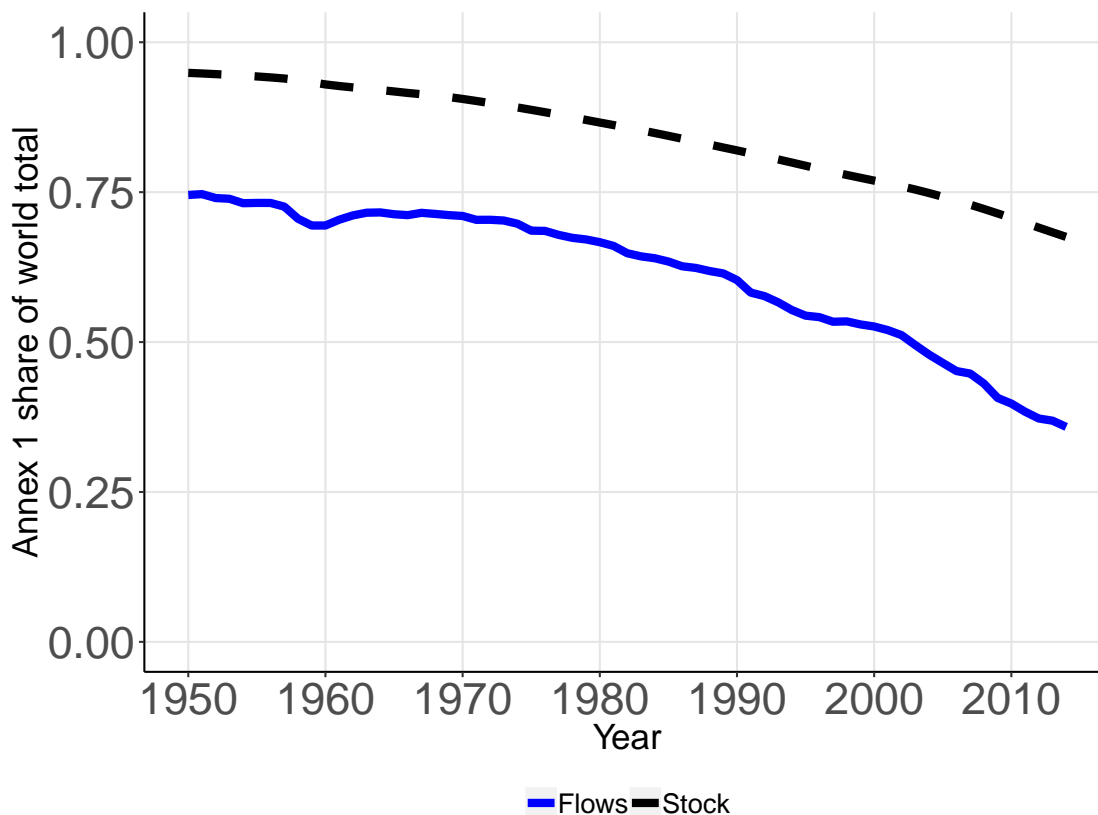


Figure 2.2: Annual GHG emissions flows and cumulative emissions stock for Annex 1 countries are decreasing over time as non-Annex 1 developing countries constitute a greater share of global GHG emissions growth.

1 countries comprise the rest of the world, including all developing countries. As such, the Annex 1/non-Annex 1 divide strongly differentiates countries based on their development status in the early 1990s. The UNFCCC does not provide any criteria for moving states between annex classifications, and does little to address the different needs of countries most vulnerable to climate impacts. Annex 1 countries accepted reporting and financial obligations under the UNFCCC and mitigation obligations under the Kyoto Protocol, while non-Annex 1 countries were exempt from these obligations. Extending mitigation obligations to, at least some, large, developing countries, such as China and India, has been a major theme of climate negotiations since the adoption of the Kyoto Protocol

Inequality in internal membership is not unique to climate change,³⁹ but

³⁹Other examples include permanent membership of the United Nations Security Council, nuclear weapons states under the Nuclear Non-Proliferation Treaty, and lower than most favored nation

the UNFCCC cements membership lines within the treaty that make inequality more salient.⁴⁰ The Annex 1 demarcation lines fit with a model of historical responsibility for climate change set in the early 1990s, when developing countries had contributed roughly 20% of cumulative CO₂ emissions and contributed roughly 40% of annual flows. By 2010, developing countries were responsible for over 30% of cumulative emissions and over 60% of annual flows (see figure 2.2). China, for instance, had contributed 13.7% of global cumulative CO₂ emissions by 2014. Concerns over the distribution of benefits from cooperation notwithstanding, it had become mathematically untenable to omit developing countries from mitigation obligations by the mid-2000s. However, the entrenched differentiation in mitigation responsibilities created by the Annex 1 classifications raised stumbling blocs to broadening mitigation obligations.

A final flaw in the UNFCCC stems from its consensus decision-making rules. The UNFCCC failed to adopt majority voting rules in 1991, when Saudi Arabia raised an objection to introducing voting as a decision-making procedure.⁴¹ Since then, the UNFCCC and annual COPs have operated on the basis of consensus, meaning that a motion passes unless a party raises an explicit objection. While explicit objections are relatively rare across the history of the COPs, the threat of a negative veto has nonetheless held back more ambitious policy proposals.⁴² In effect, the consensus rule hands small groups of recalcitrant states the ability to delay negotiations and pull outcomes towards their policy preferences. While consensus decision-making rules may enhance the process legitimacy of negotiations and ensure the adequate representation of less powerful states, they also have a negative impact on the ability to adopt new ambitious common policy goals.

tariffs for developing countries under the General System of Preferences of the General Agreement of Tariffs and Trade.

⁴⁰Castro, Hornlein, and Michaelowa 2014.

⁴¹Bodansky, Brunnee, and Rajamani 2017, pp. 75–77.

⁴²Bodansky, Brunnee, and Rajamani 2017, pp. 111–112.

2.2.3 Linking intrinsic and extrinsic features to proliferation

The UNFCCC represents an incomplete solution to the challenge of global climate change. At least until the 2015 Paris Agreement was adopted, states had failed to adopt successive GHG targets that would effectively address global warming for nearly two decades.⁴³ Part of the reason for this stagnation lies with the high preference heterogeneity among key states, which narrowed the range of possible agreements; however, the UNFCCC's own consensus decision-making rules also raised the bar for an acceptable agreement. Consensus decision-making rules meant that any agreement reached had to accommodate the preferences of states with the most restrictive participation constraints, a problem sometimes referred to as the broader-deeper tradeoff.⁴⁴ The pace of cooperation at the UNFCCC therefore left states dissatisfied, as some states would have preferred to adopt more stringent policy targets than could be agreed to by all states.

I argue that this dissatisfaction generated by the interaction of intrinsic and extrinsic features of climate change led to institutional proliferation. Governments' demand for climate action outstripped the supply available at the UNFCCC. In response, governments turned to other climate institutions to meet their demands. This made sense for two reasons. First, the UNFCCC had been deadlocked for some time, as a result of its divisive internal politics and onerous decision-making procedures. Second, it was highly unlikely that all of the sub-topics related to climate change could have been addressed feasibly at the UNFCCC. The UNFCCC's membership is too large and heterogeneous, its decision-making rules are too cumbersome and the range of topics to address is too broad for states to work out effective bargains across issues. In response, states took many topics within climate change out of the UNFCCC and began to address them in purpose-built, smaller membership climate institutions.

⁴³Furthermore, states' targets under the Paris Agreement are insufficient to meet the agreement's own temperature targets. See, e.g., Rogelj, den Elzen, et al. 2016.

⁴⁴Downs, Roake, and Barsoom 1998; Gilligan 2004; Stone, Slantchev, and London 2008; Hovi, Ward, and Grundig 2015.

Parceling topics out of the UNFCCC was also feasible given their characteristics. Many of these topics lack negative spillovers across them, such that rules adopted to govern one topic would be unlikely to negatively impact on the ability to govern others. Tana Johnson and Johannes Urpelainen argue that states should separate the governance of issues when two issues lack negative spillovers, rather than linking the issues in a common governance instrument, which they argue is more appropriate when two issues are linked by negative spillovers.⁴⁵ Bundling each different climate topic together into a single institution—as was the de facto design at the UNFCCC—detracts from cooperative progress when actors with non-cooperative preferences can obstruct agreement. Separating topics into parallel forums allows motivated actors to deepen the substance of cooperation among like-minded peers quicker than would be possible in a larger multilateral forum.⁴⁶ By separating topics across different forums, ambitious states were able to make cooperative progress on issues that were poorly addressed at the UNFCCC. Ultimately, this may allow for a multi-speed regime, where a subset of states pursue more ambitious cooperation without being constrained by laggards.⁴⁷

In this sense, the intrinsic and extrinsic features of climate change as an international cooperation problem *together* condition institutional proliferation (see table 2.1). Preference heterogeneity and multidimensionality alone do not explain why states have increasingly sought to separate climate governance across institutional sites. The internal decision-making rules at the UNFCCC foreclosed possibilities for elaborating effective agreements in this venue. Other design features of the UNFCCC, such as the bifurcated annex membership structure, elevated distributional concerns and gave additional reasons for states to slow walk cooperation at the UNFCCC. Many issue-areas of world politics are riven with preference heterogeneity or are multidimensional; similarly, many efforts at institutionalized cooperation are hamstrung by clumsy decision-making rules or the

⁴⁵ Johnson and Urpelainen 2012.

⁴⁶ Johnson and Urpelainen 2012, see also Alesina and Grilli 1993; Downs, Rocke, and Barsoom 1998.

⁴⁷ Alesina and Grilli 1993; Downs, Rocke, and Barsoom 1998.

need to sequence cooperation over time. Climate politics is struck by both sets of factors—those inherent to the nature of the problem and those that stem from institutional design choices that are maladapted to the issue at hand.

While rational choice institutionalism struggles to explain inefficient institutional outcomes, the poor fit of the UNFCCC to its subject matter accords with insights from bounded rationality, as well as, sociological and historical institutionalism.⁴⁸ States faced a new cooperation problem in the early 1990s, so negotiators took an institutional design from a familiar, recent and successful treaty regime and applied it to climate change. In the 1990s, the UNFCCC and Kyoto Protocol were improvements over no treaties, but they reshaped states' interests and their alliances, and locked them into a structure of cooperation that has been resistant to change and relatively inefficient. Institutional proliferation in climate change arises from the intersection of structural features of climate change and design elements of the contingent global institutional response.

2.3 Proliferation and dissatisfaction

In section 2.2, I argue that institutional proliferation arises from the nature of the cooperation problem and deficiencies in institutional design. However, this argument cannot explain the particular patterns of institutional proliferation that we observe in climate governance. In 2015, international climate politics encompassed over sixty different international institutions. State participation across these climate institutions varies considerably. Some states are members of over forty climate institutions, while others have ratified only the UNFCCC and Kyoto Protocol. *What accounts for state membership decisions across diverse climate institutions?* I argue that state membership in climate institutions reflects states' differing perspectives on the pace of cooperative progress in the UN-led international climate negotiations. States' divergent assessments of climate governance drive the proliferation of climate institutions, inversely to how their divergent preferences stall progress at the UNFCCC.

⁴⁸Pierson 2004; Mahoney and Thelen 2009; Fioretos 2011; Jupille, Mattli, and Snidal 2013.

Classical theories of institutionalized cooperation do not expect states to create overlapping institutions to govern the same issue. Overlapping institutions duplicate existing functions, increase fragmentation and the complexity of institutionalized cooperation and are, therefore, inefficient.⁴⁹ The transaction costs of cooperating—which international institutions are supposed to lower—are *raised* in situations where states must navigate many overlapping institutions compared to situations with a single, focal institution.

Institutionalist theory attempts to reconcile this paradox by drawing attention to states' differential positions with respect to the distribution of benefits from institutionalized cooperation. Theories of institutional proliferation argue that dissatisfaction with the distribution of benefits from cooperation in existing forums motivates states to create new institutions to re-capture some of these benefits.⁵⁰ Cooperation yields joint gains for participants, though the benefits of cooperation are not necessarily shared equally.⁵¹ Generally speaking, a state would prefer to receive a greater share of the benefits from cooperation than a lesser share, and each may bargain and pursue other strategies to shift cooperative outcomes in their favour. When actors are dissatisfied with the distribution of benefits from institutionalized cooperation, they seek to renegotiate the terms of cooperation and distribution of its benefits. When internal decision-making rules make renegotiation difficult, dissatisfied actors may choose to use other institutions or even to create new countervailing institutions that produce a more favorable distribution of resources for the actors in question.⁵² Dissatisfied states may create new institutions that articulate rival norms or rules that better resonate with their preferences.⁵³ Ultimately, the act of institutional proliferation is an attempt to alter the evolution of multilateral climate cooperation. Recent work refers to this phenomenon as

⁴⁹Drezner 2013.

⁵⁰Benvenisti and Downs 2007; Shaffer and Pollack 2009; Colgan, Keohane, and van de Graaf 2012; Jupille, Mattli, and Snidal 2013; Morse and Keohane 2014; Lipsky 2017; Kellerman 2019.

⁵¹Krasner 1991; Morrow 1994; Fearon 1998; Simmons 2001; Drezner 2007; Pollack and Shaffer 2009.

⁵²Jupille, Mattli, and Snidal 2013; Morse and Keohane 2014; Lipsky 2017; Kellerman 2019.

⁵³Karlsson-Vinkhuyzen and Asselt 2009; Drezner 2013.

“contested multilateralism,”⁵⁴ where the emphasis is placed on how states use other international institutions to contest governance outcomes, rather than defecting or going it alone.⁵⁵ Proliferators seek more favorable cooperative outcomes and use new institutional forums to pull cooperation toward their preferences.

Institutional proliferation in climate politics resembles this structure of dissatisfaction, though particularities of the history of climate governance condition its precise form. However, the nature of the dissatisfaction that animates existing accounts of institutional proliferation is under-theorized. Climate change as a case helps illuminate how diverse dissatisfaction conditions precise forms of institutional proliferation, rather than how dissatisfaction conditions proliferation in general. International climate politics is divided by an existing ineffective climate agreement that does little to redress divergent state preferences over the timing, level and allocation of mitigation obligations across states (as outlined in section 2.2.1). Climate politics demonstrates that states have opposing preferences over the pace and depth of mitigation actions. When multilateral institutions set rules in common, some states may prefer to coordinate at more or less intrusive levels of cooperative adjustments.⁵⁶

The preference heterogeneity in climate politics suggests that states may be dissatisfied with cooperative outcomes for two opposing reasons. Some states would prefer to act on GHG mitigation at a quicker pace than the UNFCCC currently adopts, whereas other states fear the compliance costs of quicker GHG mitigation. Specifically, states that are vulnerable to climate impacts seek quicker and more stringent international mitigation commitments. These states face greater damages in a changing climate and seek to forestall those outcomes. By contrast, states that are more dependent on fossil fuels seek slower and less stringent international mitigation commitments, at least for themselves. They prefer slower implementation of less ambitious temperature targets. Accordingly, they fear the compliance costs of new climate instruments with stringent mitigation targets. These recalcitrant

⁵⁴Morse and Keohane 2014.

⁵⁵Gruber 2000.

⁵⁶Alesina and Grilli 1993; Downs, Rocke, and Barsboom 1998; Stone, Slantchev, and London 2008.

states may pursue strategies to ward off stringent mitigation obligations. One of their actions may be to create additional climate institutions that advocate for and embody rival norms and rules for governing the climatic commons that better align with their preferences.

This argument about the determinants of state membership in climate institutions contrasts with existing arguments about why states join international institutions. Existing theories stress that states join an international institution if they share affinity with an institution's purposes.⁵⁷ For example, states that respect human rights are more likely to join human rights treaties.⁵⁸ However, this theory meets its limits when institutions within an issue-area do different things and are not perfect substitutes. When states use institutions to pursue different goals, state membership across institutions within an issue-area may reflect efforts to shape the evolution of cooperation more than affinity between states and a regime's overall goals. The extensiveness of state membership in climate change reflects patterns of dissatisfaction more than it reflects underlying, monotonically increasing, support for climate cooperation.

In climate politics, some states would prefer to move on GHG mitigation at a quicker pace than the UNFCCC currently adopts, whereas other states fear the compliance costs of quicker GHG mitigation. These different perspectives constitute their types. Each type of state may draw on non-UNFCCC institutions to shift the evolution of multilateral climate cooperation in its favor. However, the manner in which each type of state will do so differs. Ambitious states join climate institutions to accelerate and deepen multilateral GHG mitigation objectives. By contrast, laggards join rival climate institutions to obstruct and fragment cooperative progress on mitigation. Both types of states use outside institutions to alter the trajectory of climate governance, though they use these outside institutions for opposing purposes.

⁵⁷Simmons 2009.

⁵⁸Hill 2010; Lupu 2013.

2.3.1 Proliferating to deepen climate cooperation

If states use outside institutions for opposing purposes based on their evaluations of cooperative progress at the UNFCCC, then an account of state participation across climate institutions must be tied to these divergent perspectives on cooperative progress. I argue participation across climate institutions in the dense climate institutional space reflects states' differing perspectives of the pace of cooperative progress at the UNFCCC. First, states may be dissatisfied with cooperative progress that proceeds too slowly. Observers of international climate politics note that progress on elaborating mitigation obligations "ossified" or became "gridlocked" following the adoption of the Kyoto Protocol in 1997.⁵⁹ Furthermore, the Kyoto Protocol was not ratified rapidly and entered into force eight years after its adoption. From then until 2015, there was hardly any progress on the elaboration of mitigation obligations at the UNFCCC.⁶⁰ It was not self-evident that states were making any progress on limiting global warming.

In response, states that wanted to pursue climate action more quickly than the UNFCCC as a whole began shifting international climate cooperation outside the UNFCCC and into new standalone and purpose-built climate institutions. These states took advantage of two features of climate change to accelerate climate action. First, since climate is highly multidimensional, it was possible to identify elements of the larger climate challenge that could be separated from the UNFCCC and addressed in other forums. While the UNFCCC was deadlocked on mitigation and climate finance, interested states were nonetheless able to work on more targeted issues in other forums. For example, states established new multilateral forums to support research on agricultural GHGs and to develop expertise in the design of domestic carbon markets.⁶¹ Second, many sub-topics in climate change lack negative spillovers, in the sense that rules adopted to govern one sub-topic are unlikely to negatively impact on the ability to govern others. Following Johnson and

⁵⁹Depledge 2006; Victor 2011.

⁶⁰Victor 2011; Hale, Held, and K. Young 2013; Gupta 2014.

⁶¹See the Global Research Alliance on Agricultural Greenhouse Gases, established in 2009 with 46 members, and the Partnership for Market Readiness, established in 2011 with 31 members.

Urpelainen, this structure of issue interdependence should lead states to want to address topics separately.⁶² By separating topics across different forums, ambitious states were able to make cooperative progress on issues that were poorly addressed at the UNFCCC. These forums have smaller memberships and eschew binding obligations, such that participation is less intrusive.

States that created new institutions to deepen climate governance designed these forums to focus on building national capacities to implement climate-friendly policies. These institutions take a hands-on approach to supporting state interaction. For example, states use these forums to pool funds and risk in navigating the new market for carbon offsets that was created by the Clean Development Mechanism (CDM). The CDM allows Annex 1 states to fund mitigation activities in non-Annex 1 states and to count this mitigation toward their own Kyoto targets. However, identifying viable projects in developing countries, complying with the detailed reporting and accounting requirements the CDM prescribed, and doing so at scale posed substantial technical challenges. The World Bank saw an opportunity here to use its expertise to support climate action. It partnered with Annex 1 and non-Annex 1 states to develop a set of institutions to help states navigate the new carbon market created by the CDM.⁶³ States join these institutions to achieve lower cost mitigation.

Other examples include establishing new climate institutions to support technological solutions to climate change. In some of these forums, states collaborate on research (e.g., the Global Research Alliance on Agricultural Greenhouse Gases and the Adaptation for Smallholder Agriculture Program), while in others states collaborate on designing mitigation technologies and developing best practices (e.g., the Global Gas Flaring Reduction Partnership and the Renewable Energy and Energy Efficiency Partnership). On their own, none of these institutions drive deep decarbonization. However, they constitute part of a global and more diffuse response to climate change, where ambitious states increasingly network outside the UN-led process to support climate action. They build national and international capacities to support ambitious mitigation goals. Institutional proliferation is a

⁶²Johnson and Urpelainen 2012.

⁶³These institutions are housed in the World Bank's Carbon Finance Unit.

strategy of separating concrete topics in climate governance into standalone forums with narrower membership to allow motivated actors to pursue cooperative gains unencumbered by climate laggards. States established these new non-UNFCCC institutions to shape the evolution of climate multilateralism toward a more ambitious climate regime. I call these states *deepeners*, in reference to their efforts to deepen the substantive ambition of international climate politics.

The reasoning here is analogous to that developed in the literature on minilateral cooperation and cooperation in clubs.⁶⁴ Sometimes states may find it difficult to reach effective cooperative agreements in large membership multilaterals, perhaps because of preference heterogeneity or more simply because it is difficult to coordinate among a large number of actors.⁶⁵ When a problem structure permits cooperation in small groups to be effective—such as when sub-topics within a larger problem lack strong negative spillovers—clubs can be an efficient institutional design, though clubs raise additional concerns over representation and equity.⁶⁶ The climate literature has long recognized the theoretical appeal of club-based international cooperation.⁶⁷ However, the literature on climate clubs is mostly normative—focused on how to design “effective” climate clubs—and is mostly pessimistic about the ability of climate clubs to actually catalyze meaningful emissions reductions.⁶⁸ In this study, I examine minilateral climate cooperation systematically and show how different types of climate institutions support cooperation, even if they lack some of the ideal-typical features of clubs.

2.3.2 Proliferating to fragment climate cooperation

However, these new capacity-building institutions are only one half of the institutional proliferation story. For states that are dissatisfied with cooperative

⁶⁴Buchanan 1965; Kahler 1992; Victor 2011; Stewart, Oppenheimer, and Rudyk 2013; Weischer, Morgan, and Patel 2012; Barrett 2003; Downs, Roche, and Barsoom 1998; Falkner 2016a; Eckersley 2012; Stone, Slantchev, and London 2008; Gilligan 2004; Abbott and Snidal 2004; Alesina and Grilli 1993; Nordhaus 2015; Johnson and Urpelainen 2012.

⁶⁵Olson 1965.

⁶⁶Eckersley 2012.

⁶⁷Victor 2006.

⁶⁸Aldy, Barrett, and Stavins 2003; Victor 2011; Weischer, Morgan, and Patel 2012; Stewart, Oppenheimer, and Rudyk 2013; Green 2017; Stewart, Oppenheimer, and Rudyk 2017.

progress that proceeds too quickly, creating new forums is a strategic move to counter any forward momentum in climate governance.⁶⁹ I refer to these states as *fragmenters*. Even if the progress on elaborating new mitigation commitments at the UNFCCC has been slow, states that are unwilling to enact deeply substantive GHG mitigation policies see any signs of cooperative progress at the UNFCCC as threatening. Institutional proliferation is a forward-looking strategy. The UNFCCC's consensus decision-making rules empower recalcitrant states to obstruct action in this forum. However, states that fear costly mitigation obligations can also use outside institutions to counter forward progress at the UNFCCC and to articulate rival norms and principles that better match their interests.

Fragmenters use outside institutions for two reasons. First, by participating in climate institutions, national governments can signal continued engagement with climate politics to domestic, transnational, and international audiences while being disengaged from or hostile to progress at the UNFCCC. Consider Australia's decision to participate in establishing the Asia-Pacific Partnership on Clean Development and Climate in 2005, as an alternative model of climate governance, despite having still not ratified the Kyoto Protocol.⁷⁰ In this respect, national political leaders gained membership in a prominent international climate forum that they could use to demonstrate their continued engagement with climate governance, while doing little to implement GHG mitigation.

Secondly, states that fear climate cooperation is proceeding too quickly can use these outside forums to advocate and build constituencies for alternative rules and principles. Negotiations over the Kyoto Protocol exposed several fault lines over the design of mitigation obligations. States split notably over the stringency of emissions cuts, their distribution across countries, and the involvement of developing countries.⁷¹ However, there was also substantial disagreement over other design features, such as the bindingness of mitigation targets, the use of flexible targets versus mandated policy reforms, and several accounting rules

⁶⁹Benvenisti and Downs 2007; Drezner 2013.

⁷⁰Karlsson-Vinkhuyzen and Asselt 2009.

⁷¹Grubb, Vrolijk, and Brack 1999.

related to carbon sequestration and financing emissions reductions projects in developing countries. The Kyoto Protocol reflected an unstable compromise across many of these dimensions.⁷² The rules embodied in the Kyoto Protocol only partially addressed these issues and states have used outside institutions to build constituencies for alternative rules to those contained in the UNFCCC and Kyoto Protocol. These non-UNFCCC forums articulate alternative principles in a more macro-sense, such as governing through non-binding legal instruments, shifting away from state-led multilateralism to engage non-state actors in public-private partnerships, and relaxing the differentiation of developed and developing countries.⁷³ These all have direct bearing on the durability of the principles animating the UNFCCC. Actors fear that the UN-led process may lose legitimacy if powerful states choose to coordinate in other forums and re-found climate governance in voluntary, non-binding obligations instead of the stringent and binding Kyoto targets.

Fragmenters have created a set of negotiating forums that challenge the UNFCCC's centrality as the main negotiating venue and duplicate existing functions of the UNFCCC (e.g., Major Economies Forum, Asia-Pacific Partnership on Clean Development and Climate).⁷⁴ These institutions act as staging grounds for new norms and principles that fragmenters seek to feed back into the UNFCCC negotiating process. They raise a number of stumbling blocks and convoke alternative constituencies advocating weaker and softer mitigation objectives. They oppose the principles established in the UNFCCC and are efforts to shape the evolution of climate multilateralism to match the preferences of actors who prefer slower and less mitigation. When governance is spread across many sites, fragmenters use additional forums to weaken coordination within the issue-area. Whereas climate institutions established by states seeking to accelerate climate cooperation focus on capacity-building, climate institutions established by states seeking to obstruct climate cooperation focus on negotiation and networking.

⁷²Fehl 2012, pp. 112–115.

⁷³Vihma 2009.

⁷⁴Karlsson-Vinkhuyzen and Asselt 2009.

2.4 Proliferation and cooperation

States have created a distributed international climate architecture, in which a web of new climate institutions overlap and intersect with the UN-led climate governance process. Scholars of overlapping institutions have developed two competing perspectives on how institutional density relates to international cooperation. A prominent set of arguments sees overlapping institutions as contributing to fragmentation and hindering cooperation,⁷⁵ while another set of arguments sees these institutions as broadly complementary and supporting cooperation.⁷⁶ These two perspectives explicitly structure the climate literature. Scholars worry that new climate institutions threaten to undermine multilateralism at the UNFCCC, but others argue they may advance implementation and support cooperative outcomes.⁷⁷ *How is participation in climate institutions related to states' cooperative behavior in climate politics?*

I argue that the concept-pair of deepeners and fragmenters helps adjudicate this debate. To understand whether institutional proliferation facilitates or undermines cooperation requires understanding states' motivations for participating across institutions. States have different types of preferences and they carry these with them into their membership decisions and their subsequent cooperative behavior. My argument about the nature of dissatisfaction in climate politics and how dissatisfaction conditions institutional proliferation suggests a natural relationship between participation in climate institutions and states' cooperative behavior. Dissatisfied deepeners will adopt more cooperative behavior than dissatisfied fragmenters. The key task then is to link the concepts of deepeners and fragmenters to cooperative behavior.

I conceptualize the Paris Agreement as a bridge between these concepts and debates. States make participation decisions across over 60 climate institutions,

⁷⁵Raustiala and Victor 2004; Benvenisti and Downs 2007; Alter and Meunier 2009; Drezner 2009; Pollack and Shaffer 2009; Drezner 2013.

⁷⁶Downs, Roche, and Barsoom 1998; Alter and Meunier 2009; Kelley 2009; Keohane and Victor 2011; Johnson and Urpelainen 2012.

⁷⁷Biermann et al. 2009; Keohane and Victor 2011; Eckersley 2012; Hale, Held, and K. Young 2013; Bulkeley, Andonova, Betsill, et al. 2014; Widerberg and Pattberg 2015; Falkner 2016a.

but they also meet annually at the UN climate conferences to discuss progress on implementation, amend or clarify existing rules, and ultimately draft new international legal agreements to stem climate change. This leads climate politics to be at once centralized and distributed.

An atypical design feature of the Paris Agreement makes this dichotomy productive for researchers. Specifically, states set their own targets in the Paris Agreement. As I explain in chapter 5, institutions often set common policy targets that all members must adopt and this creates additional problems for assessing cooperation. By contrast, the Paris Agreement sought to scuttle its divisive distributional conflict by recasting climate action at the national level. States' Paris commitments reflect what each is willing to contribute to collective action, rather than the outcome of a multilateral negotiation revolving around the level of collective mitigation. This institutional design allows for a fine measure of cooperation at the level of individual states that can be paired with measures of participation also at the level of individual states.

It is difficult to answer whether cooperation on climate change would have been more or less effective in the absence of institutional proliferation, but state behavior across climate institutions helps us to better understand how states use dense institutional environments. My theoretical argument generates expectations about the relationship between state participation in climate institutions and states' cooperative behavior. To preview chapter 5, there should be no relationship between a state's sum of climate memberships and their cooperative behavior, since states may participate in climate institutions for reasons that are inversely related to supporting cooperation. Instead, states' patterns of participation in climate institutions will be associated with the stringency of their GHG mitigation pledges. This holds because deepeners and fragmenters join different kinds of institutions. Deepeners are interested in participating in climate institutions that push implementation forward, while fragmenters are interested in raising stumbling blocks in new negotiation forums. As a result, I expect deepeners to pledge stronger mitigation targets than fragmenters.

	DEEPENERS	FRAGMENTERS
<i>Extent of participation</i>	High	High
<i>Purpose of institutional proliferation</i>	Capacity-building, separating sub-topics	Duplicating forums, networking
<i>Effect on international cooperation</i>	Support cooperation	Undermine cooperation
<i>Relationship to states' targets</i>	More ambitious targets	Less ambitious targets

Table 2.3: Theoretical expectations about institutional proliferation in international climate politics

I do not expect institutional proliferation, as such, to facilitate or undermine cooperation. Instead, when states choose to separate the governance of sub-topics into new standalone forums that allow motivated and ambitious states to pursue tangible goals, these state members will display more cooperative behavior. The sum of climate memberships potentially masks this dual nature of participation.

Table 2.3 summarizes how the different elements of the theory fit together. Deepeners and fragmenters may both participate extensively across climate institutions leading a simple count of memberships to look similar for both types of states. However, deepeners and fragmenters begin to separate from each other when we consider the types of institutions they join. Deepeners join institutions that focus on implementing climate policy and fragmenters join forums that focus on networking and negotiations. Ultimately, both types of states participate for opposing purposes. Deepeners seek to support cooperation and accordingly they also adopt more ambitious GHG targets when given the opportunity. Fragmenters by contrast seek to undermine cooperation and they adopt less ambitious targets.

2.5 Conclusions

I conclude this chapter by highlighting three key themes that cut across the previous sections and inform the subsequent chapters. First, my argument draws attention to participation at the level of the issue-area, rather than participation in individual institutions. Many issue-areas in international politics have become much more institutionally dense in recent decades, but measures and theory for considering

state participation in dense institutional environments lag behind. Considering participation at a higher level of aggregation than individual institutions more accurately reflects how states are situated within issue-areas. Membership in any particular institution can be idiosyncratic, especially when that institution is prominent—such as the ones political scientists normally study. In dense institutional environments, focusing only on membership in a single institution can generate misleading inferences about participation depending on the characteristics of the institution in question and how they relate to the broader population of institutions. Instead, I argue that participation across many institutions varies more and in more informative ways than membership in individual institutions. This more complete specification of participation has descriptive and explanatory payoffs for research in international cooperation, and climate governance in particular.

Second, a productive way to conceptualize dense institutional environments may be to consider how older and newer institutions interact. In climate politics, the earlier UN climate treaties constitute the backdrop within which institutional proliferation plays out. In this sense, they condition proliferation. However, the UN-led climate governance process maintains its centrality in international climate politics despite institutional proliferation. The annual COPs are the central forum in climate governance and convene nearly every relevant actor. This is most evident in how states continue to negotiate the broad rules of international climate politics at the COPs. When dense institutional environments contain both a panoply of institutions and a prominent core institution, research may exploit this intersection to study how states use dense institutional environments.

Finally, dense institutional environments should be conceptualized as arenas where states compete for influence. Institutional proliferation, as many have noted, is a tool states use to shape the evolution of multilateralism. Theorizing the nature of dissatisfaction that conditions these strategies is a productive way to cut to the core of contestation. In climate politics, I argue that the pace of cooperative progress is states' key consideration. Some states would prefer more rapid progress on deeply substantive collective mitigation and they use outside climate institutions

to pursue this goal. Others fear the sovereignty costs of these obligations and use new institutions to hold back progress. The stakes may be different in other issue-areas, but theorizing the directions in which states seek to pull collective governance outcomes may help orient the tangle of overlapping institutions.

3

A hidden world of climate governance

Contents

3.1	Introduction	55
3.2	The UNFCCC-led climate governance process	58
3.2.1	The United Nations Framework Convention on Climate Change	59
3.2.2	The Kyoto Protocol	61
3.2.3	The elaboration of climate governance through COPs	64
3.3	Varieties of institutionalized climate cooperation	68
3.3.1	A regime complex for climate change?	69
3.3.2	Transnational climate governance	72
3.3.3	Institutional proliferation in global climate governance	73
3.4	Reconsidering state-led climate governance	80
3.4.1	The proliferation pathway	80
3.4.2	Characteristics of climate governance outside the UNFCCC	87
3.5	Conclusion	92

3.1 Introduction

Studies of climate politics have focused on the United Nations-led climate governance process above all else. In a sense, this is not surprising. This process has the legitimacy of the UN, has produced major international climate treaties, and holds annual climate conferences that convene tens of thousands of participants. Nonetheless, I argue that there is a tremendous amount of dynamism in climate governance

that has been buried by most histories of climate governance that focus only on the UNFCCC and its annual Conferences of the Parties.¹ International climate politics is extremely dense institutionally. States have created over 60 different climate institutions since the early 1990s. While scholars have been adjudicating the merits and faults of the Kyoto Protocol, some states have accumulated over 40 other institutional memberships in climate change. These institutions do not simply replicate the dynamics, divisions, and deficiencies of the UN-led climate process. They create new vectors of alliances, build new constituencies of support for climate action, and propose new principles and norms for the future of climate governance. Limiting our analysis to only the UNFCCC and its annual conferences hinders our ability to fully understand international climate politics. It amounts to selecting only the most prominent climate institutions and drawing inferences about the whole of climate politics from this sample.

In this chapter, I introduce a new dataset of climate institutions and use it to map the landscape of climate governance. I show that the extent of state-led climate governance is much broader than portrayed by conventional narratives, which focus almost entirely on the UN-led process. I use this new dataset to argue for studying institutionalized climate politics at the level of the issue-area instead of at the level of individual international institutions. Conceptualizing participation at the issue-area level more accurately reflects how states are situated in climate politics. Measuring participation at this level reveals much greater variation in how states choose to coordinate in climate politics than focusing only on outcomes of the UN climate conferences. In subsequent chapters, I build on this argument to demonstrate how measuring participation at this higher resolution helps us better understand states' preferences and their willingness to contribute to emissions mitigation.

Other scholars have noted that the UN-led process does not encompass all of climate governance. Since climate change impacts many other issue-areas of world politics, the governance of other issue-areas may impact upon the opportunities states have to govern climate change.² International rules on trade and migra-

¹Gupta 2014; Sweet 2016; Bodansky, Brunnee, and Rajamani 2017.

²Keohane and Victor 2011, Bodansky, Brunnee, and Rajamani 2017, ch. 9.

tion, for example, might constrain or expand the tools available within climate treaties to address climate mitigation and adaptation. Furthermore, climate action has also diffused to new sets of actors. Sub-national governments, civil society organizations, and firms increasingly network transnationally to pursue climate action.³ Nonetheless, I show that there is great diversity in *state* participation in climate institutions, complementing the literature that has noted the variety of climate governance initiatives at the sub-national level or across issue-areas. Participation in climate institutions outside the UNFCCC provides a wealth of additional information about how states govern the climate.

The observations that climate intersects with other issue-areas and that climate governance is increasingly transnational can be considered reactions to UN-centrism in the literature. These analyses, like my own, seek to fill out climate research by drawing attention to the range of ways climate action is being pursued globally. However, in building this fuller picture of climate politics, scholarship has overlooked the extent to which states coordinate outside the UN-led process in relation to climate change. Heterogeneity in state participation in climate politics is masked by the literature's new focus on the intersection of climate change with other issue-areas and transnational climate governance. Both of these topics contribute to our understanding of climate politics, but they have also led scholars to overlook the rapid proliferation of new climate institutions over the past two decades. As a result, the landscape of global climate governance has been surveyed unevenly and our map is woefully incomplete. In this chapter, I excavate the landscape of state participation in climate governance. I show that state participation is much broader than has been previously realized. It extends well beyond the annual UN climate conferences.

This chapter proceeds in three parts. In section 3.2, I outline UN-led climate governance. The UN has supported the negotiation, implementation and revisions of the major climate treaties. This function is well documented in the literature, but I note it in this chapter since UN-led climate governance forms the backdrop against which the proliferation of climate institutions occurs. In section 3.3, I build

³Hoffmann 2011; Bulkeley, Andonova, Betsill, et al. 2014.

out the concept of institutional proliferation within climate change. I outline the criteria for inclusion in my dataset of climate institutions, where I am interested in identifying state-based institutionalized cooperation in climate politics. I explain how intra-climate institutional proliferation is distinct from how climate change overlaps with other issue-areas, a topic often treated under the label of regime complexity. I also note the distinctions between transnational climate governance and the institutions in my dataset. I use these two alternative approaches to outline how my new dataset contributes to our understanding of climate politics.

In the final section, I provide an overview of these new climate institutions and some descriptive statistics. I demonstrate three key facts about these new climate institutions. First, the growth of these institutions has been extremely rapid and contradicts the expectations of the architects of the UNFCCC system. Second, state membership in these institutions varies dramatically. Finally, these institutions differ from the UN-led process along a number of key characteristics. They challenge many of the principles embodied in the UN climate treaties and articulate a rival set of characteristics to structure climate governance. Together, this collection of institutions challenges dominant narratives about climate politics and helps explicate the innovations contained in the Paris Agreement on Climate Change.

3.2 The UNFCCC-led climate governance process

The principal global response to climate change is led by the United Nations. In section 2.2.2, I explained how design features of the UNFCCC pose impediments to cooperation. I now discuss how features of the UNFCCC relate to the landscape of climate cooperation. States have convened at UN-led climate conferences since the early 1990s to draft rules to govern climate change. The major outputs of this process are three international treaties: the 1992 United Nations Framework Convention on Climate Change (UNFCCC), the 1997 Kyoto Protocol to the UNFCCC, and the 2015 Paris Agreement on Climate Change. In itself, the UNFCCC is a relatively weak document. It creates only minor and hortatory obligations on state members,

far from enough to effectively mitigate or adapt to climate change.⁴ The UNFCCC's designers had always intended for follow-up negotiations to produce more deeply substantive obligations in the future.

The long gap between the adoption of the Kyoto Protocol and the Paris Agreement constitutes, in a sense, the dark ages of climate politics—a time when the physical aspects of anthropogenic climate change were becoming increasingly problematic, while the political settlements to manage climate change appeared broken and ill-suited to the task at hand. This constitutes the backdrop against which the proliferation of new climate institutions has played out. The UNFCCC has provided the structure within which international climate politics have evolved since the 1990s. Accordingly, it is important to understand UN-led climate governance in order to understand the proliferation of new climate institutions. In this section, I briefly outline the UN-led response to climate change, which I take to comprise the UNFCCC, its successor treaties, such as the Kyoto Protocol, and the annual international climate conferences that the UNFCCC's secretariat hosts for parties to the agreement (COPs, Conferences of the Parties).

3.2.1 The United Nations Framework Convention on Climate Change

States have always intended to elaborate climate governance over time.⁵ This is evident from the way that the UNFCCC does not contain binding GHG emissions mitigation targets for states, and instead establishes a framework within which states can meet subsequently to agree to new rules. It is also stated explicitly by some of the regime's early principals.⁶ UN-led climate cooperation, in this respect, is modeled on ozone governance, where states began with a broad framework convention and later proceeded to more specific and binding protocols and amendments.⁷ This structure of cooperation envisions climate governance as dynamic. Instead of attempting to bundle all of the rules into a single, unified regulatory treaty, states decided to

⁴Bodansky, Brunnee, and Rajamani 2017, pp. 130–135.

⁵Bodansky, Brunnee, and Rajamani 2017, pp. 85–94.

⁶Benedick 1998.

⁷Benedick 1998; Parson 2003.

sequence cooperation over time. This institutional design is often referred to as the “convention-protocol pathway”, where states seek to move towards a universal membership institution with deeply substantive obligations over time, starting with broad membership and slowly ratcheting up states’ obligations.⁸ Scholars argue this can be an effective response to uncertainty about the gains and costs of cooperation.⁹

The UNFCCC’s annual conferences embed states in an institutionalized process of negotiating follow-up agreements and clarifications. The Kyoto Protocol (COP3, 1997), the Copenhagen Accord (COP15, 2009), and the Paris Agreement (COP21, 2015) were all finalized in negotiations at these annual conferences. None of these agreements have been enough to prevent dangerous climate change and progress has been uneven. These agreements, nonetheless, illustrate a trajectory of climate governance led by the UNFCCC Secretariat that moves toward deeper substantive obligations over time—again, the model of the ozone regime.

The UNFCCC and its COPs are the premier forum in climate politics partly because of the UNFCCC’s universal membership. The treaty’s universal membership ensures that all nations are represented in negotiations over successor treaties.¹⁰ Since climate change will affect all countries, it is important from a normative perspective to give voice to all countries in global negotiations.¹¹ However, as explained in section 2.2.2, the inclusion of over 190 countries with diverse interests has not facilitated swift and effective decision-making. This is compounded by the UNFCCC’s inability to pass new decision-making rules, which means that the institution operates using consensus.¹² Recalcitrant states have used consensus rules to hold up new agreements throughout the institution’s history, such as when Bolivia, Sudan, Tuvalu, and Venezuela formally objected to the adoption of the Copenhagen Accord.¹³

While the UNFCCC has universal membership, it also has a bifurcated internal membership structure that separates developed from developing countries.¹⁴ The

⁸A. Chayes and A. H. Chayes 1995; Brunnee and Toope 1997; Downs, Danish, and Barsoom 2000.

⁹Abbott and Snidal 2000.

¹⁰Eckersley 2012.

¹¹Eckersley 2012.

¹²Bodansky, Brunnee, and Rajamani 2017, pp. 75–77.

¹³Bodansky, Brunnee, and Rajamani 2017, pp. 111–112.

¹⁴Gupta 2014, pp. 147–149.

supplementary annexes of the UNFCCC and Kyoto Protocol mark out different classes of membership for states and ultimately different types of obligations. The annex classifications are based, broadly, on states' development status in the early 1990s, and have not been adjusted to reflect changes since then. This internal membership structure has reified a gap between developed and developing countries in climate politics.¹⁵ The annexes have raised the salience of differences between developed and developed countries and heightened distributional conflict between them.

3.2.2 The Kyoto Protocol

The Kyoto Protocol is a successor treaty to the UNFCCC. The text of the Kyoto Protocol was negotiated over three years before being finally adopted at COP3 in Kyoto in 1997, though its details continued to be negotiated well into 2001.¹⁶ Debates encompassed a wide range of issues, from whether the treaty should mandate specific policy actions versus only setting emissions targets, to which countries ought to have targets and what level of targets should be mandated, as well as a number of complex issues related to accounting.¹⁷ The United States of America, the European Union, and Japan were the world's largest emitters at the time, and their preferences shaped negotiated outcomes decisively. Developing countries largely stayed out of the debates, though they voiced their opposition to the inclusion of binding or even voluntary targets for developing countries. States ratified the Protocol slowly and it only entered into force in 2005, notably without the participation of the United States. Negotiations over the Kyoto Protocol are well-documented in the literature.¹⁸

The Kyoto Protocol established an architecture for climate politics that built on the earlier UNFCCC. Kyoto introduced binding GHG emissions limitation targets for industrialized states. Targets were negotiated at COP3 in Kyoto, and states

¹⁵Castro, Hornlein, and Michaelowa 2014.

¹⁶Fehl 2012, pp. 112–116.

¹⁷Grubb, Vrolijk, and Brack 1999.

¹⁸See, e.g., Oberthur and Ott 1999; Grubb, Vrolijk, and Brack 1999; Depledge 2000; Fehl 2012; Gupta 2014; Bodansky, Brunnee, and Rajamani 2017.

with targets committed to reduce their emissions by roughly 5% on average from 1990 levels. However, the headline percentage reductions and their stringency vary considerably across states.¹⁹ Some states were allowed to increase their emissions during the Kyoto compliance period (e.g., Australia +8% from 1990 levels). The virtual collapse of Russia and other former Soviet states' economies at the end of the Cold War meant their stated GHG emissions targets (e.g., 0% increase from 1990 levels for Russia and Ukraine) allowed for substantial increases in emissions during the compliance period compared to realistic forecasts of future GHG emissions. Even some advanced European economies obtained generous GHG emissions targets (e.g., Sweden's target of +4% from 1990 levels and France's 0% increase from 1990 levels). The EU as a whole committed to an 8% reduction in emissions from 1990 levels, which was re-allocated internally. The Japanese hosts accepted a 6% reduction and the United States of America accepted a 7% reduction from 1990 levels. Joseph Aldy and his co-authors note that this amounted to a roughly 30% decrease in GHG emissions for the United States from forecasted future GHG emissions growth in the same period under business as usual.²⁰ Evaluating the stringency of individual targets entails assumptions about forecasted emissions growth and country-level marginal abatement costs.²¹ I return to this topic in chapter 5.

Drafting explicit GHG mitigation targets into the treaty represents a design choice. Negotiators chose to coordinate on economy-wide GHG targets to be implemented as national governments saw fit, instead of advancing mandatory climate policies and measures, such as particular carbon pricing instruments or research and development targets.²² This choice of broad targets over specific policies has been criticized subsequently. Economy-wide GHG emissions are often beyond the direct control of national governments, as they are partially determined by macro-economic conditions, global commodity prices, and other factors.²³ Accordingly, these targets have a credibility gap compared to alternative design choices, such

¹⁹These targets are listed in Annex B of the Kyoto Protocol.

²⁰Aldy, Barrett, and Stavins 2003.

²¹Aldy, Pizer, and Akimoto 2017.

²²Grubb, Vrolijk, and Brack 1999, pp. 65–72.

²³Victor 2011, p. 215.

as committing to implement certain climate policies, such as a carbon tax or a cap on fossil fuel subsidies.

Developing countries were exempt from GHG emissions targets in the Kyoto Protocol. While this has an element of fairness since developing countries had contributed little to climate change by the 1990s, the lack of targets for some of the world's fastest growing emitters meant the agreement would struggle to be effective.²⁴ Negotiators drafted a set of creative policies to include developing countries, such as the Clean Development Mechanism, which allowed industrialized, Annex 1 countries with Kyoto obligations to fund climate mitigation projects in developing, non-Annex 1 countries.²⁵ However, these provisions were not equivalent to the full participation of developing countries in accepting GHG targets. For the United States in particular, the distributional implications of accepting a costly GHG emissions reduction obligation while large trading partners in the developing world abstained were untenable. President Bill Clinton did not send the Protocol to the United States Senate for ratification fearing that it would be defeated, and his successor George W. Bush openly stated his administration's intention to not have the Kyoto Protocol ratified. The Protocol eventually gathered the minimum number of ratifications to enter into force in 2005, but was widely interpreted as insufficient without US participation.

The Kyoto Protocol created a very particular policy architecture for international climate politics. It exempted developing countries from policy obligations, meaning their ratification of the Kyoto Protocol was virtually costless.²⁶ By contrast, it mandated GHG emissions cuts for industrialized countries and allocated these unsystematically.²⁷ Despite being active in the negotiations and obtaining a number of important concessions, the United States refused to ratify the treaty.²⁸ The treaty contained no penalties for non-participation, and few for non-compliance

²⁴Aldy, Barrett, and Stavins 2003.

²⁵Oberthur and Ott 1999, pp. 165–168.

²⁶von Stein 2008.

²⁷Oberthur and Ott 1999, p. 120.

²⁸Fehl 2012, ch. 6.

either.²⁹ Together, this meant the Kyoto Protocol was not incentive compatible for countries with stringent targets.³⁰ Canada formally withdrew from the Protocol in 2011, though remaining Annex 1 states all complied with their GHG obligations.³¹

3.2.3 The elaboration of climate governance through COPs

International climate politics after the adoption of the Kyoto Protocol is often told as a succession of Conferences of the Parties to the UNFCCC, with some conferences demonstrating progress towards an effective response to climate change and others scuttled by differences.³² Table 3.1 lists key events in UN-led climate governance. This narrative fits well with the conventional “convention-protocol” interpretation, where states gradually accept more ambitious obligations over time.³³ As Daniel Bodansky and his co-authors note, “most countries agreed . . . that [the UNFCCC’s] commitments were inadequate and needed to be supplemented by more specific emission limitation objectives.”³⁴ Discussions began at the very first COP in Berlin 1995, where a working group was established to develop a successor protocol containing additional commitments for industrialized countries—just as in the ozone regime. After the shallow UNFCCC, states worked quickly to elaborate the more ambitious follow-up Kyoto Protocol. However, the pace of subsequent elaboration has been much slower. In the mid-2000s, climate governance “ossified” as countries failed to develop common interests and interpretations of the severity of the problem.³⁵ There were few signs of vitality at major climate conferences until the landmark Paris Agreement in 2015.

Negotiations over a successor treaty to the Kyoto Protocol began as soon as it entered into force.³⁶ At COP13 in 2007, Washington softened its historical antipathy to binding targets and endorsed the Bali Action Plan. This Plan set COP15 in 2009

²⁹Aldy, Barrett, and Stavins 2003.

³⁰Barrett 2003.

³¹Shishlov, Morel, and Bellassen 2016.

³²Grubb, Vrolijk, and Brack 1999; Gupta 2014; C. Downie 2014; Sweet 2016; Bodansky, Brunnee, and Rajamani 2017.

³³A. Chayes and A. H. Chayes 1995; Abbott and Snidal 2004.

³⁴Bodansky, Brunnee, and Rajamani 2017, p. 105.

³⁵Depledge 2006.

³⁶Aldy and Stavins 2009.

Year	CO ₂ ppm	COP	Location	Outcome
1992	356		Rio	UNFCCC signed
1995	361	1	Berlin	Negotiations begin on protocol with mitigation targets
1997	364	3	Kyoto	Kyoto Protocol adopted
2001	371	7	Marrakesh	Kyoto Protocol details finalized
2001	371			Bush administration repudiates Kyoto Protocol
2005	380			Kyoto Protocol enters into force
2007	384	13	Bali	Bali Action Plan for new binding legal agreement
2008	385			Kyoto Protocol compliance period (2008–2012)
2009	387	15	Copenhagen	Failure to adopt new binding treaty
2010	390	16	Cancun	National pledges compiled
2011	392	17	Durban	States set 2015 as target year for new legal agreement
2012	394	18	Doha	Kyoto Protocol second compliance period
2015	401	21	Paris	Paris Agreement adopted
2016	404			Paris Agreement enters into force
2017	407			Trump administration repudiates Paris Agreement
2018	409	24	Katowice	Stalled progress on finalizing Paris rulebook

Table 3.1: Key moments in UN-led climate governance. Second column shows the steady increase in annual atmospheric concentrations of CO₂ measured in parts per million at the Mauna Loa Observatory in Hawaii by the Scripps Institution of Oceanography at University of California, San Diego. Pre-industrial concentrations were approximately 280 ppm, for reference.

as the deadline for adopting a new climate treaty with binding GHG targets for developed countries. By the logic of the convention-protocol pathway, observers were expecting a “Kyoto 2.0” to be adopted at COP15 in Copenhagen that would outline more stringent emissions targets and extend the number of states with targets—the model of the ozone negotiations. As climate governance evolved over time, from COP to COP, states were expected to develop increasingly common positions that would facilitate elaborating a new, deeper agreement. However, as noted above, this preference convergence failed to manifest. States failed to agree to a new binding treaty at COP15. Instead, parties only “took note” of the Copenhagen Accord because they could not pass it unanimously.³⁷

Negotiations over Kyoto’s successor agreement were in some ways even more complex than previous negotiations since the status of targets for developing countries remained unresolved, while their inclusion became mathematically necessary

³⁷Gupta 2014, pp. 128–130.

to forestall severe global warming.³⁸ Negotiators attempted to agree to a new set of multilaterally-agreed emissions targets, but talks remained stalemated. In response, a subset of powerful states broke with the UNFCCC's procedural norms and negotiated a quick political agreement in quasi-secrecy outside the main negotiating venues in Copenhagen at the last minute. This Accord reaffirms many of the UNFCCC's objectives and principles, but is highly under-specified in terms of targets and procedures.³⁹ Excluded states refused to endorse the agreement in the COP15 outcome document.⁴⁰ Observers had been expecting a new agreement with legally binding emissions targets, but were left wanting.⁴¹

However, the Copenhagen Accord indicated a fundamental shift in institutionalized climate cooperation. In terms of targets, the Copenhagen Accord broke with the Kyoto precedent of negotiating targets at the COP and instead called on states to submit their own targets. Governments deliberated domestically and submitted pledges ahead of COP16 the following year in Cancun. Developing countries were encouraged to do so alongside developed countries. Ultimately, seventy-three states submitted pledges outlining how they would contribute to managing climate change, though most of these are incredibly vague. At COP16, the Cancun Agreements codified the motley pledges states had submitted as the latest iteration of climate governance. The climate regime transitioned from "top-down" internationally-negotiated, legally-binding emissions targets to "bottom-up" nationally-determined voluntary contributions. The Cancun Agreements were interpreted as progress, though as Thomas Hale and his co-authors note, "the 'success' of Cancun [resulted from] the reduction in expectations and ambitions that had followed Copenhagen" rather than the inherent ambition countries demonstrated in their pledges.⁴² This bottom-up system is sometimes also referred to as "pledge and review," where countries express the level of their willingness to participate in emissions reductions

³⁸Victor 2009.

³⁹Bodansky, Brunnee, and Rajamani 2017, pp. 110–112.

⁴⁰Winkler and Beaumont 2010.

⁴¹Hoffmann 2011, p. 152.

⁴²Hale, Held, and K. Young 2013, p. 257.

and the parties at the COPs decide if the level of ambition warrants adoption.⁴³ The 2015 Paris Agreement builds on this model.

Alongside these failures, the Kyoto Protocol was extended for a second compliance period in 2012 as the Doha Amendment. This amendment still requires another twenty ratifications to enter into force.⁴⁴ Without participation from Canada, the United States, and developing countries, not even all Annex 1 parties to the Kyoto Protocol agreed to participate in a second compliance period.⁴⁵ Hopes that the climate regime would follow the ozone regime with a series of successful protocols and amendments that rectified the global problem had not been borne out by the end of 2012. Conceptually, climate governance stalled along the convention-protocol pathway. States failed to adopt increasingly stringent emissions targets over time. Most of the progress that observers have pointed to amount to far less than had been originally envisioned.

The latest piece in the international climate regime is the 2015 Paris Agreement, adopted unanimously at COP21. States laid the foundations for the Paris Agreement at COP17 in Durban after the failure of Copenhagen, where states adopted a mandate for a new agreement “with legal force.”⁴⁶ States intended for this agreement be modeled on the pledge and review system instituted at COP15 and to include emissions targets for both developed and developing countries. Countries outlined the GHG emissions reduction targets they were willing to accept in their Intended Nationally Determined Contributions (INDCs). The INDC pledges were submitted in the run-up to COP21 in Paris 2015, gathered by the UNFCCC Secretariat, and made available before the COP met.⁴⁷ These “Paris pledges” vary tremendously in their depth of emissions cuts and the precision with which these are made (see chapter 5). The INDCs allowed states to “self-differentiate” and select the level of

⁴³Keohane and Oppenheimer 2016.

⁴⁴As of February 2019, 124 states had ratified the Doha Amendment to the Kyoto Protocol, which creates a second set of GHG targets for Annex 1 countries until 2020. The Amendment requires 144 ratifications to enter into force.

⁴⁵Bodansky, Brunnee, and Rajamani 2017, p. 114.

⁴⁶UNFCCC 2011, Decision 1/CP.17, Durban Platform for Enhanced Action, para. 2.

⁴⁷UN Climate Change 2019b.

ambition each was comfortable with.⁴⁸ This design skirted the longstanding and acrimonious divide between developed and developing countries over “common but differentiated responsibilities and respective capabilities” in responding to climate change.⁴⁹ The INDC pledges form the backbone of the Paris Agreement, but are not considered legally binding as they do not appear in the text of the agreement itself.⁵⁰ Instead, the Paris Agreement creates an obligation on each state to implement its INDC, but not necessarily to achieve its goals. The Paris Agreement entered into force as an international treaty on 4 November 2016, one month after fifty-five states representing at least fifty-five percent of global greenhouse gas emissions had ratified the agreement.

3.3 Varieties of institutionalized climate cooperation

Histories of climate governance tend to privilege the UN-led process, and particularly the highly salient outcome documents of individual COPs.⁵¹ Though the headline elements of the climate regime have all been finalized at COPs, it would be a mistake to consider the extent of international climate politics as coterminous with the UNFCCC, its annual conferences and its successor treaties. There is in fact a much broader range of climate governance than is captured by focusing only on the UN-led process. In this section, I demonstrate the extent of institutionalized cooperation in climate politics. This section concludes by introducing my original dataset of climate institutions with state members.

I distinguish the institutions in my dataset from two prominent alternative perspectives on institutional density in climate politics: the intersection of climate

⁴⁸Rajamani 2016.

⁴⁹Article 3, subsection 1 of the UNFCCC outlines differentiation as one of the regime’s guiding principles: “The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof.”

⁵⁰Bodansky 2016.

⁵¹Grubb, Vrolijk, and Brack 1999; Gupta 2014; C. Downie 2014; Sweet 2016; Bodansky, Brunnee, and Rajamani 2017.

governance with other issue-areas and transnational climate governance. These latter two areas are well-documented in the existing literature. These studies often position themselves as reactions to the predominance of the UNFCCC in studies of climate politics. They have contributed to our understanding of the diversity and complexity of climate governance, but they have neglected an additional important area of governance, one that I systematically analyze in this study, namely state-based institutionalized cooperation outside the UNFCCC. In their efforts to distance themselves from the literature's UN-centric bias, studies of the intersection of climate change with other issue-areas and transnational climate governance have also passed over the full range of state participation in climate governance. As a result, attention to the variety of ways that states actually coordinate in climate governance has received insufficient and uneven attention.⁵² Without a full understanding of state participation in climate governance we risk drawing incorrect and biased inferences from observations of particularly salient climate governance institutions. In this section, I uncover a hidden world of state participation in climate politics by creating a new dataset of climate institutions with state members.

3.3.1 A regime complex for climate change?

Many scholars have noted an increased number of international institutions within different issue-areas of world politics.⁵³ Much of this literature focuses on the challenges and opportunities for effective cooperation that arise when a particular topic is negotiated across many institutional forums. Scholars often refer to these situations, when many institutions address the same topic, as "regime complexes." According to Kal Raustiala and David Victor's original definition, a regime complex refers to "an array of partially overlapping and nonhierarchical institutions governing a particular issue-area."⁵⁴ The key idea embedded in this concept is that the rules that govern a particular issue may be distributed across institutions instead of

⁵²Biermann et al. 2009; Weischer, Morgan, and Patel 2012; Widerberg and Pattberg 2015.

⁵³Raustiala and Victor 2004; Alter and Meunier 2009; Kelley 2009; Keohane and Victor 2011; Orsini, Morin, and O. Young 2013; Raustiala 2013; Milewicz et al. 2016; Abbott, Green, and Keohane 2016; von Stein 2017; Alter and Raustiala 2018; Kellerman 2019.

⁵⁴Raustiala and Victor 2004, p. 279.

centralized in a single international regulatory instrument. However, scholars of regime complexity have offered a range of overlapping and nonhierarchical definitions of regime complexity.⁵⁵ As a result, the concept has lost some of its clarity.

Two components of Raustiala and Victor's original definition are worth parsing to better understand institutional proliferation and institutionalized climate cooperation. First, the definition does little to help us understand what the relevant units are within a regime complex. Regimes are themselves poorly defined in institutionalist theory, with some authors treating regimes as synonymous with international organizations (e.g., "the World Trade Organization regime") and others using the term "regime" to refer to the set of governance activities on a particular topic (e.g., "the trade regime"). Raustiala and Victor refer to the individual institutions of a regime complex as "elemental regimes," further complicating the concept. Subsequent treatments of regime complexity have broadened the relevant units considerably, to include bilateral initiatives, transnational governance schemes, international treaties, and negotiations over new treaties as these "elemental regimes."⁵⁶ The concept risks losing its usefulness without agreement on the nature of the units that overlap to form a complex.

Secondly, Raustiala and Victor's definition does little to demarcate the boundaries of a regime complex. In their applied sections, Raustiala and Victor concentrate on the set of international treaties that regulate plant genetic resources, which are distributed across issue-areas of world politics ranging from trade to food safety and biodiversity. However, the concept of regime complexity could be refined by specifying elements of the regime complex that are "internal" to an issue-area versus elements from other issue-areas. Treaties and institutions are often nested in issue-areas and it would be helpful to distinguish between the rules regulating a topic that arise from institutions within an issue-area from those that arise from other issue-areas.

⁵⁵Raustiala and Victor 2004; Alter and Meunier 2009; Keohane and Victor 2011; Abbott 2012; Orsini, Morin, and O. Young 2013; Henning 2017; Alter and Raustiala 2018.

⁵⁶Keohane and Victor 2011; Abbott 2012.

Having flagged these two issues—that the nature of the interacting units must be specified, as well as the scope of the issue-areas—we can consider institutional proliferation within climate change more precisely. My focus in this study is on *intra*-issue-area institutional proliferation rather than how rules travel across issue-areas.⁵⁷ I contend that it is productive to separate state behavior within climate politics from behavior in other issue-areas that may nonetheless impact back upon climate change. I develop this point further in chapter 4 where I discuss state motivations for membership in climate institutions.

Existing work on institutionalized climate cooperation has focused on the UN-led climate governance process, and when it has broadened its scope it has been mostly interested in how developments in other issue-areas may impact positively or negatively upon the feasibility of climate cooperation. For example, a body of scholarship considers the intersection of climate and international trade and develops proposals for linking climate rules to the World Trade Organization to enforce climate mitigation targets.⁵⁸ Trade governance clearly can be linked to climate governance—though such a linkage would be highly complex—but I conceptualize trade law as emanating from a separate issue-area of world politics than climate change. In this sense, climate-trade linkages lie outside the scope of this project. Consider also the rules governing maritime shipping and civil aviation that emanate from the International Maritime Organization and International Civil Aviation Organization. Both maritime shipping and civil aviation are large sources of GHG emissions—as is international trade, generally—however the rules governing these two issue-areas predate climate cooperation by decades. Rule-making in these forums may facilitate or undermine effective climate cooperation, but these two forums should not be considered within the climate issue-area. States did not create these institutions to manage climate change, in contrast to the 60-plus institutions they have created to do so. I contend that the dynamics of within-climate institutions are a related phenomenon to be explained, while the dynamics of membership across issue-areas introduces many new idiosyncratic features. International Relations lacks strong

⁵⁷Michonski and Levi 2010; Keohane and Victor 2011; Bodansky, Brunnee, and Rajamani 2017.

⁵⁸See, e.g., Nordhaus 2015.

theory for variation in state membership in international institutions and part of my project is to articulate clearer expectations for variation in state membership at the level of the issue-area—an intermediate step between accounts of membership in individual institutions and macro-accounts of states’ underlying propensities to join institutions in general. This leads institutions in other issue-areas that intersect with climate to fall outside the scope of this project.

Unsystematic treatments of regime complexity have hindered the study of institutionalized climate cooperation outside the UNFCCC. Since the concept frequently lacks precise boundaries, scholars have included and excluded institutions from their analysis in unstructured ways. Furthermore, this conceptual stretching has obscured the extent of institutional proliferation *within* the issue-area of climate change, as scholars have focused more on linking issue-areas than on within issue-area density. Instead of governance centralized in the UNFCCC and a few related protocols, states have created over sixty different climate-specific institutions. Yet, major treatments of climate politics overlook these institutions. In major texts on climate governance, treatments of climate politics outside the UNFCCC are mostly speculations on how climate rules could be linked to those governing human rights, refugees, and international trade.⁵⁹ In this study, I uncover the history of intra-climate institutionalized cooperation and demonstrate its usefulness for studying contestation and cooperation in international climate politics.

3.3.2 Transnational climate governance

Transnational climate governance (TCG), by contrast, is an area where scholars have devoted tremendous care to outlining the boundaries of governance activities. TCG scholars often situate their work as a reaction to overly state-centric research in climate governance.⁶⁰ Climate governance is not coterminous with the UN-led climate governance process and broadening the scope to include the intersection of climate with other issue-areas does not remedy this lapse. TCG highlights how a

⁵⁹Gupta 2014; Bodansky, Brunnee, and Rajamani 2017; Friedrich 2017.

⁶⁰Andonova, Betsill, and Bulkeley 2009; Hoffmann 2011; Green 2013; Bulkeley, Andonova, Betsill, et al. 2014.

number of initiatives at the sub-national level, as well as those involving firms and non-state actors advance climate action in ways that had not been appreciated.

Transnational governance, according to a prominent definition, consists of “regular interactions across national boundaries when at least one actor is a non-state agent or does not operate on behalf of a national government or an intergovernmental organization.”⁶¹ In one of the most important contributions to TCG, Harriet Bulkeley and her co-authors construct a database of sixty TCG initiatives and conduct the first systematic analysis of TCG initiatives.⁶² They find substantial variation in the types of actors who are networked across TCG, the governance functions different initiatives undertake, the different sub-issues the initiatives address, and the geographic distribution of these initiatives. Thomas Hale and Charles Roger modify this dataset by applying stricter standards for inclusion consistent with the project’s founding statements.⁶³ Recent research argues that national-level climate policy conditions participation in TCG, which strengthens the case for developing a fuller understanding of state participation in climate governance institutions.⁶⁴

While TCG has been a topic of scholarly interest since at least 2007, discussions of it are largely absent from histories of climate governance. TCG provides a good mirror to my study of state participation in climate governance. Where TCG reacts to overly UN-centric treatments of climate politics by identifying and highlighting the hidden world of climate governance beneath the state and across state borders, my research seeks to recover the range of climate institutions with states as members that lie outside the UN-led process. While TCG and the intersection of climate with other issue-areas have become prominent parts of the climate literature, scholars have overlooked how states actually network outside the UN-led process.

3.3.3 Institutional proliferation in global climate governance

Research on the intersection of climate with other issue-areas and on transnational climate governance has countered the UN-centrism of much of the literature, but

⁶¹Risse 1995, p. 3.

⁶²Bulkeley, Andonova, Backstrand, et al. 2012; Bulkeley, Andonova, Betsill, et al. 2014.

⁶³Hale and Roger 2014.

⁶⁴Andonova, Hale, and Roger 2017.

the extent of state-based institutionalized cooperation *within* climate politics has often been considered outside the scope of existing studies. As a result, climate research in the social sciences tends to overlook the tremendous proliferation of climate governance institutions with state members. In this study, I foreground state participation in climate governance through the creation of a new dataset.⁶⁵

My new dataset reveals the extent to which states are interested in institutionalized cooperation within climate change. The UNFCCC includes all states as members, and therefore a state's membership in the UNFCCC indicates hardly anything about states' preferences. Furthermore, as highly visible and symbolic arenas, the UN treaties and annual conferences formalize and elevate issues, distorting them in the process. By contrast, outside climate institutions have much smaller audiences and footprints. Studying participation in these institutions reveals variation in states' previously unobserved support for internationalism in climate politics. This support may go unnoticed at the COPs amid all of the other contentious topics. Granted, membership in individual non-UN climate institutions may be idiosyncratic, but this underscores the value of conceptualizing participation at the level of the issue-area—participation decisions across 65 different climate institutions. These institutions overlap with and depart from characteristics of the UN-led climate governance process. They are not all the same, but attention to their diversity—and states' patterns of participation across them—offers insights into contestation and support for effective climate cooperation.

My dataset tracks climate governance institutions that include states as members. These institutions vary in form. They include formal and informal international organizations, transnational initiatives, and ministerial networks, as long as multiple states are members.⁶⁶ I distinguish between climate governance institutions with state members and transnational governance initiatives without states, and include only the former. Furthermore, I distinguish between institutions that are within

⁶⁵The institutions contained in this dataset are listed in table A.1 in the appendix of this chapter.

⁶⁶On formal and informal international organizations, see Vabulas and Snidal 2013; on transnational governance, see Hale and Held 2011; and on transgovernmental networks, see Slaughter 2004; Slaughter and Hale 2011.

the issue-area of climate change from institutions that operate in other issue-areas, but that may nonetheless impact on climate politics in direct or indirect ways. By separating state-based climate governance from these two near neighbors, I highlight the extent to which states choose to participate in climate politics.

A climate institution must meet a number of criteria to be included in my study. These criteria were selected to follow and complement existing work in TCG, except in my case, I redefine the units of interest to be states.⁶⁷ 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.

First, climate institutions must have states as members, but unlike formal international organizations, states need not be the only type of members permitted.⁶⁸ 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.⁶⁹ However, initiatives with only non-state actors are not included in my dataset—that is, sub-national government networks (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) are not included. The focus on states forces some unit homogeneity onto the cases. Limiting the range of cases to institutions with state members is also consistent with my theoretical expectations about the drivers of institutional membership.

⁶⁷Hale and Roger provide a thorough set of criteria for inclusion in their TCG dataset, which I used as a reference in considering my own population of cases. Hale and Roger 2014.

⁶⁸Pevehouse, Nordstrom, and Warnke 2004.

⁶⁹The 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 CO₂eq 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.

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 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 the IPCC is not included in my study.

When existing institutions develop new climate competencies or when they mainstream climate considerations into their existing operations, those institutions are not in the dataset by virtue of this alone. 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 might have developed new competences 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. 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.⁷⁰ 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.⁷¹ 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. The governance criteria is more discriminating in the context of TCG, where scholars are interested in separating governance activities from lobbying.⁷² 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 3.1 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

⁷⁰Abbott and Snidal 2000; Abbott and Snidal 2009.

⁷¹Abbott 2012; Bulkeley, Andonova, Backstrand, et al. 2012.

⁷²On the governance criteria, see Hale and Roger 2014.

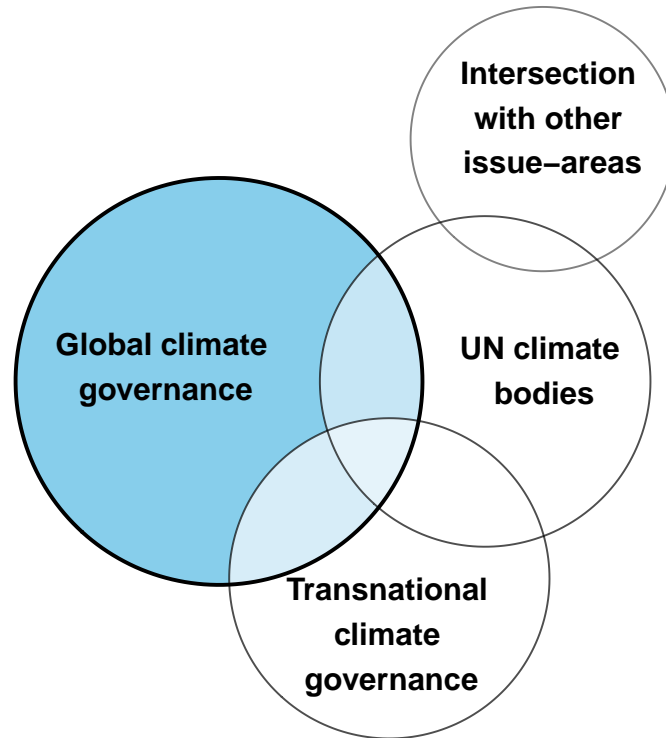


Figure 3.1: Varieties of institutions in climate governance

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 3.1 indicate this relationship.

I track state membership in these institutions over time using publicly available documents on these institutions' websites. No central depository of all international institutions exists. To identify climate institutions, I rely on existing studies, their

databases, online databases from the UNFCCC, as well as snowballing from the institutions uncovered. 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.

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 some common reference points. Granted, the ultimate success or failure of international

rules on carbon emissions may require some issue-linkage,⁷³ but it is not important for the research questions in this study to examine every possible issue-linkage.

3.4 Reconsidering state-led climate governance

3.4.1 The proliferation pathway

This new dataset allows us to re-consider UN-centric narratives of international climate politics. The proliferation of climate institutions challenges the dominant perspective that states have chosen to pursue climate cooperation along the “convention-protocol pathway.”⁷⁴ I briefly explain the intuition of the convention-protocol pathway in order to demonstrate just how far existing climate governance departs from the original intentions. Scholars note that states often sequence international cooperation over time, by using large membership multilaterals with shallow obligations and gradually adding more deeply substantive obligations over time. States may be hesitant to accept binding and stringent international obligations in the first instance, but may be willing to adopt these after a few years of practice cooperation at less intrusive, but also less effective, levels. In figure 3.2, I stylize the convention-protocol pathway’s expectation of how international cooperation in climate change would proceed. The convention-protocol approach envisions that successful international cooperation begins with broad participation in treaties with limited substantial obligations on members, which are slowly and steadily ratcheted up over time in additional protocols. The small marker at time $t = 1$ indicates a minimal framework convention adopted by nearly all states to kick-start international cooperation. Over time ($t > 1$), as states learn more about the nature of the problem, the effectiveness of different policy responses, and the characteristics of their counterparts, they are expected to adopt more ambitious agreements, indicated by the increasing size of the marker points over time. Every new iteration of international cooperation along the convention-protocol

⁷³See Barrett 2003; Nordhaus 2015 for examples.

⁷⁴A. Chayes and A. H. Chayes 1995; Abbott and Snidal 2004.

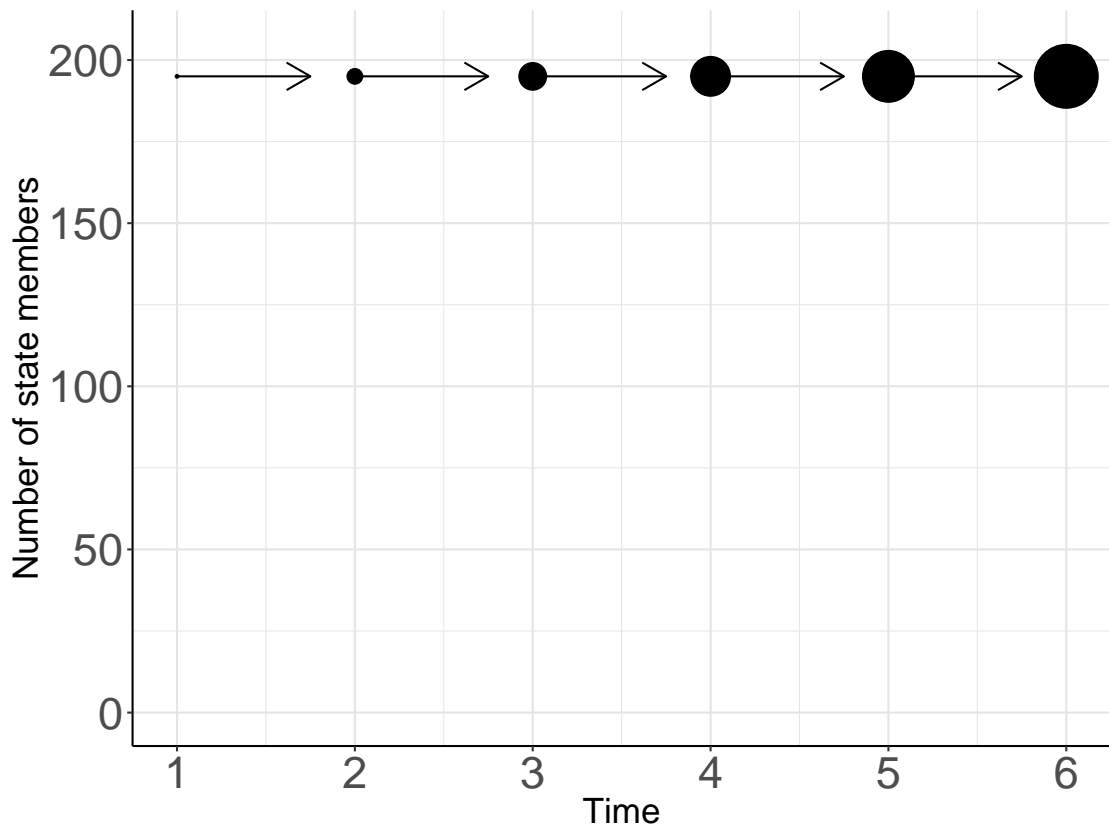


Figure 3.2: Stylized example of cooperation along the convention-protocol pathway. International cooperation begins with a broad membership multilateral that has shallow obligations for members. The depth of cooperation is indicated by the size of the marker points, with larger points indicating deeper cooperation. States only reach deeply substantive obligations after much past cooperation at shallower levels.

pathway contains deeper targets for members and maintaining full membership is considered key to effective governance.⁷⁵

The earliest climate agreements conform to these expectations. The 1992 UNFCCC focuses more on setting the broad goals for climate governance, raising the profile of climate change as a major international challenge, and establishing procedural rules to guide future UN-led climate governance than on setting stringent policy targets for parties. The 1997 Kyoto Protocol elaborated a few, relatively minor, mitigation targets for developed countries, but again constituted a relatively small step toward addressing climate change effectively. This gradualism was, nonetheless, appropriate from a policy perspective since negotiators were relatively

⁷⁵A. Chayes and A. H. Chayes 1995.

uncertain about the impacts of future climate change, the costs of mitigation and the effectiveness of different mitigation policy instruments.⁷⁶ These two international treaties emphasized the importance of extensive participation and both were widely ratified, though the Kyoto Protocol was ratified more slowly and with some notable holdouts. Extensive participation was achieved at the price of minimal substantive obligations, since obtaining the participation of states with the highest compliance costs and most skepticism required keeping legal obligations to a minimum. In this respect, the two early climate treaties reflect the broader-deeper tradeoff, wherein participation levels are negatively related to the costliness of cooperation that participants agree to.⁷⁷

My new dataset of climate institutions presents a very different picture of climate governance than the expectations of the convention-protocol approach. After the quick progress in adopting these two universal international treaties, the climate regime sputtered. The slow ratification of the Kyoto Protocol, the non-participation of the United States, and the Protocol's delayed entry into force produced a general sense of disappointment about the prospects for effective climate governance. In response to this stasis at the UN-level, states began to experiment with institutionalized cooperation outside the orbit of the UNFCCC.⁷⁸ As a result, climate governance has proliferated over time, rather than necessarily deepening along the convention-protocol pathway.

Figure 3.3 indicates that states have created many new climate institutions over time, instead of slowly adding new international treaties. Indeed, the pace of institutional proliferation accelerates immediately following the George W. Bush administration's repudiation of the Kyoto Protocol in 2001. As UN-led climate governance entered its darkest period, states increasingly created climate institutions outside the UNFCCC to pursue cooperative gains that were blocked in the world's premier multilateral forum.

⁷⁶Urpelainen 2011.

⁷⁷Downs, Roche, and Barsoom 1996; Barrett 2003; Gilligan 2004.

⁷⁸Hoffmann 2011.

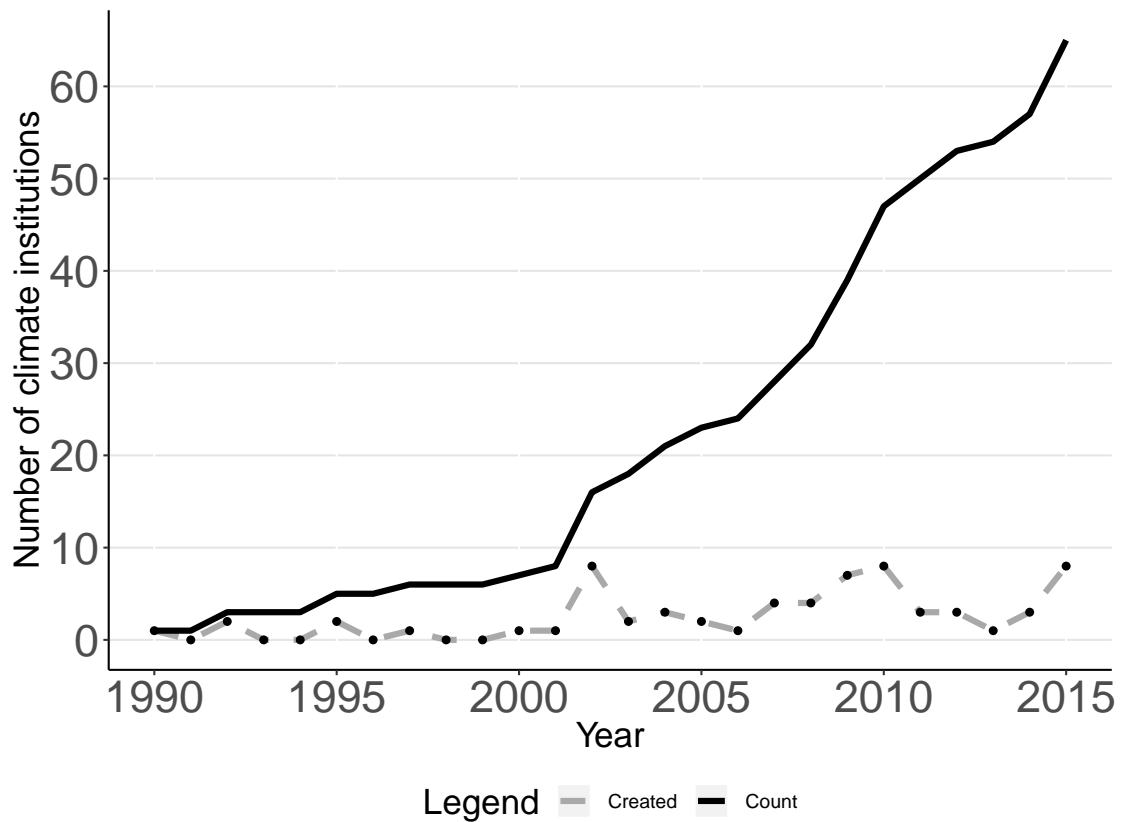


Figure 3.3: Growth of climate governance over time. Solid line indicates a steady increase in the number of climate institutions over time. The dashed line with points plots the number of climate institutions created per year. More climate institutions are created per year in later years, but there is consistent year-on-year variation in the rate.

Figure 3.4 plots state membership in climate governance institutions over time. This plot also challenges the convention-protocol narrative. Granted, many of the earliest institutions have extensive membership conforming to the expectations of the convention-protocol pathway, but rather than observing a steady accumulation of additional protocols (i.e., Kyoto 1, Kyoto 2, Kyoto 3, etc., note the empty space in the top-right of figure 3.4), there has been a proliferation of new institutions with limited membership over time. The UNFCCC negotiations have been described as “mega-multilateral”, in the sense that representatives from nearly 200 states attend, whereas most climate institutions have fewer than 50 state members.⁷⁹ By the time states met in Paris in 2015 to finalize a new climate agreement, states had established roughly sixty climate governance institutions with state members. These new climate

⁷⁹Hoffmann 2011, p. 3.

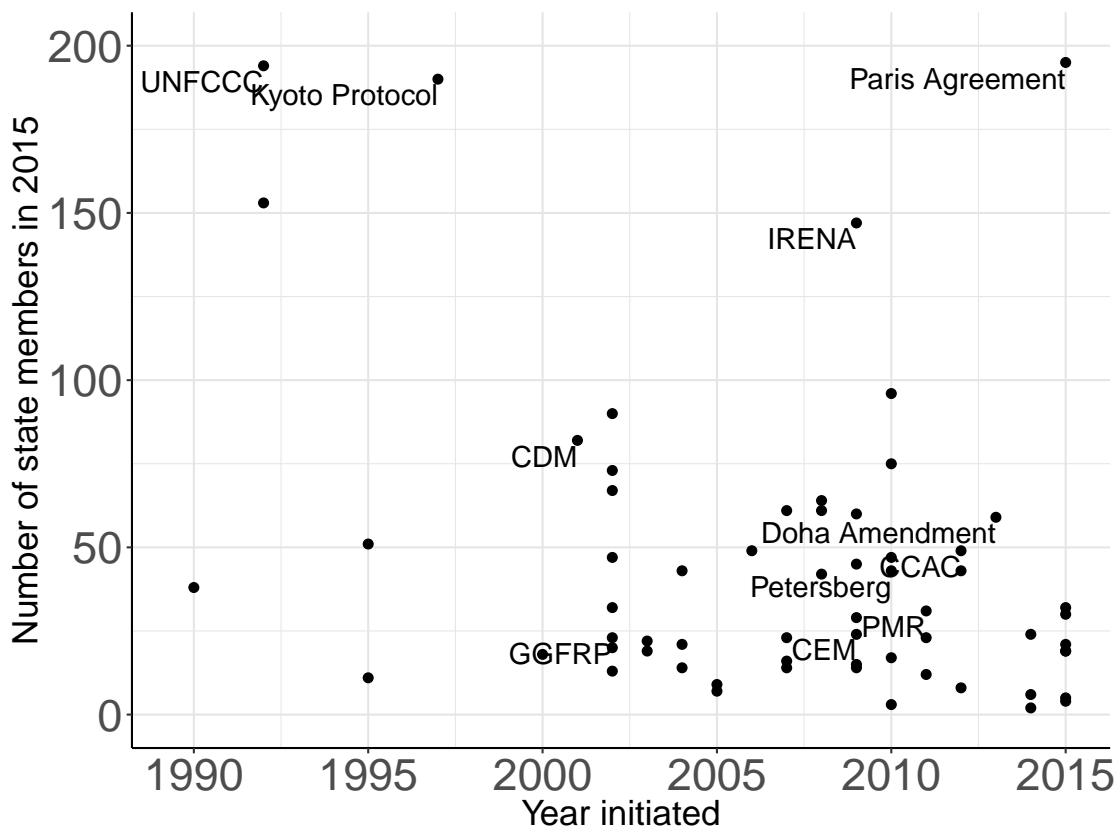


Figure 3.4: Membership in climate governance institutions

institutions often have much narrower membership than the full UNFCCC.

Figure 3.5 plots trends in the distribution of individual states' climate memberships over time. Until 2002, most states had few climate memberships, reflecting the limited opportunities for institutionalized climate cooperation. While the mean and median number of climate memberships are increasing over time, the distribution of memberships begins to diverge after 2001. Some states become very active in non-UNFCCC climate governance, while lower percentiles only slowly accumulate additional memberships. Brian Greenhill and Yonatan Lupu analyze a broad range of international organizations included in the Correlates of War Intergovernmental Organizations dataset and find a similar pattern over time: the majority of states have joined more institutions over time, but the gap between the top participants and the rest has also widened.⁸⁰

⁸⁰Greenhill and Lupu 2017.

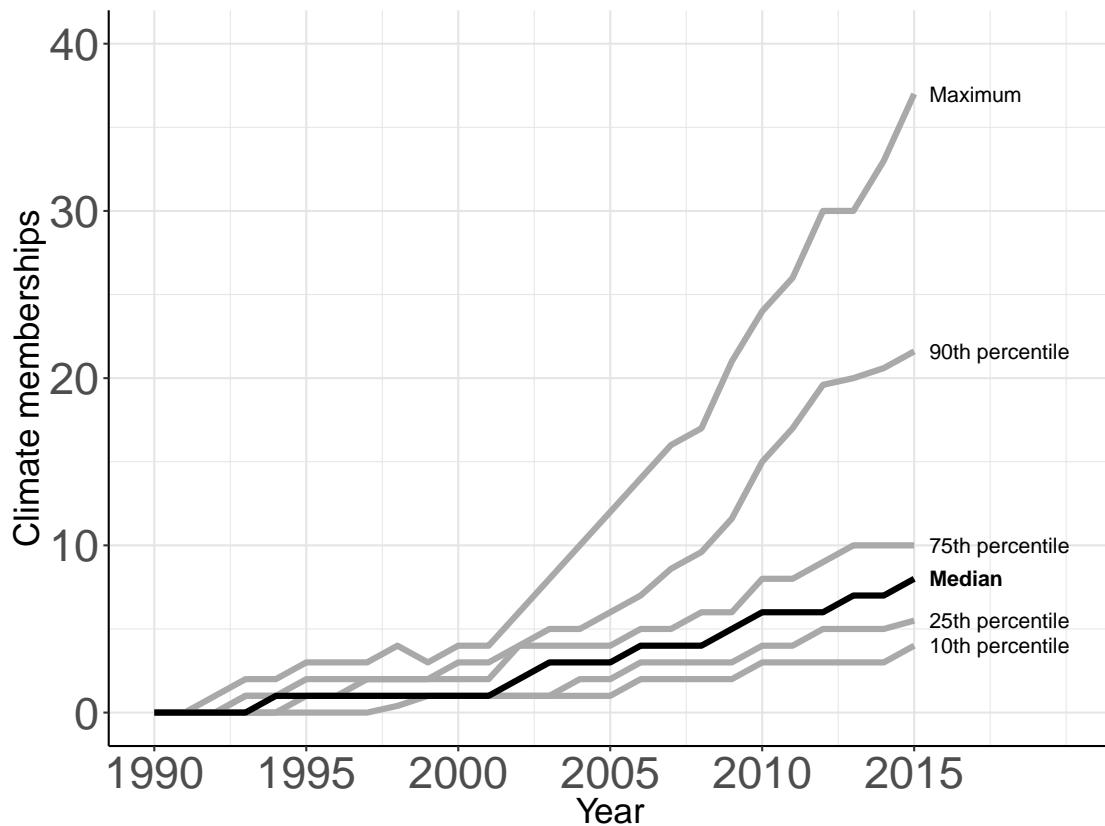


Figure 3.5: Distribution of state membership in climate institutions. States increasingly join climate institutions over time, though the participation gap between states with the most and least participation also increases over time

Similarly to Greenhill and Lupu, I analyze membership statistics at the level of the climate institution. Figure 3.6 plots the number of state members at different percentiles of institutions. The distribution of membership at the institution-level is less stable over time than the distribution of membership at the state-level since the number of institutions grows over time from a low base (see figure 3.3). We see that the maximum membership in a climate institution grows rapidly in the 1990s as states ratify the UNFCCC. As more climate institutions are created, the median number of members in a climate institution drops sharply, falling below 25 state members. After 2004, the 75th percentile of membership never rises above 50 members. The number of state members per climate institution is relatively stable after 2003, once the number of total climate institutions in operation reaches around 20. While the number of institutions has increased

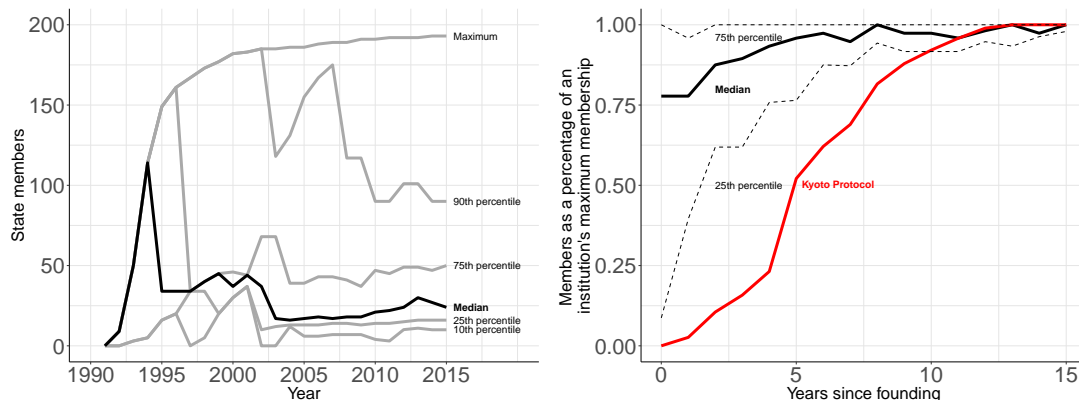


Figure 3.6: Membership in climate governance institutions at the institution level. Aside from a few large membership multilaterals, most climate institutions have limited membership. States that join climate institutions are also more likely to be founding members than late joiners. This pattern of rapid membership differs substantially from the slow pace of ratification of international treaties, such as the Kyoto Protocol.

over time, new climate institutions mostly have limited membership. The wide discrepancy between the membership of the largest climate institution and that of more average ones mirrors the distribution of membership at the institution-level for international organizations more generally.⁸¹ State membership in climate institutions therefore differs considerably from state membership in the UNFCCC and the Kyoto Protocol—the climate institutions with the most members.

In the right panel of figure 3.6, I show that the timing of membership in new climate institutions also differs substantially from the UNFCCC and Kyoto Protocol. Scholars are often interested in the amount of time states take to ratify international treaties and use the pre-membership and post-membership periods to estimate the effect of membership on state behavior. The solid red line plots membership in the Kyoto Protocol in the fifteen years after its establishment. Membership rises slowly and relatively consistently. By contrast, most climate institutions acquire virtually all of their members in their first year or two after their creation. The Kyoto Protocol took nine years to reach 90% of its maximum observed membership, whereas the median climate institution reaches 90% of its fullest membership

⁸¹I further investigated the modularity of the climate institution network as in Greenhill and Lupu 2017. Modularity operationalizes the concept of fragmentation in IO membership and measures the extent to which clusters of states with common intra-cluster memberships are connected (or not) to other clusters of states with common intra-cluster memberships. There are no obvious trends in the modularity score over time in climate change.

within 3 years. This means that the distinction between creating new climate institutions and joining them is relatively minor, since nearly all members are founding members. The slow pace of ratification of the Kyoto Protocol differs substantially from membership patterns in other climate institutions.

3.4.2 Characteristics of climate governance outside the UNFCCC

These descriptive statistics about the growth of climate institutions over time and variation in state membership within and across institutions demonstrate that these new climate institutions are not replicas of the UNFCCC. Institutional proliferation within international climate politics has led to a structure of international climate cooperation that differs markedly from what the UNFCCC's architects envisioned. Instead of centralizing governance functions in a powerful, universal membership international organization—the UNFCCC—states have apportioned different topics across new institutional forums.

However, these climate institutions also depart from several of the key principles enshrined in the UNFCCC and at the COPs (see table 3.2). New climate institutions weaken the principle of differentiation that has structured the UN-led process. Article 3 of the 1992 UNFCCC articulates that developed and developing countries have different obligations under the Convention, as they have made different contributions to the problem of climate change and have different capabilities to respond in the present. This principle is re-affirmed in the treaties' annexes which cement states into fixed categories based on their development status in the early 1990s. However, climate institutions outside the UNFCCC have much weaker differentiation between developed and developing countries. Indeed, some of these new institutions were established with the express intent of bringing together major developed and developing country emitters on a more level playing field. The Major Economies Forum, for example, gathers the world's major GHG emitting countries for negotiations outside the UN-led process, regardless of their development status. Other climate institutions try to convene states with ambitious climate policies

Principle	UNFCCC/COPs	Non-UNFCCC institutions	Paris Agreement
<i>Number</i>	Mega-multilateral	Minilateral	Mega-multilateral
<i>Developing countries</i>	Annex-based differentiation	Cross-annex, undifferentiated	Self-differentiation
<i>Actor type</i>	States	States with non-state actors	State-centric
<i>Legal status</i>	Legally binding treaty	Non-binding soft law	(Soft) Treaty law
<i>Commitments</i>	Targets and timetables	Sectoral, policies	NDCs
<i>Scope</i>	High dimensionality	Separated, sectoral	High dimensionality

Table 3.2: Characteristics across climate governance

outside the UN-led process, such as in the Petersberg Climate Dialogue. Again, this forum does not differentiate between developed and developing countries. Finally, more sectoral forums, such as the Global Gas Flaring Reduction Partnership, engage key gas producing states, often without then separating members internally by their status within the UNFCCC.

Granted, some differentiation exists. Developed countries are likely to be the largest contributors to these institutions' budgets, especially in the case of climate finance institutions—but even here some non-Annex 1 countries are climate finance donors, particularly in recent years.⁸² Furthermore, some climate institutions have been established to help developed and developing countries navigate the flexibility mechanisms created by the Kyoto Protocol, whereby developed countries can receive mitigation credits from contributing to mitigation activities in developing countries. These institutions can be considered as having “buyer” and “seller” sides, where buyers of mitigation offsets are developed countries with mitigation obligations under the Kyoto Protocol. In sum, whereas the UNFCCC and Kyoto Protocol differentiate rigidly between developed and developing countries, extra-UNFCCC institutions often blend these categories.

Observers have noted that the UN-led process is very state-centric, even if civil society organizations have become more active and present at the COPs. States negotiate the terms of the UN climate treaties, and the treaties' obligations are binding only on state members. Even in the formal UN-led process, the rigid differentiation of states and non-state actors is blurred somewhat by members of civil society organizations who frequently assist and staff developing country

⁸²For example, China, India, Mexico, Pakistan, South Africa and South Korea have become donors of climate finance through the Global Environment Facility's climate window.

delegations. Some civil society organizations have formally recognized status as observers at the UN climate conferences, such as the International Institute for Sustainable Development. By contrast, many non-UNFCCC climate governance institutions are public-private partnerships (PPPs) that network state actors with firms, civil society, other international organizations, and/or sub-national governmental actors to address climate change. Non-state actors can be included directly as constituent members of a climate institution, such as with the Climate and Clean Air Coalition (CCAC). The Coalition was founded in 2012 to help identify and prioritize the co-benefits of GHG mitigation, particularly with respect to local air quality in developing countries. It describes itself as “a voluntary partnership led by governments” but with 153 non-state actors that also advance climate action in this area and “actively participate in the Coalition’s work.”⁸³ Some of these partners are international organizations, but others are NGOs, or firms. Similarly, the members of the Global Gas Flaring Reduction Partnership are not only states, but also sub-national governments (e.g., the Canadian province of Alberta) and major state-owned and non-state owned oil companies (e.g., Qatar Petroleum and Shell, respectively).

The creation of these “multi-stakeholder” initiatives coincides with a more general turn away from formal international organizations and hard international law.⁸⁴ Actors increasingly rely on non-binding agreements—soft law—to regulate global problems.⁸⁵ Climate institutions follow this more general trend and avoid establishing legally binding obligations for members. Non-state actors do not have the ability to create treaty law, but even non-UNFCCC initiatives with only state members do not use hard international law, preferring instead to work through softer arrangements to steer actors toward mitigation and adaptation goals. In some respects, it is not obvious what legally binding, non-UNFCCC obligations would add to climate governance. Given that non-participation is already a large problem in climate politics and that legally binding obligations may accentuate this problem,

⁸³CCAC 2019.

⁸⁴Raymond and DeNardis 2015.

⁸⁵Abbott and Snidal 2000; Brummer 2015.

adding further obligations outside the UNFCCC may dissuade participation.⁸⁶ Furthermore, it is not obvious how non-UNFCCC institutions would enforce their obligations, since UNFCCC obligations are not linked to a robust enforcement system. Accordingly, instead of setting explicit GHG mitigation targets for members and timetables for meeting them, non-UNFCCC instruments use softer means of steering targets toward policy goals, such as providing support for implementation or developing best practices.⁸⁷

By moving away from complex negotiations over economy-wide mitigation targets, non-UNFCCC climate institutions have developed much more specialized subject matter. The UNFCCC negotiations are highly multidimensional, as states negotiate across mitigation, adaptation, climate finance, and loss and damage, among other topics.⁸⁸ Many non-UNFCCC climate institutions attempt to cut through the high dimensionality of the COP negotiations by focusing on individual sub-issues, such as carbon pricing, GHG emissions from agriculture, or short-lived climate pollutants. When governance topics are separated across functional forums, individual states are able to tailor their engagement to the issues they care about more strongly and proceed at a quicker pace than would be possible at the UNFCCC level.⁸⁹ These sectoral institutions address topics that are important for effective climate action, but that the UNFCCC is not able to fully address internally. Granted, some non-UNFCCC climate institutions are not sectoral. Outside negotiating forums have also been developed that in some ways duplicate existing functions of the UNFCCC.

Sometimes these institutions are linked formally or informally to other international organizations. For instance, several of the climate governance institutions under study qualify as “emanations” of the UNFCCC (e.g., Joint Implementation or the Doha Amendment) or other international bodies.⁹⁰ Recall that to enter into my study states must pro-actively join or decide to participate in a climate

⁸⁶von Stein 2008.

⁸⁷Hale and Roger 2014.

⁸⁸Bagozzi 2015.

⁸⁹Alesina and Grilli 1993; Downs, Roche, and Barsoom 1998; Johnson and Urpelainen 2012.

⁹⁰Shanks, Jacobson, and Kaplan 1996; Johnson 2014.

institution, rather than becoming members by virtue of their pre-existing membership in another institution, as is the case with IPCC. Other climate governance institutions are also linked to the UN Environment Program, the World Bank, the International Energy Agency, the International Renewable Energy Agency, the Food and Agriculture Organization, or the Global Environment Facility. These other, formal international organizations may have played active roles in establishing new climate institutions, may host a climate institution's administrative facilities, or may finance its operations from a larger budget.⁹¹ Membership in these climate emanations is not strictly determined by preexisting membership in the parent institution. For example, the International Renewable Energy Agency (IRENA) helped establish the SIDS Lighthouse Initiative, despite the fact that many small island developing countries (SIDS) are not members of IRENA.

Greater attention to these non-UNFCCC forums reveals that a number of supposed innovations contained in the Paris Agreement existed already within climate politics. The Paris Agreement blends elements of both the highly formal state-driven UNFCCC process and the more fluid and inclusive approach of non-UNFCCC climate institutions. Consider that the Paris Agreement's GHG targets are not legally binding: states have duties to implement their Nationally Determined Contributions, but are not obligated to meet their targets. This shift toward soft law in international obligations reflects the lack of binding obligations in non-UNFCCC climate governance. In this respect, we can see the imprint of climate institutions such as the Asia-Pacific Partnership, which publicly announced its intention to elevate soft law instruments in climate governance.⁹² States use these outside institutions to articulate rival norms and build constituencies to support them. Some of the design features of the Paris Agreement are less surprising in light of the fact that they have been present in non-UNFCCC climate institutions for years.

The Paris Agreement still recognizes differentiation as a core normative principle, however, the demarcation lines between Annex 1 and non-Annex 1 countries have

⁹¹Hale and Roger 2014.

⁹²Vihma 2009; Andresen 2015.

become blurred, at least in target-setting. States have been encouraged to self-differentiate within their Intended Nationally Determined Contributions (INDCs) and to describe how their INDC is consistent with a notion of equity. The UNFCCC Secretariat has also increasingly reached out to non-state actors, particularly through the Non-State Actor Zone for Climate Action. The Paris Agreement remains an international treaty with state parties, negotiated mega-multilaterally and covering a large number of topics, but many novel traits developed outside the UN-led process have been incorporated into the Agreement.

3.5 Conclusion

The landscape of climate governance outside the UNFCCC forces us to reconsider how states have chosen to govern climate change. Climate cooperation is more diffuse than the UN-led system would have one believe. States have chosen to create a series of separate and loosely connected forums alongside the UNFCCC to pursue climate action. Some of these forums address topics that are under-addressed at the UN climate conferences, specifically issues related to policy implementation, such as the design of carbon pricing instruments. Others appear to duplicate existing functions of the UNFCCC or of other new climate institutions, such as the creation of additional networking venues and financing mechanisms.

These institutions re-articulate certain features of the Kyoto architecture of climate cooperation, but they challenge others. Kyoto sought universal participation, established binding emissions targets for developed countries, and introduced a series of market mechanisms to ease implementation and encourage climate action in developing countries. Each new climate institution blends different elements of the Kyoto architecture and relaxes some of its strictures. They govern through soft law or with non-state actors. They split the macro-problem of global climate change into more specific sub-components. They gather new combinations of interested parties in less formal venues. Together, they represent a choice to govern climate change through a distributed and heterogeneous architecture, in contrast to the original sequential convention-protocol design of the UNFCCC.

I use my new dataset to address two key questions about international institutions and international cooperation. First, it is unclear how and why state membership in international institutions varies. The literature mostly treats this question at the level of individual international institutions, yet membership in any individual institution may be idiosyncratic. Based on developments in climate politics, I argue that the issue-area is a more appropriate level at which to study membership. State membership in climate institutions varies more and in more informative ways than ratification of the UNFCCC or the Kyoto Protocol. I show that states sort themselves into like-minded clusters based on their patterns of membership in dense institutional environments, while the universal membership UN climate treaties pool virtually all states together.

Second, the greater institutional density across issue-areas calls for a better understanding of how states use dense institutional environments to pursue their goals. Many scholars are concerned that the creation of overlapping institutions impedes governments' abilities to coordinate their policies. However, if states use overlapping institutions to enhance bargaining efficiency, tailor incentives, or increase the legitimacy of stalemated governance processes, then cooperative outcomes may improve. I argue that the key to separating these arguments lies in understanding states' motivations for membership in the first place. Some states establish new climate institutions to accelerate climate governance, whereas others seek to obstruct cooperation. Dense institutional environments allow scholars to measure these motivations when states separate themselves by type through their institutional memberships.

4

Participation in global climate governance

Contents

4.1	Introduction	95
4.2	Membership in international institutions	97
4.2.1	Why do states join international institutions?	97
4.2.2	Why do states join climate institutions?	100
4.2.3	A revisionist theory of participation: Participation motivated by two types of dissatisfaction	104
4.3	Measuring participation in climate institutions	108
4.3.1	Scaling participation using item response theory	110
4.3.2	Locating states in the climate governance space	115
4.3.3	Identifying the ideal point dimensions by constraining discrimination parameters	118
4.4	Determinants of climate ideal points	126
4.4.1	Data and measurement	127
4.4.2	Normal vector analysis	133
4.4.3	Multivariate analysis	137
4.5	Criterion-related validity of climate ideal points	141
4.5.1	Comparison across measures of climate preferences	142
4.5.2	Comparison across measures of international preferences	150
4.6	Conclusion	153

4.1 Introduction

Climate governance is torn by a contradiction. It is gathered in a prominent multilateral institution that convenes states, hosts annual negotiations, and supports

efforts to build an effective response to global climate change—namely, the UNFCCC. Yet, states have also created over 60 additional climate institutions, thereby spreading climate governance across sites. Given that theories of international institutions expect institutions to facilitate cooperation by providing focal points, reducing transaction costs, and facilitating linkages between topics, it is surprising that climate governance is distributed across so many institutions, seemingly degrading the mechanisms of institutionalist theory.

In this chapter, I argue that the key to understanding this puzzle lies in recognizing that not all states are alike and neither are climate institutions. As outlined in the chapter 2, states have opposing preferences with respect to cooperative progress at the UNFCCC: some would prefer to establish more ambitious mitigation obligations, while others would prefer to delay mitigation into the future. These diverging perspectives motivate different strategies of participation in climate governance. States use non-UNFCCC climate institutions to challenge and shape the evolution of multilateral climate governance consistent with their preferences over the pace of mitigation.

This institutional strategy is most noticeable when state participation in international institutions is observed at the level of the issue-area rather than in individual institutions. Existing institutional theory and most empirical work on institutions focuses on the determinants of membership in individual institutions and the effects of individual institutions on subsequent state behavior. In this chapter, I steer the study of institutionalized cooperation toward the level of the issue-area.

My argument has affinities with the expressive theory of participation and the concept of contested multilateralism, but diverges in key respects.¹ Expressive theory argues states join institutions that express values that resonate with their own domestic priorities. Existing applications of expressive theory have focused on the human rights regime, an issue-area where scholars argue all institutions are nested under a common goal of supporting liberal human rights practices.² Expressive theory does not translate smoothly to climate change, since states have

¹Hathaway 2002; Simmons 2009; Morse and Keohane 2014.

²Hathaway 2002; Simmons 2009.

not created a coherent set of institutions nested under a common goal. Instead, states establish and join climate institutions to accelerate or obstruct effective governance. This resembles contested multilateralism,³ though I emphasize that states may contest existing multilateral cooperation from two directions: to deepen multilateral cooperation or to stifle it. Existing theory masks these different strategies.

I support my argument with the new dataset of state membership in climate institutions that I introduced in chapter 3. I derive predictions about the determinants of membership from institutionalist theory and climate politics. To test these predictions, I develop a new measure of participation in climate institutions that accounts for different motivations for membership. A conventional count of memberships would conflate the two separate motivations states have for joining climate institutions that I outline in chapter 2. I opt instead to use a statistical measurement model based on item response theory to scale participation in two dimensions. I separate states' underlying propensity to participate in global governance from their preferences over substantive cooperation in climate change. In statistical tests, I show that my measure of climate ideal points is more consistent with theory than a straight count of memberships. I conclude by comparing my new measure to other existing measures of state preferences in climate governance and international politics.

4.2 Membership in international institutions

4.2.1 Why do states join international institutions?

Despite international institutions being one of the central research areas in International Relations, surprisingly little work examines why states join international institutions.⁴ Existing research tends to theorize why international institutions exist and how they might affect outcomes, but the determinants of membership in international institutions are less well-understood. Theory suggests states create institutions to resolve cross-border externalities or solve cooperation problems that

³Morse and Keohane 2014.

⁴Mansfield and Pevehouse 2006.

cannot be addressed domestically. Institutions, according to Robert Keohane, facilitate cooperation by “reduc[ing] transaction costs, alleviat[ing] problems of asymmetric information, and limit[ing] the degree of uncertainty that members face in evaluating each others’ policies.”⁵

Yet, such explanations of how institutions facilitate cooperation under-specify motivations for states to join institutions. Empirically, we observe wide variation in the degree to which states are members of international institutions. Unless states vary tremendously in the extent to which they are affected by a specific transboundary externality or transboundary externalities in general, then the transactions costs approach does not yield clear expectations about variation in state membership across institutions. Some variation in the extent to which states are affected by transboundary externalities is plausible. For instance, some problems have clear spatial heterogeneity and membership in the institutions that regulate those problems should account for this, such as the distribution of exposure to sulphur emissions in Europe and variation in the ratification of the 1985 Helsinki Protocol on the Reduction of Sulphur Emissions.⁶ States also vary in the extent to which they are exposed to shocks from the global economy. States with greater openness to trade are more vulnerable to negative externalities abroad and may participate more extensively in global governance to represent their interests. Yonatan Lupu finds support for this approach in his analysis of multilateral treaty ratification, where states’ treaty commitments are most strongly associated with their total trade.⁷ Beyond these broad strokes, however, the transaction costs approach is relatively silent on the comparative drivers of membership in international institutions.

Beth Simmons offers the most comprehensive theoretical assessment of the determinants of membership in international institutions, in the context of state ratification of international human rights treaties.⁸ For Simmons, the key factor in

⁵Keohane 1984, p. xi.

⁶Murdoch, Sandler, and Vijverberg 2003.

⁷Lupu 2016.

⁸Simmons 2009.

determining participation decisions is the fit between underlying state preferences and the content of cooperation embodied in an institution: “Polities participate most readily and enthusiastically in treaty regimes that reflect values consonant with their own.”⁹ States that value the terms of cooperation embodied in an institution are more likely to be members than states that do not value these terms of cooperation. Simmons terms this synthesis an “expressive theory of state ratification”, in line with Oona Hathaway and with a literature on expressive voting in democratic elections.¹⁰ However, the relationship between domestic fit and participation is not perfect, and some states with divergent values nevertheless end up ratifying, while others with convergent values end up not ratifying.

This imperfection leads Simmons to conceptualize three kinds of states based on their ratification decisions and underlying, unobservable motivations. First, sincere ratifiers value the content of a treaty and anticipate complying with its provisions. They ratify largely because their domestic practices already match the treaty’s obligations. This is the scenario that George Downs and his co-authors draw attention to when they argue that participation in international institutions may not necessarily imply behavioral changes, since states may join institutions that create no additional obligations of conduct.¹¹ For example, full liberal democracies will often not be required to conduct any domestic reforms to bring their human rights practices into compliance with the terms of a human rights treaty, while less liberal states may have to carry out substantial reforms to do so. In this respect, liberal democracies comply with a treaty’s obligations based on their preexisting traits that make compliance costs, rather than a treaty constraining the range of acceptable behavior.

Second, “false negatives” are states that also value the content of the treaty, but fail to ratify due to features of domestic political institutions, such as extensive ratification hurdles associated with many veto points or uncertainty over future interpretations of legal commitment stemming from domestic judicial institutions.

⁹Simmons 2009, pp. 12–13.

¹⁰Hathaway 2002; Schuessler 2000.

¹¹Downs, Rothe, and Barsboom 1996.

Third, “false positives” are strategic ratifiers who do not value the content of the treaty and do not anticipate complying with its obligations, but ratify nonetheless. Given that international legal agreements often lack extensive monitoring and enforcement powers, these states ratify expecting to see reputational benefits or at least to avoid criticism for not ratifying. We could add a final category of states—those that do not value the treaty’s contents and do not ratify.

Note that these categories combine elements of “instrumental” and “normative” motivations for membership. Simmons argues that governments consider the costs and benefits associated with ratification, and the posited expected utility function includes material and social terms. Simmons considers the costs and benefits of membership to be a function of the fit between domestic institutions, transnational dynamics, and the contents of a treaty. For example, keeping with human rights, “governments with deep historic commitments to democratic governance” should ratify more extensively than repressive autocracies, as these democracies have greater underlying affinity with the values articulated in modern human rights treaties.¹² The expectations of expressive theory are that states with greater affinity to the contents of a treaty in question will ratify, where affinity is defined as a close fit between domestic political institutions, domestic political practices and the obligations outlined in a treaty.

4.2.2 Why do states join climate institutions?

How does the expressive theory of participation fit in the climate context? The expressive theory expects that governments will join institutions when they support the positions expressed by those institutions—the content of cooperation embodied in an institution. In human rights, this proximity manifests in the form of a close association between the specific provisions related to human rights in a treaty and country-level human rights practices. To pair the expressive theory of participation to the context of climate governance requires specifying factors that dispose states

¹²Simmons 2009, p. 65.

toward environmental protection.¹³ While some particular membership decisions may be idiosyncratic, extensive participation across 60 institutions is likely to reflect a systematic disposition. The climate politics literature suggests a range of factors that could condition states' willingness to participate actively in climate governance. I turn to these now briefly.

Close affinity between states and climate institutions

Many studies have found a strong association between democratic institutions and environmental protection. Democracies seem to comply with their international legal obligations more readily,¹⁴ reduce their emissions more rapidly,¹⁵ participate more extensively in transnational climate governance,¹⁶ and seek out negotiating positions nearer the cooperative median in climate negotiations.¹⁷ Battig and Bernauer explain that the effect of democracy likely stems from the fact that the domestic “median voter and/or influential interest groups prefer more public goods provision.”¹⁸ Given that the public goods benefits of mitigation are not fully internalized at the country-level, the relationship between democracy and climate policy is likely moderated by another input, such as public awareness and concerns about climate change.¹⁹ Pressure to adopt more climate-friendly policies could come from citizens directly or via environmental non-governmental organizations (NGOs).²⁰ Accordingly, the expressive theory suggests that democracies will value environmental protection more and should participate more extensively in climate governance, all else being equal.

Vulnerability to climate change impacts has also been shown to influence states' climate policy.²¹ States that are more vulnerable to climate change may pursue

¹³Note here that I am switching concepts from “ratification” to the simpler “participation” or “membership”, and from “treaties” to “institutions”. I recognize that these are separate sets of concepts, but I bracket these considerations for now.

¹⁴Battig and Bernauer 2009.

¹⁵Lachapelle and Paterson 2013.

¹⁶Andonova, Hale, and Roger 2017.

¹⁷Bailer and Weiler 2015.

¹⁸Battig and Bernauer 2009, p. 285.

¹⁹Harrison and Sundstrom 2010.

²⁰Bernauer, Bohmelt, and Koubi 2013; Andonova 2014; Andonova, Hale, and Roger 2017.

²¹Sprinz and Vaahoranta 1994; Battig and Bernauer 2009; Bailer and Weiler 2015.

more activist climate policies in attempts to raise the salience of climate change as an international issue. More vulnerable states may also expect greater benefits from participation in climate institutions to the extent that participation supports adaptation and strengthens domestic resilience to climate impacts.

Democratic institutions, domestic NGOs and vulnerability to climate change impacts can be thought of as lowering the costs of participating in climate governance, since domestic publics are likely to be more supportive of active climate policies. In contexts where these variables are stronger, expressive theory expects states to engage more extensively with climate governance institutions. Following Simmons' theory of expressive ratification, the content embodied in international climate institutions will fit more readily with the policy preferences of these types of states. These are Simmons' "sincere ratifiers."

Divergence between states and climate institutions

By contrast, studies have shown that states with greater national reliance on fossil fuels adopt less cooperative climate policies. Countries are differentially reliant on fossil fuels in a number of ways. Government revenue from oil, gas, and coal sources varies across countries. Battig and Bernauer find that countries that derive greater rents from fossil fuel sources have worse compliance with reporting requirements under the UNFCCC.²² Bailer and Weiler also theorize that greater reliance on fossil fuel rents will be associated with less cooperative negotiating positions, though they do not find evidence for this relationship.²³

Countries with higher GHG emissions may also view active climate policy less favorably. Battig and Bernauer find evidence that countries with higher per capita GHG emissions have less cooperative international climate policies.²⁴ By contrast, Lachapelle and Paterson find that countries with greater carbon intensity of GDP reduced their GHG emissions more rapidly during the lead-up to the Kyoto Protocol's first compliance period (i.e., 1997–2008).²⁵ As climate

²²Battig and Bernauer 2009.

²³Bailer and Weiler 2015.

²⁴Battig and Bernauer 2009.

²⁵Lachapelle and Paterson 2013.

mitigation policy becomes more stringent, reducing GHG emissions from high absolute or per capita levels will be more costly. If climate institutions drive climate mitigation, then high emitting countries may abstain from participating to distance themselves from these costs.

Finally, governments may rely on fossil fuels for electricity generation. Electricity infrastructure has high fixed costs and long operating lives, implying that risk-averse investors are generally unwilling to abandon existing plants. Coal-, natural gas- or oil-fired power plants represent significant investments that raise the cost of deep decarbonization. Nonetheless, Lachapelle and Paterson find no relationship between electricity generation from fossil fuels and GHG emissions trends, after controlling for a range of other factors.²⁶

If, following the expressive theory of ratification, countries join international institutions when the content expressed in the terms of cooperation match domestic priorities, then countries with high reliance on fossil fuels should participate less in climate governance than countries with lower reliance on fossil fuels, all else being equal. States' preferences over climate cooperation are shaped by both a set of factors that prompt participation through common priorities (broadly, environmentalism) and a set of factors that dissuade participation through divergent priorities (dependence on fossil fuels). These factors work in opposite directions, with the former pulling states toward participation, and the latter pushing states away.

General propensities of states to participate

States may also join climate institutions for reasons unrelated to climate politics. States vary widely in the extent to which they join international organizations and ratify international environmental agreements. If participation in climate institutions reflects states' general underlying propensities to participate in global governance, then membership in climate institutions may simply reflect this broader disposition. Wealthier countries may be similarly inclined to participate, as they have more resources available for foreign policy and, arguably, a larger stake in the effectiveness

²⁶Lachapelle and Paterson 2013.

<i>Variable</i>	<i>Expectation</i>
Strong democratic institutions	Join
High public awareness of climate change	Join
High environmental NGOs	Join
High vulnerability to climate impacts	Join
High electricity generation from fossil fuels	Abstain
High fossil fuel rents	Abstain
High GHG emissions	Abstain
High IO memberships	Join
High IEA ratifications	Join
High trade openness	Join
High GDP (per capita)	Join

Table 4.1: Summary of theoretical expectations from expressive theory

of international cooperation. The transactions costs approach suggests that countries that are more exposed to the world economy join more international organizations since they are most affected by transboundary externalities. Accordingly, states with high levels of trade openness may join more climate institutions as a reflection of their general disposition toward participation in international politics.

Table 4.1 summarizes expectations in the literature about how domestic variables influence membership in institutions and climate policy. Note that they all imply a monotonic relationship, whereby countries domestic attributes condition membership increases or decreases across all climate institutions. In the next section, I articulate an alternative conception of climate institutions rooted in my theoretical argument about how states use institutional proliferation to deepen or fragment climate governance. If this revisionist theory better characterizes the drivers of participation than the expectations from the literature may be misaligned. I evaluate this empirically in section 4.4.

4.2.3 A revisionist theory of participation: Participation motivated by two types of dissatisfaction

The transactions costs and the expressive theory both suggest a simple correspondence between domestic structural factors and states' climate policies. With respect to membership in climate institutions, they suggest that states already disposed

to cooperative climate policies will join more climate institutions. This reasoning assumes that all climate institutions are designed to support climate action. As Kenneth Abbott puts it, non-UNFCCC initiatives can be seen as “weakly nested under ... the same broad goals” as the UNFCCC and Kyoto Protocol.²⁷

However, I argue the correspondence between states’ dispositions and their climate memberships is actually more complicated, since states can use new climate institutions to shape the evolution of climate cooperation. States may join institutions to support climate action, but instead of recalcitrant states simply abstaining from membership, laggards may use non-UNFCCC forums to challenge climate governance. Therefore, the link between country-level structural factors and climate membership is more complex than either correspondence approach. If human rights treaty ratifications are “sincere in the aggregate,” climate memberships may not be, since states use these institutions to steer the UN-led process in their preferred direction.²⁸ Total membership is not necessarily an indication of a state’s interest in supporting substantive mitigation objectives, even if in other issue-areas total membership may be better aligned with a regime’s goals.

Within climate politics, many institutions have been established to facilitate GHG reductions; however, not all climate institutions support ambitious mitigation policies. Instead, some states have developed and deployed climate institutions to hinder ambitious collective mitigation policies, and especially costly mitigation obligations under international law. States may use non-UNFCCC climate institutions to delay formal, treaty-based GHG mitigation obligations under international law. In this sense, climate institutions are heterogeneous and membership may reflect heterogeneous evaluations of climate cooperation.

I draw on the concept of contested multilateralism to evaluate the design and evolution of climate governance.²⁹ Contested multilateralism argues that states use multilateral institutions to shape the evolution of cooperation in an issue-area. States set up and join institutions not only to resolve transboundary

²⁷Abbott 2012, p. 581.

²⁸Lupu 2013, p. 916.

²⁹Morse and Keohane 2014.

externalities (transactions cost approach) or express support for existing values (expressive theory), but also to “challenge the rules, practices, or missions of existing multilateral institutions.”³⁰ When states are dissatisfied with existing multilateral cooperation, they may push for intra-institutional reforms, but they may also use other multilateral institutions to pull cooperative bargains toward their preferred outcomes. In dense institutional environments, states may use cross-institutional strategies to undermine existing rules and attempt to supplant them with more favorable ones.³¹

My argument builds on studies that argue institutional proliferation is a function of dissatisfaction;³² however, existing work under-theorizes the nature of dissatisfaction within prevailing cooperative bargains. States have preferences over the pace and depth of cooperative policy adjustments. When multilateral negotiations seek to establish obligations for members, different states prefer to coordinate at more or less intrusive levels of cooperative adjustments. In climate politics, some states would prefer to move on GHG mitigation at a quicker pace than the UNFCCC currently adopts, whereas other states fear the compliance costs of quicker GHG mitigation. Under contested multilateralism, each type of state may draw on non-UNFCCC institutions to shift the evolution of multilateral climate cooperation in its favor. Ambitious states may establish and join new climate institutions to accelerate multilateral GHG mitigation objectives, while laggards may establish and join rival climate institutions to fragment and obstruct cooperative progress on collective mitigation. The dual nature of participation in climate institutions therefore belies the expressive theory’s expectation that all memberships reflect affinity between domestic policy objectives and support for the regime’s goals.

Understanding participation in climate institutions, therefore, requires attention to two sources of dissatisfaction within multilateral climate negotiations. First, states may be dissatisfied with cooperative progress that proceeds too slowly. For these

³⁰Morse and Keohane 2014, p. 385.

³¹Raustiala and Victor 2004; Benvenisti and Downs 2007; Alter and Meunier 2009; Drezner 2013.

³²Benvenisti and Downs 2007; Shaffer and Pollack 2009; Colgan, Keohane, and van de Graaf 2012; Jupille, Mattli, and Snidal 2013; Morse and Keohane 2014; Lipsy 2017; Kellerman 2019.

states, setting up new institutions outside the UNFCCC is a means to accelerating and deepening climate cooperation. These forums are mainly problem-oriented and focused on facilitating implementation of climate-friendly policies. Institutional proliferation becomes a strategy of separating concrete topics in climate governance into standalone forums with narrower membership to allow motivated actors to pursue cooperative gains unencumbered by climate laggards.

However and second, states may also be dissatisfied with cooperative progress that proceeds too quickly. States that are unwilling to enact deeply substantive GHG mitigation policies may attempt to create new climate governance institutions that rival the authority of the UNFCCC. These institutions are more likely to be alternative negotiating and networking forums. Since the UNFCCC proceeds with consensus decision-making rules, recalcitrant states have substantial institutional power to obstruct action at the UNFCCC. Nonetheless, creating new forums may further their ends in two ways. By cultivating an appearance of engagement with climate governance, recalcitrant governments may deflect pressure from domestic, transnational, and international actors to ramp up their ambition. These alternative forums may also act as staging grounds for new norms and principles that recalcitrant actors seek to feed back into the UNFCCC negotiating process—such as, a shift towards softer forms of obligations than binding treaty-based mitigation targets.

Accordingly, participation in climate governance may be driven by two logics: one related to deepening climate governance by creating additional operative forums, and another related to fragmenting climate governance by creating additional obstructionist forums. If contested multilateralism is a more accurate description of participation decisions than the expressive theory, then representing membership in climate institutions by the sum of states' memberships will not capture how state preferences relate to participation. Dissatisfied states may participate in new multilateral institutions to accelerate multilateral cooperation, while others may participate to slow cooperation. This also implies that there are two kinds of climate institutions: those established by ambitious states seeking to accelerate climate cooperation and those established by recalcitrant states intent on minimizing their

international obligations and hindering an effective global response. An implication of this argument is that the fit between states and individual institutions matters and each type of dissatisfied state will prefer its corresponding type of institution. Deepeners and fragmenters will systematically join different climate institutions. In the next section, I develop a measure of participation that accounts for the different patterns of institutional membership of states with more ambitious climate objectives and states with less ambitious ones.

4.3 Measuring participation in climate institutions

States have created over 60 different institutions to govern climate change over the past 25 years. State membership varies tremendously across these institutions. Some states are members of many institutions, while others are members of few. However, the sum of a state's memberships may mask motivations for participating in climate governance. I argue that membership in climate governance reflects states' evaluations of cooperative progress at the UNFCCC. Following the logic of contested multilateralism, states establish non-UNFCCC institutions within climate change to shape the evolution of climate cooperation. Membership reflects efforts to accelerate and support climate cooperation versus efforts to fragment and undermine it. Measuring membership at the level of the issue-area can separate these opposing motivations. Membership at this higher level of aggregation helps separate the systematic from the idiosyncratic components of membership.

Simply summing these heterogeneous membership together will yield an uninformative measure of participation because it conflates both motivations for participating across climate institutions. Accordingly, I use a Bayesian measurement model based on item response theory (IRT) to measure participation in climate governance. The IRT model predicts whether each state will be a member of each climate institution by estimating latent parameters for states and institutions. The model takes a matrix of country-level institutional membership data and estimates a set of country-level and institution-level parameters that maximize the joint posterior likelihood of observed membership choices. Since I argue that membership

in climate institutions is driven by two motivations, I estimate a two-dimensional IRT model in an attempt to recover these two motivations from the underlying data. I use diagnostics, quantitative, and qualitative evidence below to validate the interpretation of the two dimensions.

The two dimensions of IRT outputs can be interpreted in light of the following two concepts that I consider as structuring membership decisions. First, there is a scale effect where larger countries that participate more extensively in global governance also participate more in climate governance. The first dimension is designed to isolate this relationship in the data. Along this engagement dimension, we can distinguish *joiners* who are states that join many climate institutions from *abstainers* who pass on extra-UNFCCC institutional memberships. This dimension is highly correlated with the sum of climate memberships. I demonstrate in statistical tests that this dimension should be interpreted as recovering states' general propensities to participate in global governance, writ large, rather than a more specific climate-related preference.

The second concept relates to states' efforts to support or undermine climate cooperation. I design the second dimension to measure the quality of a state's climate memberships. Along this ambition dimension, I distinguish *deepeners* at one end of the dimension from *fragmenters* at the other. Deepeners join climate institutions that specialize in capacity-building and implementing GHG mitigation policies, and states are situated along this dimension based on their membership in these types of climate institutions. Fragmenters abstain from these institutions and join more institutions focused on networking and negotiation. These latter talking shop forums do little to advance climate action.

The two IRT dimensions create a latent climate governance space in which states and climate institutions are located. Different quadrants contain the combinations of countries: joiners and abstainers, deepeners and fragmenters—though the scores are actually continuous allowing for states' relative placement. States' scores along these two dimensions summarize their membership patterns.

The key strengths of IRT modeling are that it uses the full set of states' membership decisions to score participation and that it can be used to recover dimensions from patterns of participation. It can therefore be used to evaluate my theory that membership is motivated by two kinds of dissatisfaction. The chief weakness of IRT is that it is unsupervised and produces outputs that require additional interpretation to validate. In the following sections, I first develop the model and then undertake a series of analyses to validate the interpretation of my climate ideal points as separating first joiners from states that abstain from global climate governance, and second separating deepeners from fragmenters. Below, I demonstrate that this measure effectively recovers states' evaluations of cooperative progress in climate governance.

The fundamental assumption in this measurement model is that different evaluations of climate governance will be associated with different patterns of participation in climate governance. Fortunately, this assumption can be tested empirically and allows me to validate the IRT measure. This focus on patterns of membership diverges from more naive measures, such as the sum, that only capture raw quantities. In the next chapter, I take the measure a step further and demonstrate that ideal points are a strong predictor of the ambition of countries' GHG mitigation targets in the 2015 Paris Agreement on Climate Change. I use this to show that institutional memberships separate states by type within climate governance.

4.3.1 Scaling participation using item response theory

I develop a new measure of state participation in climate governance using Bayesian item response theory (IRT), a statistical measurement model, that allows me to operationalize my argument that patterns of participation across climate governance are distinct from raw counts of membership. IRT estimates a set of (latent) state- and institution-level parameters to fit observed membership choices in a manner similar to statistical techniques for estimating other binary outcomes. The key difference is that the regressor is not observed, so IRT uses a re-sampling technique

to find approximate values of this variable. Latent variable modeling has become increasingly prominent in political science over recent years and has been applied to the study of legislative and judicial politics,³³ human rights practices,³⁴ government transparency,³⁵ and treaty ratification.³⁶ Christopher Fariss provides a particularly good overview Bayesian IRT with application to human rights.³⁷ Federica Genovese uses a different ideal point estimation technique to recover state preferences from their written submissions to the UNFCCC.³⁸

The IRT model fits a binary indicator of whether a given country (indexed $i \in 1, 2, \dots, I$) is a member of a given climate institution (indexed $j \in 1, 2, \dots, J$).³⁹ Let $y_{i,j} = 1$ if a state i is a member of institution j , and $y_{i,j} = 0$ if that state is not a member.⁴⁰ The model outputs summarize membership across 65 climate institutions by 190 countries with continuous country-level scores for climate participation. The model used in this study only measures whether a state is a member in 2015, the year the Paris Agreement was adopted. The IRT estimates are therefore a snapshot of climate governance, rather than estimates of climate participation over time. Climate finance institutions are split into a donor and a recipient side, with eligibility coded using the UNFCCC annexes.⁴¹

IRT estimates the probability that a state i is a member of a climate institution j by estimating additional, *latent*, country-level and institution-level parameters to fit the observed membership data. The country-level parameters are referred to as ideal points (x_i), and the two institution-level parameters are referred to as difficulty parameters (α_j) and discrimination parameters (β_j). The model inputs are a matrix of country-level institutional memberships, and the model outputs are a set

³³A. Martin and Quinn 2002; Clinton, Jackman, and Rivers 2004.

³⁴Fariss 2014.

³⁵Hollyer, Rosendorff, and Vreeland 2014.

³⁶Lupu 2016.

³⁷Fariss 2018.

³⁸Genovese 2014.

³⁹My exposition of the IRT model draws heavily from the expositions by Jackman 2001; Clinton, Jackman, and Rivers 2004; Lupu 2013; Armstrong et al. 2014; Hollyer, Rosendorff, and Vreeland 2014; Fariss 2018.

⁴⁰Data are coded as missing ('NA') if a state is not eligible for membership in a particular institution, such as the ratification of additional protocols for countries that have not ratified the primary framework convention, and not estimated for that country-institution pair.

⁴¹I discuss eligibility considerations in appendix C.

of country- and institution-level parameters that maximize the joint probability of the estimated parameters. The model is estimated without covariates and attempts to correctly classify membership decisions with a single set of country-level ideal points, as well as parameters for each institution. When an IRT model is estimated for more than one dimension (d , indexed $d \in 1, 2, \dots, D$), ideal points are estimated for each actor in each dimension ($x_{i,d}$) and discrimination parameters are estimated for each institution in each dimension ($\beta_{j,d}$).⁴²

A state's probability of joining a particular climate institution is given by a function linking state ideal points to that institution's difficulty and discrimination parameters mapped on to the unit probability interval,

$$Pr(y_{i,j} = 1|x_{i,d}) = \text{probit}(\alpha_j + \beta_{j,d} \times x_{i,d}) \quad (4.1)$$

In two dimensions, the model is:

$$Pr(y_{i,j} = 1|x_{i,d}) = \text{probit}(\alpha_j + \beta_{j,d=1} \times x_{i,d=1} + \beta_{j,d=2} \times x_{i,d=2}) \quad (4.2)$$

Arranged as such, the IRT model resembles the probit regression model, with the discrimination parameters being institution-specific regression coefficients ($\beta_{j,d}$), the difficulty parameter being an institution-specific intercept (α_j), and the ideal points being vectors of unit-level data ($x_{i,d}$). The Bayesian IRT model is estimated using the `pscl` package in the R computing environment.⁴³

I model states' two motivations by recovering two dimensions of states' climate preferences from their observed membership decisions.⁴⁴ I interpret these dimensions as follows, and support this interpretation with the exposition below. The first dimension scores reflect a state's general propensity to join climate institutions. Accordingly, I call states that score *high* on this dimension "joiners." The second dimension reflects states' willingness to participate in forums that accelerate climate

⁴²There is only one difficulty parameter for each institution, regardless of the number of dimensions.

⁴³Jackman 2017.

⁴⁴Multidimensional IRT models have additional identification issues compared to the ones unidimensional models face. I follow Jackman (2001) in placing constraints on the discrimination parameters of three institutions to identify the model. I discuss the choice of constraints in greater detail below.

governance by separating topics into productive standalone forums. Countries that join the most of these forums have low second dimension scores, and I therefore refer to countries that score *low* on this dimension as “deepeners.” I interpret the dimensions based on the institutions that locate countries across the two dimensions (see section 4.3.3). This is done by investigating the discrimination parameters ($\beta_{j,d}$) of climate institutions and comparing them to their stated objectives and practices. I also interpret the dimensions statistically in sections 4.4.2 and 4.4.3.

The difficulty parameter reflects how popular an institution is on average—whether it has large or small membership. The discrimination parameter reflects two things. First, the absolute values of the discrimination parameters in each dimension indicate whether one dimension is more decisive than another in predicting membership. Second, the sign of the discrimination parameters reflects whether states at high or low values of that dimension are expected to be members. Larger absolute values of the discrimination parameters indicate more confident model predictions. These parameters represent statements about climate institutions. They relate whether deepeners or fragmenters are more likely to be members, and whether an institution has broad membership or only attracts joiners. The IRT model is able to recover underlying state characteristics because many states are observed making many choices over a common set of institutions. When a pair of states join some institutions but not others, IRT estimates the unobserved state-level and institution-level characteristics that make those choices most likely. Inversely, when two states join few common institutions, the model parameters separate these states in the latent space. I plot states’ ideal points and institutions’ discrimination parameters in appendix C.

To see IRT in practice, consider membership in the Global Research Alliance on Agricultural Greenhouse Gases (GRA, 46 members). The GRA was established in 2010 to support research and capacity-building to reduce GHG emissions from agriculture, a sector that accounts for over 11% of global annual GHG emissions. The left panel of figure 4.1 plots countries’ ideal points, actual membership in the

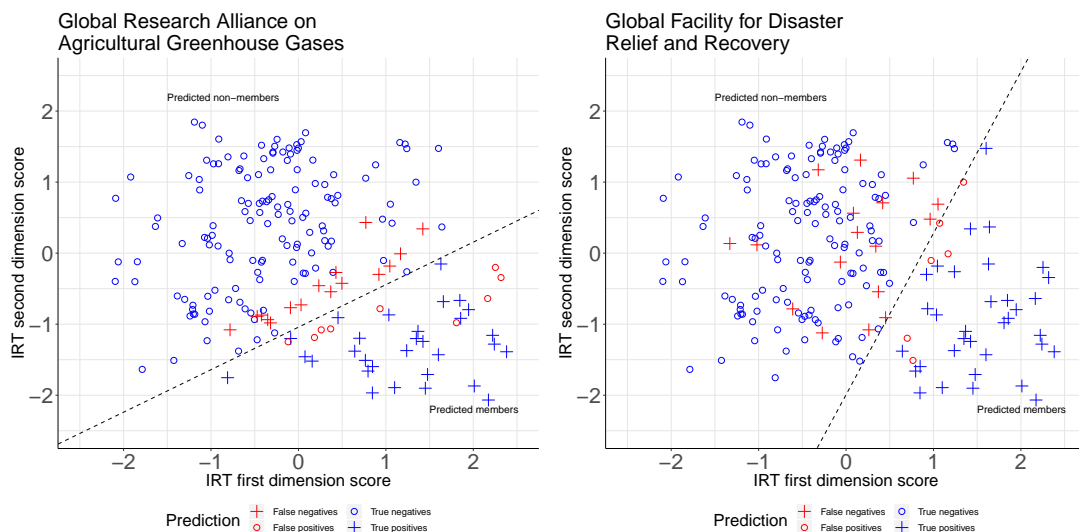


Figure 4.1: IRT membership predictions in the Global Research Alliance on Agricultural Greenhouse Gases and the Global Facility for Disaster Relief and Recovery. Plotted points represent states’ ideal points and the dashed line represents the set of coordinates where the model predicts that states are indifferent between joining and not joining ($Prob(y_{i,j} = 0.50)$). Members are denoted with plus signs (+) and non-members with an open circle (o). Correct model predictions are in blue and incorrect predictions are in red.

GRA, and the cutting line that separates predicted members from non-members.⁴⁵ The cutting line represents the set of ideal points where a country is indifferent between joining and not joining the GRA—i.e., has a predicted probability of joining equal to a half. Members are indicated by a plus sign (+) and non-members are indicated with an open circle (o). The two-dimensional model predicts membership well (86.8%). Blue markers are correctly classified membership decisions, whereas red markers are incorrect predictions. Most states are not expected to join, but the states that are expected to join score highest on the first dimension (joiners) and lowest on the second dimension (deepeners).

In the right panel of figure 4.1, I plot the predicted membership of the Global Facility for Disaster Relief and Recovery (GFDRR, 51 members). The GFDRR is an initiative managed by the World Bank that “helps developing countries better understand and reduce their vulnerability to natural hazards and climate change.”⁴⁶ The GFDRR advertises itself more on the basis of adaptation to climate impacts

⁴⁵The cutting line is represented by: $y = \alpha_j / \beta_{j,2D} - (\beta_{j,1D} / \beta_{j,2D})x$.

⁴⁶GFDRR 2017.

than on mitigation or raising ambition in climate politics. Note that the location of the ideal points are exactly the same in both plots—that is, ideal points are country-level characteristics and do not vary by institution—though the position and angle of the cutting line and the model predictions change. The angle of the cutting line is flatter for the GRA than the GFDRR, indicating that the second dimension ideal point estimates are more decisive for predicting membership in the GRA than in the GFDRR. In other words, holding constant states’ first dimension scores, deepeners are more likely to join the GRA than the GFDRR. The relative size of an institution’s discrimination parameter in each dimension determines this slope and helps us understand which dimension is more important for classifying membership decisions. The model estimates states’ probabilities of joining an institution and as such it makes both correct and incorrect predictions. Overall, this model correctly classifies 87.9% of membership outcomes in the GFDRR. Note, furthermore, that most of the prediction errors for the GRA and GFDRR occur near their cutting lines (see figure 4.1), in the area where the predictions are less confident (i.e., $Prob(y_{i,j}) \approx 0.50$).

4.3.2 Locating states in the climate governance space

We can evaluate the fit of the IRT model to the underlying theoretical concepts being measured by considering states’ ideal point estimates (this section) and the estimated institution-level parameters (section 4.3.3). A contention of the decision to model membership using IRT is that different states have different climate preferences and that these preferences are reflected in their *patterns* of institutional memberships rather than the *sum* of their climate memberships. In practice, this implies that states may have a similar raw number of memberships, yet very different patterns of memberships and accordingly very different estimated climate ideal points. To see this in practice, I compare the ideal points and climate memberships of states situated in different “quadrants” of the recovered climate governance space.

Compare first the climate memberships of Russia (16 memberships), Saudi Arabia (8) and Oman (4), plotted in figure 4.2. All three countries are large fossil

fuel producers and have high GDP per capita as a result. Russia has the most climate memberships of these three countries, but the patterns of membership across the three are indicative of how IRT scales participation. All three states by 2015 had ratified the UNFCCC and Kyoto Protocol, the two core instruments in climate governance. Nearly every state has ratified these two treaties, meaning that these two memberships have little effect on locating states' ideal points.

Russia is a member of nearly all of the institutions that Saudi Arabia and Oman are members of. In this sense, Oman and Saudi Arabia's climate memberships are nearly subsets of Russia's memberships and all three have similar membership portfolios. Saudi Arabia and Russia share 6 climate memberships, 75% of Saudi Arabia's total. These include the Carbon Sequestration Leadership Forum,⁴⁷ the Global Methane Initiative,⁴⁸ the Global Facility for Disaster Reduction and Recovery,⁴⁹ and the Petersberg Climate Dialogue.⁵⁰ The first two of these institutions are tailored forums for large oil producers that have done relatively little to advance mitigation. They advance small incremental changes that do not threaten a model of economic growth premised on capturing rents from extracting fossil fuels.

All of these institutions have statistically significant first dimension discrimination parameters, while their second dimension parameters are not statistically significant. This implies that membership in these institutions locates states at relatively high values of the first dimension scores.⁵¹ Since these states join few if any deepening institutions, their ideal points are pushed away from the deepening pole, and accordingly to high values of the second dimension. The IRT model uses membership and non-membership to situate states in the climate governance space. These high $\beta_{j,d=1}$ reflect in part that the other members of these institutions are

⁴⁷An institution established by large fossil fuel producers in 2003 to pilot CO₂ capture at fuel facilities, but that by 2015 had only 1 project in operation.

⁴⁸A similar initiative developed by the US Environmental Protection Agency under the Bush Administration capture methane emissions and develop secondary markets for methane.

⁴⁹One of the few climate institutions that focuses on adaptation to severe climate impacts and natural disasters.

⁵⁰A negotiating forum that gathers key states before the annual COP to facilitate informal dialogue.

⁵¹This is less true for Russia, since Moscow has 8 other climate memberships apart from Saudi Arabia and these institutions lower Russia's second dimension score.

some of the states with the most climate memberships—joiners. Saudi Arabia and Russia’s common memberships with these states pulls their first dimension ideal points towards those of the largest participants. The first dimension scores reflect how many institutions a state joins weighted by how often they join institutions where the members of that institution are among the most frequent participants.

Saudi Arabia and Oman—in keeping with many other Arab states—are members of the International Renewable Energy Agency (IRENA), while Russia is not. Since IRENA has a positive second dimension discrimination parameter, this leads Saudi Arabia and Oman to separate from Russia along the second dimension. While the three countries maintain many overlapping memberships, instances of diverging memberships lead the countries’ estimated ideal points to diverge as well.

Russia has a number of memberships that neither Oman nor Saudi Arabia have. These latter memberships are shared with states that are often considered to be more ambitious within climate politics, such as Germany, Norway, the UK, and France. These memberships separate Russia from Saudi Arabia and Oman to score relatively lower on the second dimension—less of a fragmenter than Saudi Arabia. Finally, Russia and Saudi Arabia maintain far fewer climate memberships than Germany, Norway, the UK and France, but both score high on the first dimension, similar to these other countries. This results from shared memberships between Russia and Saudi Arabia and Germany, Norway, the UK and France in other relatively small membership forums, such as the Petersberg Climate Dialogue, and the Global Methane Initiative, without Oman.

Now compare the previous countries with Fiji and Nepal, two developing countries with a similar number of climate memberships as Russia (13 each), but very different estimated climate ideal points. The only common climate memberships among Russia and Fiji or Nepal are the two major pre-Paris UN climate treaties, the Global Facility for Disaster Relief and Recovery (Nepal) and the Global Bioenergy Partnership, Petersberg Climate Dialogue and the pilot Activities Implemented Jointly scheme (Fiji). Aside from these, Fiji and Nepal share six common memberships, roughly half of each country’s total. As Fiji and

Nepal have a relatively average number of total memberships, but a number of common memberships, and few common memberships with Russia, their ideal points are located on a diagonal away from Russia's. Their different memberships push them away from Russia along the second dimension, to score nearer to deepeners than fragmenters.

Finally, we can compare Fiji and Nepal to a handful of high participation developing countries in Latin America: Chile (23), Colombia (25), Costa Rica (17) and Peru (19). Nearly all of Fiji and Nepal's climate memberships overlap with one of these Latin American countries. Many of these are climate finance institutions, particularly forestry-related instruments. These Latin American countries participate more on average than Fiji and Nepal, and accordingly score higher on the first dimension. The large number of common, overlapping memberships among these countries help locate their ideal points in a similar space, and their lack of overlapping memberships with Russia and Saudi Arabia push their ideal points away from Oman, Russia and Saudi Arabia and toward the bottom of the second dimension. For example, none of the Latin American countries has joined IRENA, though Fiji has. This demonstrates that no *individual* institutional membership is decisive in locating states' ideal points. Instead, countries are situated based on the extent of their memberships and their patterns of overlapping and divergent memberships compared to other countries.

4.3.3 Identifying the ideal point dimensions by constraining discrimination parameters

In this section, I discuss the choice of item constraints in my IRT model. IRT models allow users to recover a number of dimensions from observed data. Based on my theoretical argument, I expect there to be two salient dimensions of membership in climate governance: one dimension related to states' general propensity to join international institutions, and a second related to their preferences over the pace of climate cooperation. I estimate a two dimensional model that seeks to recover these two motivations for membership. Specifically, I recover a first

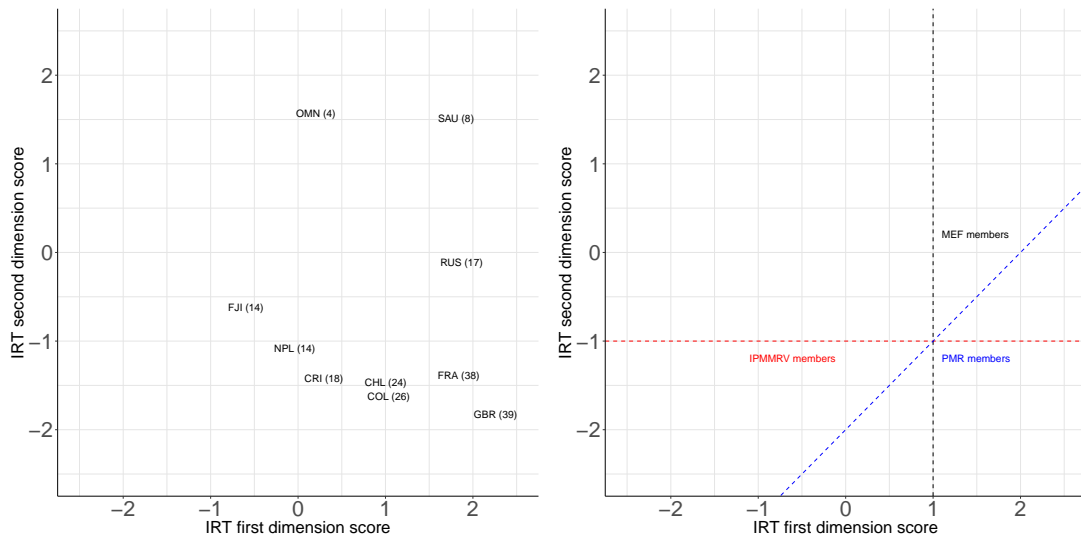


Figure 4.2: Dimensions of participation in climate governance. Left panel plots indicative countries. Right panel plots IRT model constraints. Constraints on three institutions' discrimination parameters help to structure the climate space. MEF members (to the right) are expected to score high on the first dimension score, IPMMRV members (to the bottom) are expected to score low on the second dimension score; and PMR members (bottom-right corner) are expected to score high on the first dimension and low on the second dimension. These locations match the theoretical argument about how states participate in non-UNFCCC climate institutions to support or undermine climate cooperation.

dimension that captures the extent of states' climate memberships, and a second dimension that captures states' membership in climate institutions that separate governance topics into productive standalone forums. States' recovered ideal points are coordinates representing their extensiveness of engagement in climate governance (first dimension) and their intensity of participation in high quality forums (second dimension). The two dimensions are weakly correlated with each other ($r_s = -0.22$).

IRT model parameters are not identified without constraints.⁵² In two dimensions, the correction is to supply constraints on the discrimination parameters of three institutions to orient the model. Since IRT estimates parameters using

⁵²The IRT model attempts to fit state- and institution-level parameters that maximize the joint posterior density of the observed data. Rotating or rescaling either the ideal points or item parameters produces outputs that are observationally equivalent from a likelihood perspective: the signs and scale of the values are arbitrary. Rotations of the ideal points around the origin (flipping high and low values) or multiplying the ideal points by a constant leads to the same final likelihood. Since the IRT model estimates the parameters using many iterations, it is important to keep the rotation and scale of the parameters consistent across iterations as the ideal points, difficulty and discrimination parameters shuffle around from one iteration to the next.

many iterations, the constraints ensure that the outputs (i.e., ideal points and discrimination parameters) are consistent across iterations. Following Simon Jackman,⁵³ I supply a set of restrictions on the discrimination parameters of three institutions in a two-dimensional IRT model to identify the ideal points.⁵⁴

Jackman refers to the choice of constraints as “‘reference proposals’ for specific dimensions.”⁵⁵ These item constraints operate as weak informative priors, establishing the rotation of the model, but the values chosen are not strong enough to dominate the posterior. For example, the range of the estimated discrimination parameters (see figure 4.3) is much larger than the values chosen to constrain the model. I choose item constraints theoretically, using the implications of my argument that different motivations underlie different types of institutional proliferation. Specifically, I choose constraints on three institutions to extract two dimensions from membership in climate governance. The first dimension is designed to capture states’ general propensities to participate in climate governance. The second dimension is designed to separate states seeking to deepen cooperation by separating sub-topics into standalone forums from institutions intended to obstruct cooperation by proliferating redundant forums in the climate regime. The right panel of figure 4.2 stylizes these dimensions and plots the locations of the three constrained sets of discrimination parameters. Given that testing my theoretical expectations requires separating states along these two dimensions, a defensible choice of institutional constraints that accurately orients these dimensions is important. However, I do not want the model outputs to be solely driven by these constraints. In a robustness check, I estimate the IRT model using an alternative set of institutional constraints and find that the ideal points and discrimination parameters are stable to other specifications (see appendix C). The chosen item constraints help structure the outputs, but do not strictly determine them.

⁵³Jackman 2001.

⁵⁴Users must supply $d + 1$ constraints (where constraints are understood as coordinates in D dimensions) for identification and the constrained parameters must span the D -dimensional space, for example, by forming a triangle in $d = 2$ dimensions.

⁵⁵Jackman 2001, p. 233.

Accordingly, I constrain the Partnership for Market Readiness (PMR) to have prior discrimination parameters in two dimensions equal to $\beta_d = (1, -1)$; the Major Economies Forum on Energy and Climate (MEF)'s discrimination parameters to equal $\beta_d = (1, 0)$; and the International Partnership for Mitigation and Monitoring, Reporting and Verification (IPMMRV)⁵⁶ to discrimination parameters equal to $\beta_d = (0, -1)$. All three institutions were established in the mid-years of the climate regime and have a medium number of members. With these constraints, the first dimension separates high participants from low participants. Along the second dimension, the extent of membership is only weakly related to ideal points. I demonstrate below that the second dimension identifies states that participate in climate institutions that deepen cooperation in the climate regime and distinguishes these states that join institutions intended to obstruct further cooperation.

The Partnership for Market Readiness is a climate institution created by the World Bank in 2011 to advance the implementation of domestic carbon markets. The PMR's 31 members work closely with technical experts at the World Bank and in other partnering countries to design and implement carbon pricing instruments—such as carbon taxes and emissions trading systems—in order to facilitate GHG mitigation. Members are expected to make progress toward enacting domestic carbon pricing programs, but are not explicitly held to account for these commitments. Members are among the world's largest GHG emitters, but also include ambitious countries in Europe and the developing world with smaller carbon footprints. These countries are among the world's leaders in the implementation of carbon pricing policies. Negative $\beta_{j,2D}$ constraints allows the PMR to structure the latent climate governance space with these states at low scores of the second dimension, deepeners. Since PMR countries are also among the most active participants in climate institutions, the positive $\beta_{j,1D}$ constraint pushes countries with the most climate memberships toward higher values of the first dimension score, joiners.

⁵⁶IPMMRV re-branded after the Paris Agreement was adopted as the Partnership on Transparency in the Paris Agreement. MRV refers to monitoring, reporting and verification.

The Major Economies Forum (17 members) was first established by the George W. Bush administration in 2007 as the Major Economies Meeting on Energy Security and Climate Change. The Obama administration described the forum as a means to “help generate the political leadership necessary to achieve a successful outcome” at the Copenhagen climate conference in 2009, and the Bush administration often described the MEF as a venue for “meeting outside the formal UN climate negotiations.”⁵⁷ MEF members undertake no additional obligations to reduce their GHG emissions and members focused in the institution’s early years on setting a viable long-term emissions mitigation goal. The MEF members comprised roughly 90% of annual GHG emissions flows when the institution was created, and its members remain the largest emitters and wealthiest countries. As such, the institution could have real leverage in catalyzing emissions reduction if members could agree to implement common reductions. However, the MEF has been criticized for not making full use of its potential. It has pushed for replacing “binding international commitments with voluntary pledges” to the ire of many environmental groups, and its meetings have not obviously translated into its members adopting ambitious climate policies.⁵⁸ The MEF is primarily a negotiating forum in parallel to the UN-led process. The members are also among the top participants in climate institutions. The positive $\beta_{j,1D}$ constraint helps orient the latent climate governance space with the most extensive participants on the right hand side, at high values of the first dimension. By contrast, the null $\beta_{j,2D}$ constraint implies that MEF membership has no effect on states’ second dimension scores.

The International Partnership for Mitigation and Monitoring, Reporting and Verification is in some ways the mirror image of the MEF. The IPMMRV was launched as an initiative of Germany, South Africa, and South Korea in 2010 as a forum “to promote ambitious climate action” and “practical exchanges” between developed and developing country negotiators outside the formal UNFCCC environment. One of the IPMMRV’s main goals is to improve the transparency of mitigation commitments, for example, issuing guidance on formulating INDCs ahead

⁵⁷Rucker and Eilperin 2009.

⁵⁸Greenpeace 2007.

of COP21.⁵⁹ The constraints on the second dimension discrimination parameter leads the IPMMRV to play an important role in orienting the ambition dimension—pushing states’ second dimension scores downward, labeling them as deepeners and not fragmenters. The IPMMRV has large and varied membership (96 members). As such, it necessarily encompasses a wide range of states—from high participation developed countries, to vulnerable developing countries, as well as a number of developing countries that participate in few extra-UNFCCC institutions. The IPMMRV is therefore unsuited to constraints on the first dimension, which is designed to capture a general propensity to join climate institutions. Since membership is not conditional on treaty ratification and the IPMMRV has a relatively minimal operational profile compared to other institutions, membership should be accessible for capacity-constrained states and relatively uncontroversial domestically. In an attempt to lighten sovereignty costs associated with participation, the Partnership states explicitly that it “is not a formal alliance” and state members are simply referred to as “partnering countries” rather than members or Parties.

The three sets of $\beta_{j,d}$ constraints specified in the two-dimensional model have values near the center of the distribution of estimated discrimination parameters, meaning that beyond setting the rotation of the outputs, they are not themselves a main determinant of state ideal points and the other discrimination parameters. They are selected based on my theoretical argument about the different types of climate institutions.⁶⁰ The IPMMRV and PMR have been established to build national capacity in implementing domestic climate policies, whereas the MEF is an international networking forum for political leaders detached from details about implementation. The MEF’s varied membership highlights that some subset of high participating countries are members of nearly every institution and finding a single institution that sharply separates climate leaders from climate laggards is fraught. This demonstrates a strength of the IRT model, which uses the full

⁵⁹IPMMRV 2017.

⁶⁰In the appendix, I discuss an alternative set of constraints on discrimination parameters that are taken more inductively based on countries’ actual climate memberships. The model outputs are nearly identical.

set of membership decisions at the level of the issue-area—membership decisions across over sixty institutions—to generate continuous scores for participation. It also highlights that the model will make incorrect predictions, since individual institutions do not deterministically separate deepeners from fragmenters. While existing theories argue *individual* institutions contribute to cooperative outcomes by screening states by type, I demonstrate that patterns of participation in an issue-area can also separate actors by type. This may be especially valuable in issue-areas that lack a strong focal institution capable of imposing membership costs that separate actors by type. In climate change, for example, the UNFCCC exists as a focal institution, but it does not enact high costs for membership, such as a minimum domestic carbon price, that could separate states that are serious about climate mitigation from states that are less serious. In this context, separation can emerge organically when states make membership decisions across a large number of forums.

I validate the interpretation of the second dimension as capturing efforts to deepen accelerate climate governance by analyzing the estimated second dimension discrimination parameters ($\beta_{j,d=2}$). I plot the posterior means and uncertainties of these parameters in figure 4.3. First, note that roughly half of the parameters are statistically distinguishable from zero, implying that the dimension is well identified. Each point denotes an institution's second dimension discrimination parameter estimate and the error bars denote the 95% highest posterior density interval around the estimate. Discrimination parameters that are statistically distinguishable from zero are plotted with closed points and in blue. Greater absolute values of the discrimination parameter indicate institutions that are more influential in situating ideal points along that dimension. In a sense, the discrimination parameters constitute weights, so that each institution's effect on the ideal point estimates is allowed to vary. This contrasts with a measure of participation that is simply the sum of memberships, wherein each membership has the same weight, namely one.

Second, the characteristics of institutions at either end of the dimension help us understand the determinants of state ideal points. Many of the top implementation forums have negative and statistically significant second dimension discrimination

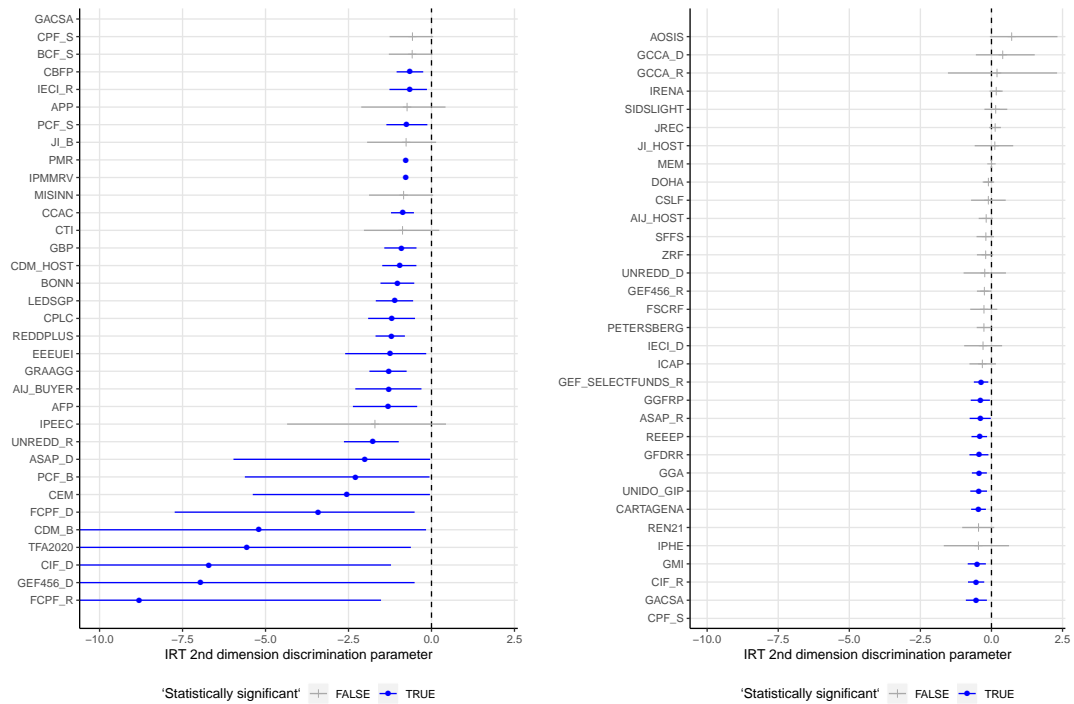


Figure 4.3: Second dimension discrimination parameters ($\beta_{j,d=2}$) and their 95% highest posterior density intervals. Discrimination parameters that are statistically distinguishable from zero are plotted with points and in blue. The institutions with the highest estimated discrimination parameters focus on implementation and capacity-building. By contrast, top negotiating forums’ discrimination parameters are not statistically significant.

parameters, indicating that states that participate in these forums have negative second dimension ideal points. This matches my theoretical expectation that ambitious states move ahead with concrete governance topics in new standalone forums when cooperative progress in universal membership multilateral forums is too slow. For example, the Climate and Clean Air Coalition (CCAC) helps members identify mitigation policies for a range of short-lived climate pollutants that are often overlooked in comparison to carbon dioxide and which provide local air quality co-benefits. The GRA, described above, also has a statistically significant and negative second dimension discrimination parameter. Climate finance institutions also cluster at low values of $\beta_{j,d=2}$, which again supports identifying the second dimension as related to implementation and capacity-building. States that want faster progress in climate governance separate concrete topics into new alternative institutions and the second dimension ideal points capture this behavior.

By contrast, negotiating forums do little if anything to structure second dimension ideal points. The second dimension discrimination parameters of the top negotiating forums (e.g., the Petersberg Climate Dialogue and the Asia-Pacific Partnership on Clean Development and Climate) all overlap with zero, meaning that they do not help locate states along the dimension. This implies that the membership of ambitious institutions that facilitate implementation diverges from the membership of institutions that fragment negotiating and networking across the climate regime. States are situated along the second dimension based on the intensity of their relative participation across implementation forums.⁶¹ This yields a continuous measure of states' participation in an important subset of climate governance forums: those that deepen climate cooperation by facilitating implementation among like-minded peers at a quicker pace than would be possible than at the UNFCCC. In the appendix, I discuss additional considerations of the IRT model, including a more detailed account of its strengths versus the sum measures of participation, eligibility for membership in climate institutions, and alternative item constraints (see appendix C).

4.4 Determinants of climate ideal points

To further interpret the IRT outputs, I study the relationships between these recovered ideal points and state-level variables that might structure states' preferences. In section 4.3, I developed the IRT model and analyzed its outputs by considering the location of states in the recovered climate governance space and the location of institutions in this space. I now conduct a more systematic assessment of the determinants of states' ideal points. I first use a set of models with no controls, regressing vectors of country characteristics on ideal points. This method, referred to as normal vector analysis, allows me to assess the extent to which each dimension is associated with values of a particular variable. I analyze the regression

⁶¹This pattern of one-sided discrimination parameters is common in the empirical literature and does not prevent the ideal points from filling the latent space. For example, Hollyer, Rosendorff, and Vreeland 2014; Copelovitch, Gandrud, and Hallerberg 2018; Fariss 2018 use IRT models and find discrimination parameters that discriminate only in one direction or which are not statistically significant.

coefficients, along with the overall fit of each model, to determine which dimension is the strongest predictor of a given country-level trait. Afterward, I use multiple regression to adjudicate which of the results from the normal vector analysis are strongest after controlling for the influence of other predictors. In the final section (section 4.5), I compare my ideal points to other measures of state preferences.

4.4.1 Data and measurement

To analyze the determinants of participation in climate institutions, I compare indicators of participation to other, known country-level variables. In practice, this involves collecting indicators of the variables outlined in section 4.2.2. Table 4.1 lists the main variables that existing studies have shown to be linked to states' climate policies. Operationalizing these variables involves tradeoffs between the precision of an indicator's fit with its underlying concept and the availability of indicators across countries and over time. I opt to measure participation as a single cross-section in 2015 and to lag the regressors to 2000 to avoid reverse causation, whereby participation affects the regressors. I use multiple imputation to address missing data.⁶²

The first set of explanatory variables are linked to arguments that some states are more likely to participate in climate governance since they prioritize climate change more highly than other states. Recall from section 4.2.2 that democratic institutions, public awareness of climate change, domestic environmental policy and vulnerability to climate change impacts should all make countries more likely to undertake active climate policies, such as extensive participation in climate governance institutions.

To measure democratic institutions, I use the combined Freedom House/imputed Polity score. Both the Freedom House and Polity IV indicators of democratic regimes are ordinal indicators ranking countries from least to most democratic. To make the combined indicator, both indicators are re-scaled to range from 0 to 10 and then averaged. Since the Freedom House indicator has greater spatial coverage, values of the Polity score are imputed for countries missing Polity scores. This

⁶²The multiple imputation is performed using *Amelia II* in the R computing environment. Honaker, King, and Blackwell 2011.

indicator is collected from the Quality of Government project's January 2019 data release.⁶³ As either the Freedom House or Polity IV indicators may have idiosyncratic tendencies and neither indicator on its own perfectly encapsulates how well national governments respond to demands from domestic publics, the combined measure should smooth out inconsistencies and help transform both ordinal measures into a more continuous measure suited to regression analysis.

To measure public awareness of climate change, I use a cross-national survey from Tien Ming Lee and his colleagues.⁶⁴ This survey was fielded to individuals in 118 countries over 2007 and 2008. It asked respondents, "How much do you know about global warming or climate change?" and respondents then placed themselves on a three-point scale ranging from "I have never heard of it," "I know something about it," and "I know a great deal about it."⁶⁵ The latter two categories were collapsed into a binary measure of "awareness." This indicator has two main problems, as mentioned above. First, it has sparse data coverage, since only 118 countries are surveyed. Second, it is only available for a single point in time: 2007–08. I use this indicator in section 4.4.2 in preliminary analyses of the relationship between country-level data and participation in climate institutions, but set it aside in subsequent analyses.

To measure domestic environmental policy, I use the Environmental Performance Index (EPI) compiled by Zachary Wendling and his colleagues at Yale University's Center for Environmental Law and Policy.⁶⁶ The EPI ranks 180 countries on over twenty indicators of domestic environmental policy and combines them into a final total ranking. An indicator of the quality of a country's climate policy is available, but is not included in the summation of final ranking. This implies that the final EPI score is not itself a product of states' climate policies. This makes it less likely that the EPI indicator is actually a possible outcome of participation in climate institutions, unless participation leads states to pursue higher quality domestic

⁶³Teorell et al. 2019.

⁶⁴Lee et al. 2015.

⁶⁵Respondents were also given the ability to answer "Don't know."

⁶⁶Wendling et al. 2018.

environmental policy generally rather than climate policy specifically. The EPI score is only available from 2007 onward, however.

I use two indicators of states' vulnerability to climate impacts. States that are more vulnerable to climate impacts may be more likely to participate in climate institutions in order to help catalyze ambitious global mitigation policies and in order to gain access to climate finance and technologies for adaptation and capacity-building purposes. Several measures of climate vulnerability are available. I rely on Notre Dame's Global Adaptation Initiative (ND-GAIN)'s country vulnerability index to measure vulnerability to climate impacts.⁶⁷ This indicator is available for over 180 countries since 1997. The vulnerability indicator is produced from a combination indicators measuring the vulnerability of food, water, health, and other sectors.

I also consider an econometrically-derived indicators of climate change impacts. I use Marshall Burke and his co-authors' measure of the economic impacts of climate change. This indicator measures the effect of moderate GHG emissions growth on national GDP per capita growth by 2050.⁶⁸ This figure is computed by estimating the historical response of annual GDP per capita growth to within-country annual temperature shocks and extrapolating to 2050 under a projected global GHG emissions growth scenario.⁶⁹

Electricity generation from renewable sources measures the share of electricity generated from renewable sources as a percentage of total national electricity generation.⁷⁰ Nuclear power is not considered a renewable source in this series. The direction of the relationship between renewable energy production and active climate policy is ambiguous *ex ante*. States with a higher share of renewable energy in domestic electricity generation may have lower reliance on fossil fuels for national energy security, but may also have higher relative costs of GHG

⁶⁷Notre Dame Global Adaptation Initiative 2018.

⁶⁸Burke, M. Davis, and Diffenbaugh 2018.

⁶⁹Specifically, this indicator is developed assuming the "Representative Concentration Pathway (RCP) 4.5," a standardized emissions scenario used by comparative climate modeling projects that assumes annual GHG emissions stabilize near their current level through mid-century. The economic effects of climate change could be modeled using other emissions scenarios, but for simplicity, Burke et al.'s main specification is evaluated here.

⁷⁰World Bank 2018.

emissions mitigation, since decarbonizing the energy sector will not have high leverage on domestic emissions.

The second set of explanatory variables are linked to arguments that some states are less likely to participate in climate governance since they do not prioritize climate change highly among other issues. In section 4.2.2 I outlined that high reliance on fossil fuels domestically, either for government revenue, for electricity generation, or simply GHG emissions should all make countries less likely to undertake active climate policies, such as extensive participation in climate governance institutions, since they have a greater stake in the high emissions status quo.

To measure greenhouse gas emissions, I use national historical GHG emissions data from the Potsdam Institute for Climate Impact Research (PRIMAP).⁷¹ Another time-series is available from the World Resources Institute, but the benefit of the PRIMAP GHG data is that my main dependent variable in the next chapter is measured using the same PRIMAP time-series. National GHG emissions are highly skewed by large emitters, so I use the natural logarithm of the variable.

To measure fossil fuel rents, I sum annual domestic oil, gas and coal rents taken from the World Development Indicators.⁷² Rents reflect the difference between the total cost of producing a unit of fossil fuel and the value of the fuel at market. Rents per unit of fossil fuel are multiplied by the amount of fuel produced and finally divided by the sum of GDP to give fossil rents as a share of GDP. Fossil fuel rents have a highly skewed cross-national distribution, as many countries do not produce fossil fuels any fossil fuels, while fossil fuels account for sometimes upwards of 80% of GDP in other countries. I use the natural logarithm of the indicator in regression analyses to minimize the effect of extreme values on predictions, after transforming the variable by a constant to prevent negative values.

Just as high domestic fossil fuel consumption may dissuade states from participating extensively in climate institutions, air pollution from high consumption of fossil fuels may drive domestic pressures for GHG mitigation. I test a measure of domestic air quality to see whether this channel of accountability holds. Specifically,

⁷¹Gutschow et al. 2017.

⁷²World Bank 2018.

I use a population-weighted measure of fine suspended particle concentrations (PM2.5) from the World Development Indicators.⁷³

A final set of variables may make states more likely to join international institutions in general. The most direct measures of a state's propensity to join international institutions are two measures of membership in international institutions. First, I examine state membership in formal international organizations (IOs) using data from the Correlates of War Intergovernmental Organizations dataset.⁷⁴ This is the most commonly used dataset for membership in IOs, however, it measures a very specific type of IOs, namely those that are founded with legally binding treaties. Given that the majority of climate institutions are founded in soft international law, this measure will poorly reflect states' underlying propensity to join institutions to the extent that the level of formality conditions state membership.

Second, I create a new indicator of participation in global environmental politics using Ronald Mitchell's database of international environmental agreements.⁷⁵ Mitchell's database records state ratification of over 1,300 multilateral environmental agreements. I merge country-level ratification records and drop bilateral agreements, amendments, and annexes to create a new indicator of state ratification of international environmental agreements. This indicator provides a more tailored measure of the extent to which states choose to govern transboundary environmental externalities using international law. States use treaties to govern transboundary pollution problems, but also to manage shared waterways, joint fisheries, trade in species, and other environmental problems besides climate change. As above, to the extent that the level of an instrument's legality conditions state participation in international institutions, this indicator may be a biased measure of states' underlying propensity to participate in global environmental politics, as some states may have been willing to participate at lower levels of formality, but abstain from ratifying binding instruments of international law.

⁷³World Bank 2018.

⁷⁴Pevehouse, Nordstrom, and Warnke 2004.

⁷⁵Mitchell 2018.

Variable	Obs.	Mean	St. Dev.	Min.	Max.
Sum of climate memberships	190	11.85	8.18	3	43
Share of climate memberships	190	21.37	14.00	5.50	71.70
IRT 1D: joiners	190	-0.01	0.99	-2.10	2.38
IRT 2D: deepeners/fragmenters	190	0.01	1.00	-2.07	1.84
Burke et al. (2018) climate damages	163	3.52	6.80	-23.59	13.00
COW IO memberships	186	60.03	21.20	12.00	126.00
Domestic environmental NGOs	134	4.99	7.01	0.00	46.00
Environmental Performance Index†	178	64.70	15.57	27.42	90.94
Fossil fuel rents (as share of GDP, logged)	172	0.76	1.19	0.00	4.26
Freedom House-Polity combined score	185	6.40	3.15	0.00	10.00
GDP (market rates, logged)	182	23.72	2.39	17.18	30.17
GDP per capita (market rates, logged)	182	8.27	1.55	5.28	11.84
GHG emissions (ex. LULUCF, logged)	190	9.86	2.42	2.22	15.80
IEA ratifications	186	36.35	24.28	0.00	132.00
PM2.5 exposure (population weighted)	182	30.79	21.35	4.37	128.91
Population (logged)	189	15.37	2.20	9.15	20.96
Public awareness of climate change†	118	63.71	22.64	20.62	98.92
Renewable electricity share	189	30.98	35.10	0.00	100.00
Trade openness	167	82.61	47.78	1.17	366.07
Vulnerability to climate impacts	180	46.05	9.88	27.64	70.83

Table 4.2: Summary statistics for membership regressions. Membership is measured in 2015. All other variables are measured in 2000, except for EPI and awareness, which are only available from 2007. The Burke et al. measure is time-invariant. Missing data is addressed with multiple imputation.

National GDP is likely associated with membership for reasons explained in section 4.2.2. I take measures of GDP at market rates and constant 2010 US dollars, as well as GDP per capita at purchasing power parity. These two variables are highly skewed by large economies and wealthy countries, so I use the natural logarithm of the variable. I also include a measure of trade openness, operationalized as national imports and exports as a share of GDP. Since states that are more economically open may be more vulnerable to disruptions to the global economy, these states may be more active participants in global governance to ensure their interests are represented in global forums. This may lead states with high levels of economic openness to participate in international institutions across issue-areas. These measures are taken from the World Development Indicators.⁷⁶

⁷⁶World Bank 2018.

4.4.2 Normal vector analysis

I now interpret the recovered climate governance space using normal vector analysis. Normal vectors assess the association between ideal points and known country-level data. In this application, normal vector analysis is similar to probing a series of bivariate regressions, except in this case I use two regressors: the ideal points in both dimensions. I use ideal points to predict country-level traits, though I am not claiming that climate participation causes levels of these traits. The estimated associations between the variables provide an indication of which measures are the most closely related to participation. I follow Lupu in predicting country-level data (e.g., GDP, IO memberships, etc.) as a function of ideal points in two dimensions.⁷⁷ I estimate the following ordinary least squares (OLS) model,

$$x_i = \alpha + \beta_1 D_{1,i} + \beta_2 D_{2,i} + \epsilon_i \quad (4.3)$$

where x_i are vectors of country-level data, $D_{1,i}$ is the vector of countries' first dimension ideal points, and $D_{2,i}$ is the vector of countries' second dimension ideal points. The ratio of the two coefficients indicates whether the first or the second dimension scores are more strongly associated with a particular country-level trait. Since the ideal point scores have the same scale, the absolute size of the regression coefficients for each dimension determine which dimension is the stronger predictor. Country characteristics are measured in 2000, where available, to avoid post-treatment bias, since participation in climate institutions over time could have an effect on the values of the variables being predicted. For example, changes in GHG emissions could be a function of participation in climate institutions.

Each regression model—each prediction of country-level characteristics (x_i) using climate ideal points ($D_{1,i}$ and $D_{2,i}$)—can be summarized by a normal vector that measures the strength of the association between each dimension of the ideal points and the country-level characteristic. The normal vector is a line through the origin (0,0) and another point (x', y' , derived below) whose slope indicates the extent to which that parameter is associated with either dimension. Each country-level

⁷⁷Lupu 2016.

Variable	Coef. D_1	Coef. D_2	R^2	Obs.	Slope
GDP (market rates, logged)	1.79	-0.58	0.69	181	-0.32
GHG emissions (ex. LULUCF, logged)	1.56	-0.68	0.56	189	-0.43
COW IO memberships	9.87	-9.59	0.50	185	-0.97
IEA ratifications	14.72	-6.79	0.50	185	-0.46
Population (logged)	0.99	-0.95	0.47	188	-0.96
Vulnerability to climate impacts	-0.06	-0.02	0.38	179	0.24
Domestic environmental NGOs	2.77	-2.58	0.33	133	-0.93
Environmental Performance Index†	8.68	1.49	0.30	177	0.17
Public awareness of climate change†	12.82	1.16	0.29	117	0.09
GDP per capita (market rates, logged)	0.81	0.36	0.26	181	0.45
Burke et al. (2018) climate damages*	-2.85	-0.56	0.16	162	0.20
Renewable electricity share	-6.06	-13.76	0.14	188	2.27
Trade openness	-6.20	8.08	0.04	166	-1.30
Freedom House-Polity combined score	0.66	-0.09	0.04	184	-0.13
Fossil fuel rents (as share of GDP, logged)	0.18	0.18	0.03	171	0.95
PM2.5 exposure (population weighted)	-2.51	0.08	0.00	181	-0.03

Table 4.3: Normal vector analysis of climate ideal points. Positive coefficients on the first dimension associated with joiners and the extent of climate memberships. Positive coefficients on the second dimension associated with fragmenters and negative coefficients on the second dimension associated with deepeners. Summary statistics are provided in table 4.2 and variable descriptions are provided in section 4.4.1.

variable is therefore summarized by a new slope, derived from the OLS outputs that compares the magnitude of the regression coefficients for each ideal point dimension. Slopes that run nearer to parallel to either dimension indicate that a dimension is highly associated with that particular variable. The x' and y' coordinates are obtained as a ratio of the regression coefficients for each dimension,

$$x' = \frac{\beta_1}{\sqrt{\beta_1^2 + \beta_2^2}}, \quad y' = \frac{\beta_2}{\sqrt{\beta_1^2 + \beta_2^2}} \quad (4.4)$$

The slope (m) of the normal vector can then be obtained by taking: y'/x' .⁷⁸ Normal vectors with steeper slopes separate countries with high and low values of the variable along the second dimension; flatter slopes, higher and lower values of the variable along the first dimension.

Table 4.3 presents the model outputs and normal vectors for country-level indicators of variables outlined in the previous section and taken from expectations

⁷⁸The general formula for a slope in Euclidean space is $m = y_2 - y_1/x_2 - x_1$, however, since the path of the normal vector connects to the origin, we can substitute x_1 and y_1 for 0 and obtain $m = y_2/x_2$.

in the literature. The R^2 statistic provides an indication of how much variation in the observed country data is predicted by the ideal points. Overall, the normal vectors show that participation in climate institutions has the strongest links to economic size and the extent of prior participation in global governance. Smaller, but still substantial, relationships exist between more specifically climate-related variables, such as vulnerability and environmental NGOs.

The strongest association is between ideal points and national GDP and GHG emissions. GDP and GHG emissions are themselves highly correlated, so the common relationship with ideal points is not surprising. The normal vector analysis suggests that countries with high GDP or high GHG emissions are more likely to score high on the first dimension than low on the first dimension. By contrast, the second dimension is less strongly associated with GDP, as indicated by the relative size of the coefficients—the coefficient on the first dimension score is roughly three times the size of that on the second dimension score. This indicates that the slope of the normal vector for GDP is relatively flat, with more of the variation in GDP being associated with changes in the first dimension score than the second dimension score (see figure 4.4). Studies have shown GDP to be a strong predictor of membership in international institutions, and the strong association between climate memberships and GDP here supports this finding. However, population is also well predicted by ideal points. This suggests that participation may be well characterized by country size, though the ideal point coefficients are of roughly equal size indicating that neither dimension is more strongly associated with population than the other.

The sum of IO memberships and IEA ratifications are also well predicted by ideal points. Since climate institutions are international institutions, it is not surprising to see such an association in the data. The ratio of the IEA coefficients implies that countries that ratify more IEAs are more likely to score high on the first dimension and slightly negative on the second dimension than states that ratify few IEAs (see figure 4.4). This is without controlling for any other variables that might covary with both IEA ratification and climate ideal points, such as GDP.

More climate specific variables are also well predicted by ideal points in the normal vector analysis, though the model fit statistics are lower than for GDP and IEAs. States that are more vulnerable to climate impacts are expected to score lower on both dimensions, and this result is consistent across both operationalizations of vulnerability. The normal vectors suggest states with more domestic environmental NGOs are likely to score high on the first dimension and low on the second. Both coefficients are relatively equal in size implying that both are strongly associated with the presence of environmental NGOs. States' electricity generation from renewable sources is also associated with patterns of ideal points. Here, the coefficient for the second dimension score is over twice the size of that of the first dimension score indicating a much steeper slope through the recovered climate governance space. Countries that generate more of their electricity from renewable sources are more likely to have low second dimension scores than high second dimension scores. I find little evidence that trade openness, democratic institutions, air pollution or, surprisingly, fossil fuel rents are strongly associated with patterns of climate memberships as indicated by their low R^2 statistics.

Figure 4.4 plots the normal vectors for six of the variables in table 4.3. Line thicknesses are weighted by the R^2 statistic from the OLS model. We see that the slopes for IEA ratification (blue) and GDP (black) are very similar and near horizontal. The slope for vulnerability (red) is similar, but in the opposite direction. The slopes for NGOs (orange), fossil fuel rents (brown) and renewable energy (green) are much steeper, indicating that the second dimension ideal points are stronger predictors in these regressions. Normal vectors near the $y = x$ and $y = -x$ lines indicate that both dimensions are roughly as important in the prediction.

Of course, most of the variables in table 4.3 and figure 4.4 are themselves highly correlated. Normal vectors cluster together when the underlying variables are themselves correlated. Normal vector analysis on its own cannot determine the independent effect of any of these variables in structuring patterns of climate memberships. I turn to assess the relative importance of these variables in section 4.4.3.

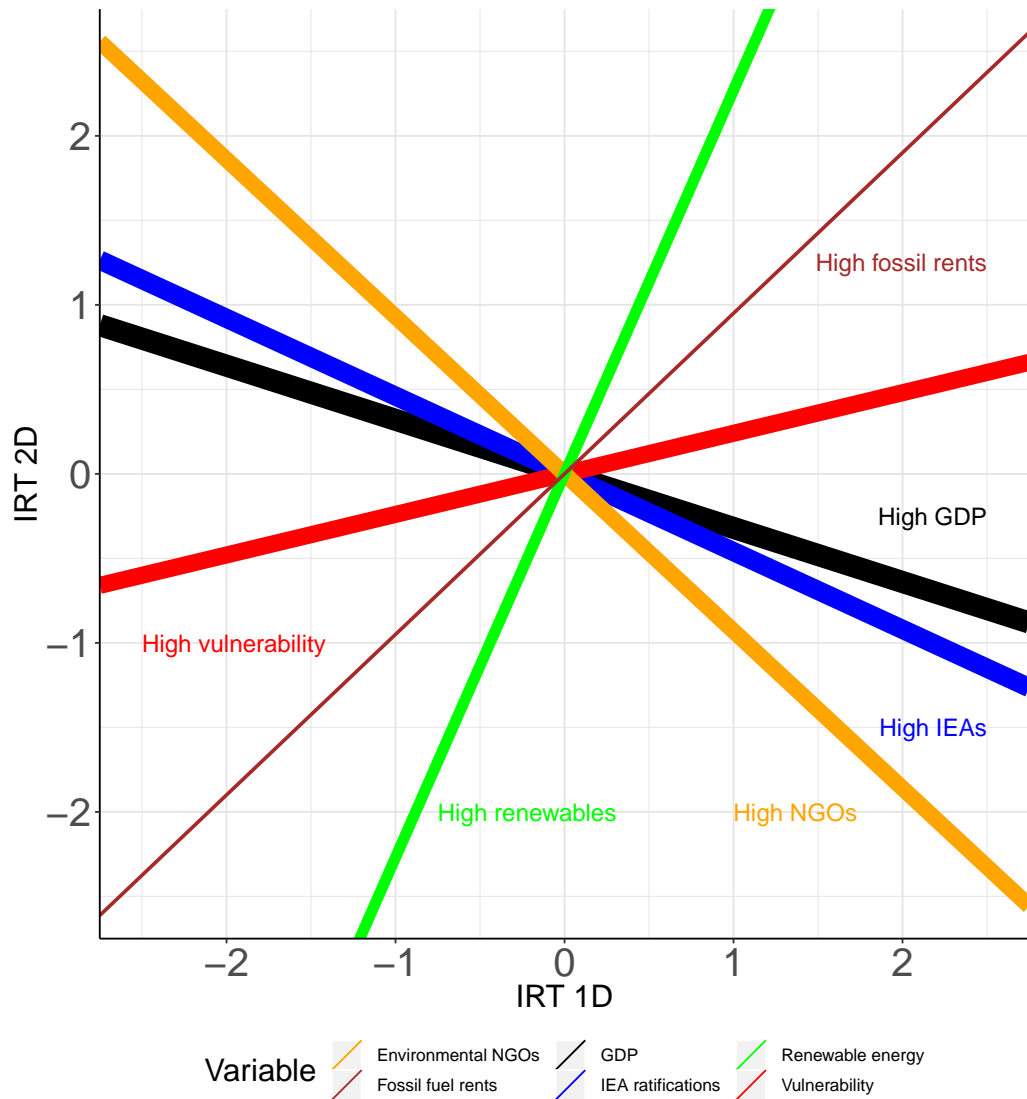


Figure 4.4: Indicative normal vectors. Line widths are proportional to the model R^2 , so variables that are better predicted appear thicker. Starting clockwise, the variables are: renewable electricity, fossil fuel rents, climate vulnerability, GDP, IEA ratifications, and environmental NGOs.

4.4.3 Multivariate analysis

Normal vector analysis allows us to study the extent to which states' climate ideal points are related to individual country-level characteristics, but they are not able to account for inter-relationships among country-level characteristics that jointly determine state participation in climate governance. I now assess a set of multivariate regression models to estimate the relationship between country-level variables and states' participation in climate governance. I estimate the following

model, substituting each measure of participation ($k \in \{\text{sum, share, IRT 1D, IRT 2D}\}$) as the outcome variable:

$$\begin{aligned} \text{Participation}_i^k = & \alpha + \beta_1 \text{NGOs}_i + \beta_2 \text{IEAs}_i + \beta_3 \text{Renewables}_i + \\ & \beta_4 \text{Vulnerability}_i + \beta_5 \text{EnvironmentalPerformance}_i + \beta_6 \text{Democracy}_i + \\ & \beta_7 \ln(\text{FossilFuelRents}_i) + \beta_8 \ln(\text{GDP}_i) + \epsilon_i \end{aligned} \quad (4.5)$$

where i indexes states. Fossil fuel rents and GDP are measured using their natural logarithms. The estimation is a single cross-section with participation measured in 2015 and the regressors measured in 2000 to preclude reverse causation where participation in climate institutions causes changes in the levels of the regressors.

The regressors are chosen from the normal vector analysis in section 4.4.2 and based on findings from the literature mentioned in section 4.2.2. Recall that the expressive theory argues states will join institutions they have affinity toward and refrain from joining institutions whose goals diverge from their own. In section 4.2.3, I argue that this perspective will poorly account for observed membership choices to the extent that participation decisions in climate governance are also determined by dissatisfaction with the pace of cooperation at the UNFCCC. States that wish to accelerate the pace of climate governance will join different types of climate institutions than states that wish to obstruct further collective mitigation objectives. If laggards and deepeners are joining different subsets of institutions, then simply counting the extent of their memberships will say little about states' underlying cooperative preferences. Both types of states may join in general, though I expect them to have different membership patterns.

I estimate the relationship between country characteristics and participation using three different measures of participation as my outcome variable (see table 4.4). In models I and II, I use the two-dimensional ideal point estimates developed in section 4.3. I then evaluate the sum and share of climate memberships. The extent to which regression coefficients in the models with ideal points diverge from the coefficients in models where all memberships are weighted equally (i.e., models III and IV, sum and share, respectively) provide support for using the IRT model to measure participation.

	I IRT 1D	II IRT 2D	III Sum	IV Share
Domestic environmental NGOs	0.001 (0.009)	-0.024* (0.011)	0.267** (0.074)	0.474** (0.129)
IEA ratifications	0.006 (0.003)	-0.014** (0.004)	0.176** (0.029)	0.258** (0.052)
Renewable electricity	-0.001 (0.001)	-0.008** (0.002)	0.016 (0.011)	0.030 (0.019)
Vulnerability to climate impacts	-0.002 (0.010)	-0.046* (0.012)	0.194* (0.084)	0.366* (0.147)
Environmental Performance Index	0.005 (0.006)	0.000 (0.007)	-0.020 (0.048)	-0.020 (0.085)
Democratic institutions	-0.002 (0.020)	-0.007 (0.024)	0.243 (0.172)	0.497 (0.300)
Fossil fuel rents (logged)	-0.054 (0.046)	0.085 (0.057)	-0.007 (0.402)	-0.034 (0.701)
GDP (logged)	0.289** (0.034)	-0.212** (0.047)	0.898** (0.288)	1.873** (0.503)
IRT 1D score		0.184* (0.092)		
IRT 2D score	0.121* (0.061)			
(Intercept)	-7.196** (1.265)	7.952** (1.570)	-26.340* (10.288)	-53.507* (17.978)
Observations	190	190	190	190
Adjusted R^2	0.65	0.49	0.61	0.59

Table 4.4: OLS models predicting participation in climate institutions. Models I and II use the IRT ideal points as the outcome variables; model III uses the sum of climate memberships; model IV uses the share of climate memberships. Summary statistics are provided in table 4.2. Missing data accounted for using multiple imputation. Standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$

I first interpret the ideal point specifications. In model I, GDP is the only statistically significant predictor of states' first dimension scores, yet the R^2 statistic is very high (0.65). States with large GDP have been shown to participate more extensively in international institutions generally.⁷⁹ By contrast, the extent of states' ratification of international environmental agreements (IEAs) is not a statistically

⁷⁹Mansfield and Pevehouse 2006; Simmons 2009; Lupu 2016.

significant predictor of states' first dimension ideal points, though IEA ratifications do predict second dimension scores. This strong separation of GDP from other regressors supports identifying the first dimension as capturing features related to states' general underlying tendency to participate in international institutions. The first dimension separates joiners from abstainers. States' structural positions with respect to climate change specifically are relatively unimportant determinants to the extent of their participation, measured using the first dimension ideal point scores.

By contrast, in model II states' second dimension scores are well predicted by climate-specific variables. States with more domestic environmental NGOs have lower second dimension scores than states with fewer domestic environmental NGOs—they are deepeners. Similarly, states that have ratified more IEAs are more likely to be deepeners than states that have ratified fewer IEAs. States that produce more of their electricity from renewable sources, and states that are more vulnerable to climate impacts all score lower on the second dimension than their peers that rely more on fossil fuels for electricity generation or that are less vulnerable to a changing climate. These results are all statistically significant at the $p < 0.05$ level. I find no relationship between states' participation in climate institutions and their domestic environmental performance, democratic institutions, or fossil fuel rents. These variables were only weakly predicted in the normal vector analysis (table 4.3). The consistency in the direction of the climate-specific variables is strong support for identifying the second dimension as capturing states' substantive preferences over the depth of international climate cooperation.

With these two dimensions, the ideal points help parse states' general propensities to participate in international institutions (their first dimension scores) from their more climate-specific motivations (their second dimension scores). States' sum or share of climate memberships conflate these two motivations for joining climate institutions. In models III and IV, the extent of participation in climate institutions is well predicted by GDP, but also by the climate-specific variables that predict ideal points. The similarity in the direction and statistical significance of the regression coefficients across models II and III suggests that the composition of

climate institutions is tilted toward implementation and capacity-building forums. Recall from 4.3 that the sum of a state's climate memberships may provide an accurate proxy for state preferences when the number of climate institutions of each type (capacity-building versus negotiation forums) is heavily tilted to one side (i.e., there are many more capacity-building institutions than non-UNFCCC negotiation forums). The added value of the ideal points is that they provide a summary of states' preferences for quicker or slower climate cooperation, while being less sensitive to how states' general propensities to participate in international institutions generally may make associations between the extent of membership spurious.

4.5 Criterion-related validity of climate ideal points

Beyond general impressions that international climate politics are structured by preference heterogeneity, scholars lack good measures of the affinity between states. In this section, I illustrate how my new climate ideal points from membership in climate institutions compare to other existing measures of preferences in climate change and international politics. The advantages of IRT are that it provides a principled way of measuring participation in climate institutions and is available for all states. Other measures of state preferences are either available only for a (non-random) subset of states or are not direct measures of climate preferences. This is not to critique the merits of existing indicators, but rather to say they complicate comparisons. Future work could consider more carefully the determinants of affinity between states in climate politics using my climate ideal points, along with this broader set of companion measures.

I interpret the relationship between my climate ideal points and other existing measures to help specify the content of my two dimensions. Criterion-related validity refers to the extent to which a proposed measure relates to other indicators that measure similar concepts. The relationship between the first dimension scores (joiners) and more general indicators of states' international, but not climate-specific preferences, supports my identification of the first dimension. Specifically, the first dimension is more strongly associated with measures of state preferences

derived from general international treaties and voting at the United Nations than it is with other climate measures. By contrast, the second dimension departs from these measures. My climate ideal points are similar to existing measures of states' climate preferences, but depart in meaningful ways that make them more appropriate measures for this study. They parse the component of state membership in climate institutions that relates to general pro-global governance preferences from climate-specific preferences.

4.5.1 Comparison across measures of climate preferences

A. UNFCCC negotiating groups

UNFCCC negotiations are structured, in part, by negotiating groups.⁸⁰ These constitute enduring networks, where states with similar stated perspectives on or challenges stemming from climate change meet to coordinate their negotiating strategies at the COPs. Negotiating groups are predominantly regionally-based (e.g., the African Group, various Latin American groups), but many span different geographic regions to gather states with similar structural situations with respect to climate change (e.g., the Landlocked Developing Countries Group). Negotiating group memberships are not mutually exclusive and nearly all date from the early years of the UN climate regime. The negotiating groups also play a role in disseminating information across members, since UN climate negotiations involve many parallel sessions, and small and resource-constrained states may have difficulty placing representatives in every meeting.

These negotiating groups are a natural point of comparison for ideal point measures of preference affinity. Since negotiating groups are formed by states that, at least at some level, share common interests and since they constitute one of the most structured and repetitive forums for state interaction, we may expect negotiating

⁸⁰The negotiating groups are: the African Group of Negotiators; Arab States; Independent Alliance of Latin America and the Caribbean (AILAC); Association of Small Island States (AOSIS); BASIC Group; Bolivarian Alliance for the Peoples of our America (ALBA); Central Asia, Caucasus, Albania and Moldova (CACAM); Coalition for Rainforest Nations; Environmental Integrity Group; European Union; Group of 77 plus China; Landlocked developing countries; Like-minded developing countries; Organization of Petroleum Exporting Countries; and Umbrella Group. Groups are listed in the order they appear in figure 4.6.

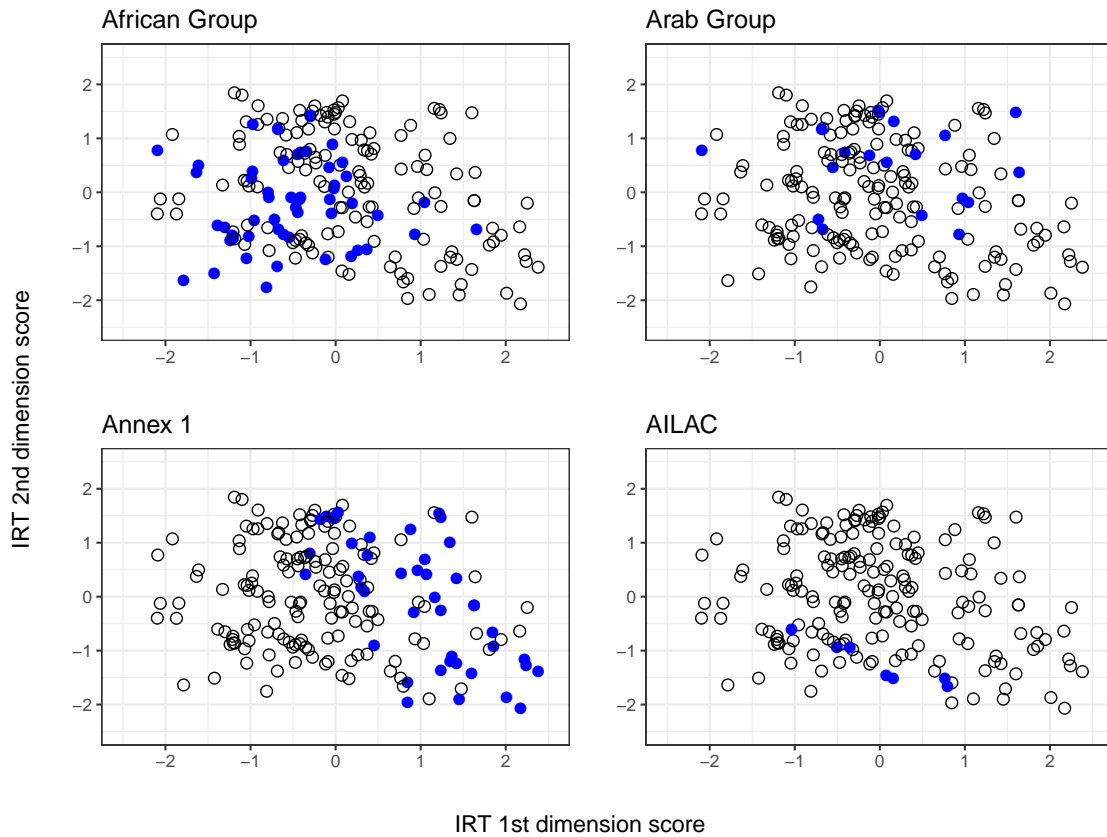


Figure 4.5: Ideal points and UNFCCC negotiating groups. All states' ideal points are plotted, with members of a negotiating group shown with closed blue circles. The four chosen negotiating groups are indicative of the kind of variation in ideal points across negotiating groups. Some are more tightly clustered (e.g., AILAC), while others are more dispersed (e.g., African Group). Note in the Annex 1 and AILAC panels that negotiating group membership correlates with ideal points, but only along one dimension (1st and 2nd, respectively).

group membership to structure states' participation in climate institutions, and thus their ideal points. Figure 4.5 plots ideal points across four negotiating groups.⁸¹ Closed points represent members and open points depict non-members. Across all four plots, we see some similarities in ideal point estimates—note the clustering of the African Group at low values of the first dimension scores and the Independent Association of Latin America and the Caribbean (AILAC) countries at low values of the second dimension scores—but also substantial heterogeneity. States' climate memberships are not strictly determined by their negotiating groups, and instead, the negotiating groups mask meaningful heterogeneity across states.

⁸¹Technically, Annex 1 is not a negotiating group, but it is provided here for comparison.

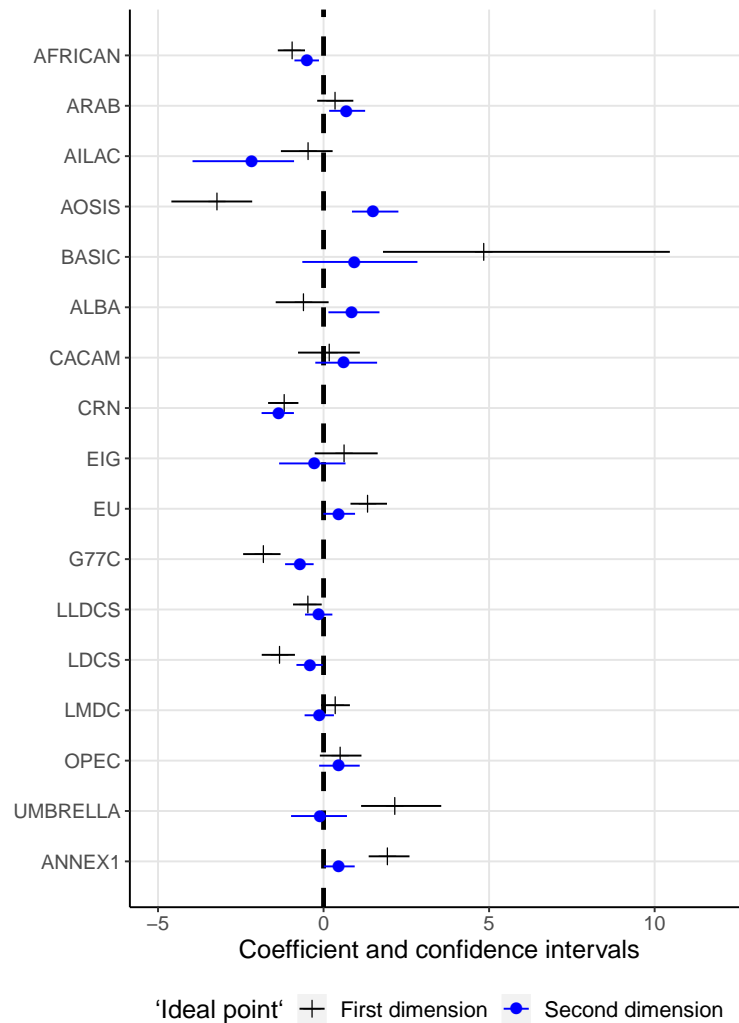


Figure 4.6: Relationship between UNFCCC negotiating groups and participation in climate institutions. Plot markers represent coefficients from logistic regression predicting membership in a UNFCCC negotiating group on the basis of states’ estimated climate ideal points. Bars denote 95% confidence intervals. Ideal points are inconsistent predictors of negotiating groups. This suggests that participation in climate institutions is not a mere reflection of existing climate alliances and cleavages, and instead these institutions convoke new constellations of states.

Figure 4.5 indicates some similarity in ideal points across negotiating groups, but also substantial heterogeneity. Figure 4.6 provides a more systematic comparison of the relationship between negotiating groups and ideal points. It reports the binary logistic regression coefficients for models predicting negotiating group membership using the climate ideal points.⁸² Coefficients whose 95% confidence intervals do

⁸²Regression models are estimated separately for each negotiating group ($g \in 1, \dots, G$). The model is: $Pr(NegotiatingGroup_i^g = 1) = \text{logit}^{-1}(\alpha + \beta_1 D_{1,i} + \beta_2 D_{2,i} + \epsilon_i)$.

not overlap zero are statistically significant at the $p < 0.05$ level. The regression outputs show that negotiating groups are unevenly associated with ideal points. In some cases, such as the African Group, the Association of Small Island States, and the Group of 77, both dimension scores are strong predictors of membership. However, it is also often the case that only one dimension predicts membership. Consider AILAC and the Arab Group, where the second dimension scores are strong predictors of membership. Arab Group states score higher along the second dimension, situating these states as fragmenters, while AILAC states score lower on the second dimension, situating these states as deepeners. These results have face validity, given that the oil-producing Arab states are often depicted as laggards, while the eco-friendly Latin American states are depicted as leaders.

B. Genovese ideal points from National Communications to the UNFCCC

Federica Genovese provides the first statistical estimate of states' climate ideal points from states' written submissions to the UNFCCC.⁸³ Under the Framework Convention on Climate Change, countries are obligated to submit written reports that outline their national circumstances and policy responses to climate change. These "National Communications" describe national GHG emissions, policies undertaken to meet their obligations under the Convention, as well as information about vulnerabilities to climate impacts and requests for financial and technology transfers. Genovese undertakes both a qualitative (i.e., hand-coded) and a quantitative (i.e., Wordfish) analysis of the content of these documents to generate two unidimensional estimates of state ideal points in climate governance. States are positioned in these models based on the distribution of different words in each country's texts, with certain words being associated with different types of states. States that draw attention to similar topics within climate change cluster together with more similar ideal points, while states that discuss divergent topics have ideal points further apart.

The Spearman correlation between Genovese's factor scores (qualitative coding) and Wordfish scores (quantitative coding) and my IRT estimates is moderate. The

⁸³Genovese 2014.

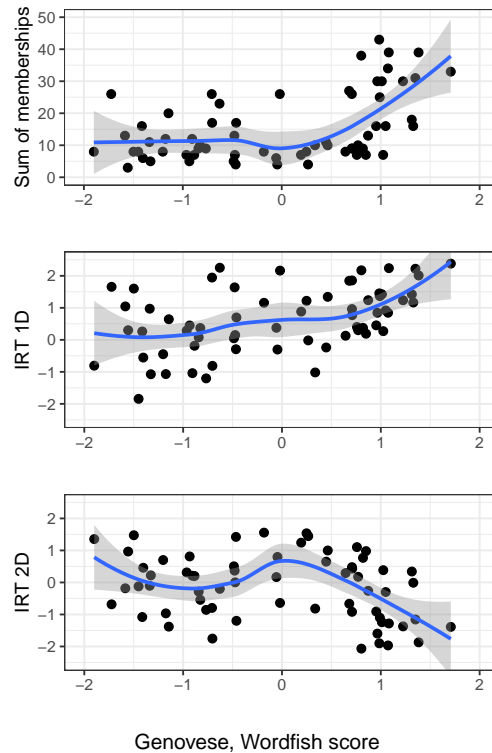


Figure 4.7: Relationship between Genovese ideal points and participation in climate institutions

first dimension scores are correlated with the qualitative scores at $r_{s,1D} = 0.38$ and with the quantitative scores at $r_{s,1D} = 0.44$; while the second dimension scores are correlated with the qualitative scores at $r_{s,2D} = -0.12$ and with the quantitative scores at $r_{s,2D} = -0.31$. Figure 4.7 plots these two sets of ideal points.

These divergent ideal point estimates may stem from two, non-exclusive explanations. First, states may be speaking to different audiences and trying to satisfy different constituencies with their membership decisions (IRT scores) and their written submissions to the UNFCCC (Genovese scores). Genovese interprets her recovered dimensions as structuring contestation over the bindingness of international commitments under UN climate treaties versus historical responsibility for climate change and the imperative of aid flows to facilitate mitigation and adaptation in developing countries. In this respect, Genovese's scores recover one of the most salient distinctions that observers have noted in climate politics, and one that broadly maps onto the stated policy positions of the Umbrella Group of developed countries in opposition to the Group of 77 developing country negotiating

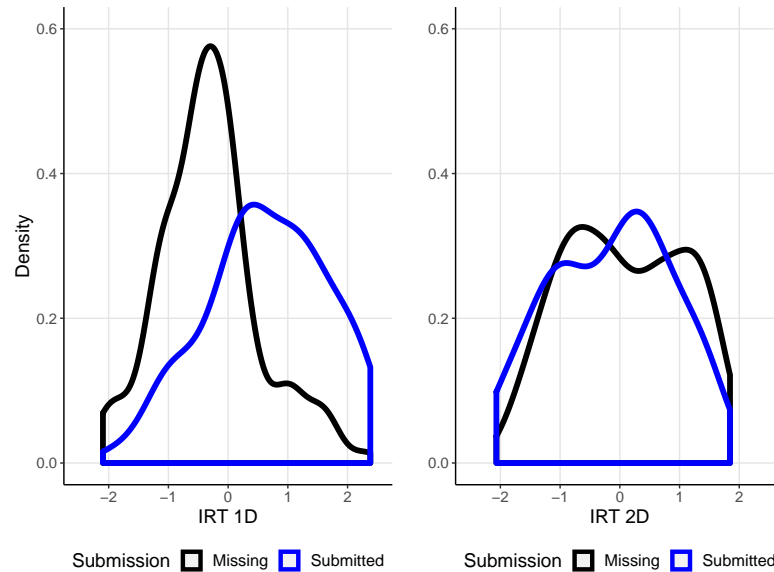


Figure 4.8: Sample selection in submissions to the UNFCCC. First dimension ideal points are related to the likelihood of complying with legal obligations under the UNFCCC, specifically the requirement to submit National Communications. This complicates comparing ideal points drawn from the latter due to non-random sample selection.

bloc. Given that many accounts of contestation in climate politics are derived from the same types of materials (i.e., documents and speeches) that Genovese uses, this close fit is re-assuring. The weak relationship between Genovese’s scores and my own suggests that the politics of membership in climate institutions may be structured by other dynamics, which I have suggested are non-UNFCCC collaboration on implementation and capacity-building in climate change versus networking and further negotiation.

Second, while UNFCCC parties are required to submit the documents Genovese uses to score preferences, not all states do indeed submit, leading the coverage of our two measures to differ. In the 2009–11 period when countries were tasked to submit national communications, only 84 countries actually submitted these documents. It is likely that the baseline characteristics of states that submit the National Communications that Genovese uses to score states differ from the baseline characteristics of states that do not submit, leading to a problem of non-random sample selection. Figure 4.8 shows how the data is segmented, presenting the distribution of IRT scores for states that submitted these documents and for states

that did not. States' first dimension IRT ideal point estimates are strongly associated with submitting a National Communication (statistically significant at the $p < 0.01$ level), whereas second dimension scores do not predict submissions. The absence of a strong correlation between the two scores is not surprising given the differing coverage of the two measures. Essentially the units being compared are not comparable.

C. Bailer and Weiler negotiating positions at COP15

Stephanie Bailer and Florian Weiler create two measures of states' climate preferences in UNFCCC negotiations based on states' negotiating positions at the 2009 Copenhagen climate summit (COP15).⁸⁴ The authors note that states proposed different targets for common emissions reductions and the provision of climate finance at COP15, and that the wide gulf between states' bargaining positions may have contributed to the collapse of negotiations on a new international climate treaty. For emissions mitigation, states' initial negotiating positions ranged from demanding a 49% reduction in Annex 1 GHG emissions by 2020 to calls for a 0% reduction for the same countries and time period. Positions on climate finance were measured as what proportion of GDP ought to allocate to climate finance and ranged from 0% to 2% of GDP. Bailer and Weiler measure states' negotiating positions on emissions mitigation and climate finance by recording each country's position on these two issues. They then scale cooperativeness in terms of absolute distance from the median negotiating position on each issue at COP15. The authors justify this measure with reference to the median voter theorem and they "consider the median of all negotiation positions to be the point where the win-set, and thus the agreement is most likely to be."⁸⁵ Using the absolute spatial distance implies that more ambitious and less ambitious positions can be considered equally "cooperative" when they are equally distant from the median in either direction.

Figure 4.9 does not suggest that there is a relationship between states' participation in climate institutions and their negotiating positions on climate finance at COP15. Similarly, states' participation in climate institutions is mostly unrelated

⁸⁴Bailer and Weiler 2015.

⁸⁵Bailer and Weiler 2015, p. 55.

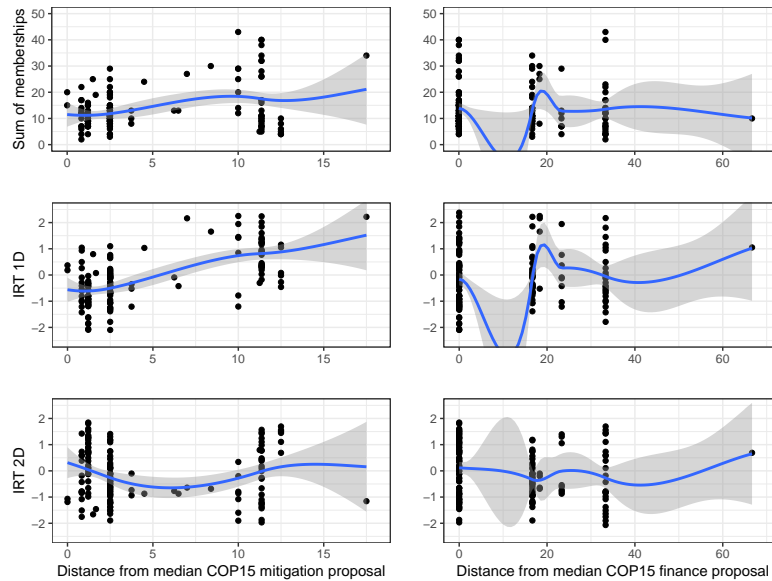


Figure 4.9: Bailer and Weiler’s analysis of states’ negotiating positions at COP15 and ideal points measured from institutional memberships. COP15 negotiating positions demonstrate strong indications of herding in states’ positions and are weakly related to ideal points.

to their negotiating positions on mitigation targets at COP15, except that states first dimensions scores are positively associated with distance from the median negotiating position. This implies that joiners adopted negotiating positions further from Bailer and Weiler’s median. In further analysis on Bailer and Weiler’s two measures, it is evident that the scale is heavily influenced by coordination within Annex 1 and non-Annex 1 countries, such that the actual median reflects in part the number of countries in each group. The Annex 1 divide accounts for the revealed difference nearly perfectly. Bailer and Weiler characterize states’ cooperativeness based on the distance from the median negotiating position at the COP, but the scores indicate such strong clustering that there is very little remaining variation to separate states. The divergence between my scores and Bailer and Weiler’s measure highlights the value of developing continuous measures of states’ climate preferences.

Summary

Comparing my recovered climate ideal points to other measures of state preferences in international climate politics reveals substantial differences across measures. In

part, this stems from the fact that each measure is designed to capture a different element of state behavior—whether in negotiations or in broader participation. In interpret this divergence as an indication that many measures of climate preferences highlight something about international climate politics that has been masked by the literature’s often narrow focus on the UNFCCC. Genovese and Bailer and Weiler’s measures of state preferences are tied to UNFCCC obligations and negotiations, while mine stem from states’ broader climate memberships. My ideal points highlight a dimension of climate politics that has not been explored previously—state participation in climate institutions—and reveal that membership patterns are structured by a different set of considerations than those that drive negotiating positions, at least in the pre-Paris Agreement period. I now turn to inquire into whether these ideal points capture an element of state behavior that is distinct from states’ behaviour toward international cooperation more broadly.

4.5.2 Comparison across measures of international preferences

D. Lupu treaty commitment preferences

Yonatan Lupu has estimated two-dimensional state ideal points from state membership in 280 open membership international treaties deposited at the United Nations using W-NOMINATE.⁸⁶ He finds that states’ ideal points are associated with economic size, measured as total trade, with high trading states scoring highest on the first dimension and lowest on the second dimension. These relationships are mirrored in my own ideal points, suggesting that the rotation of countries’ ideal points is the same in both specifications. Indeed, both dimensions of our ideal points are positively correlated, though to differing degrees, with $r_{s,1D,1D} = 0.64$ and $r_{s,2D,2D} = 0.23$.

Nonetheless, figure 4.10 demonstrates states’ climate preferences as measured by their institutional membership diverge considerably from their more general treaty commitment preferences. The closest association is the positive correlation between

⁸⁶Lupu 2016.

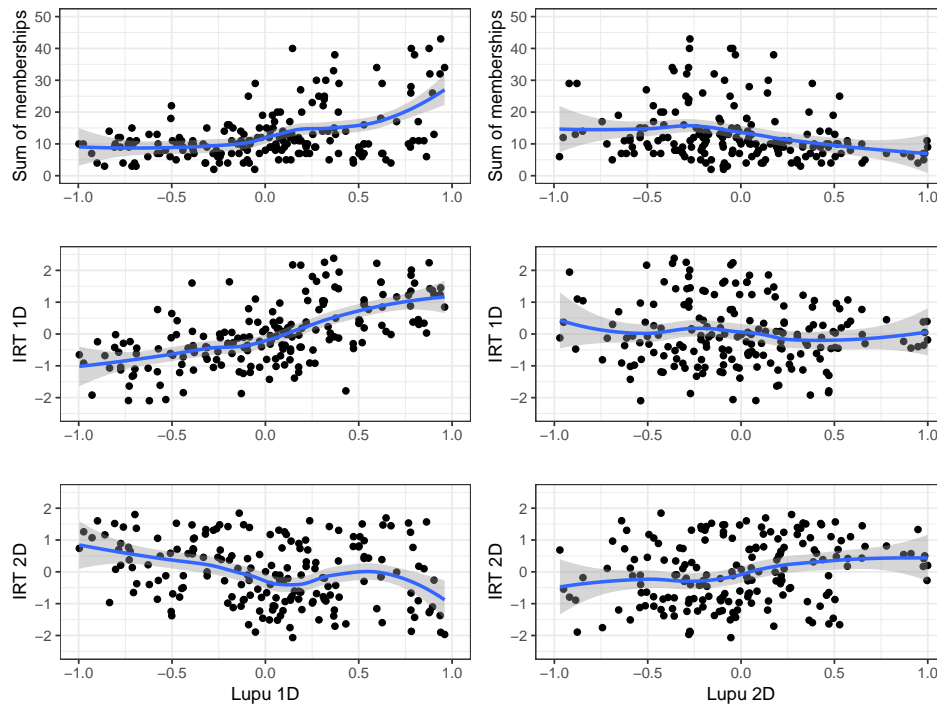


Figure 4.10: Lupu’s estimated treaty commitment preferences and climate ideal points. Both sets of ideal points’ first dimension scores appear associated, while the second dimension scores are relatively unrelated. This supports identifying the first dimension as a more general state preference for internationalism. The divergence along the second dimension suggests identifying this variation as less related to states’ general treaty commitment preferences and more of a specific attribute of climate politics.

both sets of first dimension ideal points. This suggests that my first dimension scores, which I have been interpreting as capturing states’ general propensities to join institutions, may indeed be capturing this more general propensity to participate in global governance. If this is the case, then this is further support for considering the first dimension climate scores as a measure of states’ underlying tendencies to join international institutions. By contrast, the divergence of Lupu’s ideal points and my second dimension scores is further evidence for identifying my second dimension scores as measuring intra-climate preferences. The flat loess regression line in figure 4.10’s comparison of Lupu’s ideal points and my second dimension scores demonstrates that ideal points do not predict each other. The second dimension scores are only weakly associated with each other.

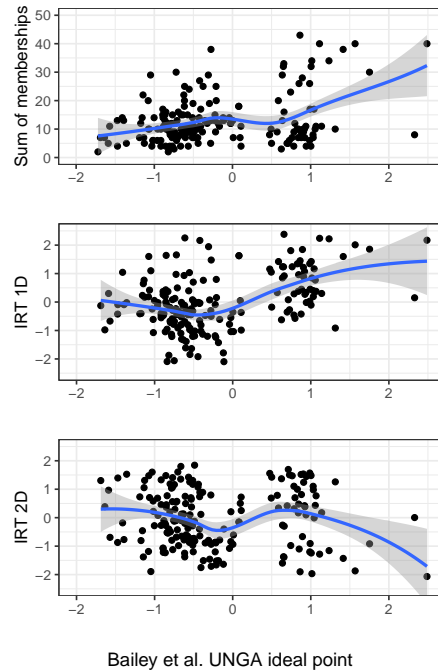


Figure 4.11: Relationship between UNGA ideal points and climate ideal points

E. Bailey, Strezhnev and Voeten UNGA ideal points

Michael Bailey and his colleagues recover state ideal points from UN General Assembly (UNGA) voting using an ordinal item response theory model.⁸⁷ The UNGA is the most similar international venue to a national legislature, with state representatives voting on resolutions in a similar manner to legislators voting on bills in domestic legislatures. UNGA voting is frequently used to measure states' general foreign policy preferences, as well as dyadic affinity.

My IRT scores and Bailey et al.'s UNGA ideal points are modestly correlated, with a Spearman coefficient of $r_s = 0.33$ for the first dimension score, but only $r_s = 0.05$ for the second dimension score (see figure 4.11). Again, it should not be surprising that the scores are not highly correlated, as UNGA resolutions cover the full range of issues in international politics—topics in international security, human rights, political recognition, etc.—and are not designed to create a tailored estimate of states' preferences in global climate governance. If the two scores were highly correlated, then it would suggest that my recovered ideal points are

⁸⁷Bailey, Strezhnev, and Voeten 2017.

indicative of a more general disposition in international cooperation than a measure of climate-specific state preferences. The divergence between the two sets of scores supports viewing the climate ideal points as recovering preference in climate politics. Interestingly, Bailey et al.'s UNGA ideal points are more highly correlated with Genovese's climate ideal points ($r_s = .65$ and $r_s = .74$ for the qualitative and quantitative ideal points, respectively).

The comparison of my climate ideal points with Bailey et al.'s UNGA ideal points and Lupu's treaty commitment ideal points suggests that participation in climate governance is not strictly determined by states' existing international preferences. The analysis above indicates that state participation in climate institutions partly reflects broader dispositions toward internationalism, especially along the joiners dimension. By contrast, the deepening-fragmenting dimension diverges from other existing measures, suggesting that it captures a novel element of states' climate preferences.

4.6 Conclusion

The core of my argument is that states participate in climate institutions because they are dissatisfied with the pace of cooperative progress at the United Nations Framework Convention on Climate Change. States can be dissatisfied for two reasons: because the pace of cooperative progress is too slow and they would rather undertake more deeply substantive collective obligations, or the pace of cooperation is too quick or the risk of a new agreement is too high and they would rather block future collective action. I call these two types of states deepeners and fragmenters, respectively.

The existing literature understands membership in international institutions as an expression of affinity with the broad goals animating an issue-area. The canonical example is human rights, where scholars attribute the extensiveness of state participation in human rights treaties to the depth of states' commitments to liberal values. Deepeners and fragmenters challenge this narrative. I argue that in dense

institutional environments states use institutions to shape how cooperation evolves. Deepeners push for quicker progress while fragmenters erect stumbling blocks.

To evaluate this argument, I develop new scores for state participation in climate institutions. If membership stems from deepening and fragmenting, then the sum of states' climate memberships may be unrelated to their cooperative preferences. I instead attempt to model these motivations as dimensions of participation using item response theory. IRT fits parameters to predict state membership decisions, returning country-level ideal points that I use as new scores for participation. I extract a first dimension that captures a state's general propensity to join international institutions: joiners. Holding constant this heterogeneity in states' levels of participation, the second dimension recovers fragmenting and deepening.

The strengths of IRT modeling are that it uses all of states' membership decisions to score participation and that it can be used flexibly to recover dimensions or patterns of participation. The chief weakness of IRT is that it is unsupervised and produces outputs that require considerable interpretation to validate. In section 4.3, 4.4, and 4.5, I undertake a series of analyses to validate the interpretation of my climate ideal points as separating first joiners from states that abstain from global climate governance, and second separating deepeners from fragmenters. I consider which states lie in which quadrants of the latent climate space (4.3.2) and then which institutional memberships (and non-memberships) put them there (4.3.3). Qualitative reading of the fit between key states, institutions, and their scores suggests that the estimates have face validity.

I then undertake a more systematic quantitative assessment of the fit. I use regression models to estimate the country-level variables most associated with countries' scores in two dimensions (section 4.4.2 and 4.4.3). I find that GDP best fits the first dimension, which matches existing findings that powerful and wealthy states participate more extensively in global governance. My joiners are joiners generally. I also find that climate-specific variables structure countries' second dimension scores. Deepeners are associated with a greater number of domestic environmental NGOs, a greater share of electricity generated from renewable sources, greater vulnerability

to climate impacts, and a higher number of international environmental agreement ratifications. Fragmenters lack these characteristics. Countries' climate preferences are shaped by their domestic political economy and IRT modeling recovers this.

Finally, I compare my ideal points to other measures of state preferences. I show that my measures are similar to existing climate measures, but go beyond them in key respects. My ideal points are available for all countries and analyze preferences at a much finer scale than existing measures, which tend to feature excessive clustering that masks affinity. I also show that my scores diverge from more general measures of state preferences. My first dimension that measures states' general propensity to participate in climate institutions tracks most closely to states' general treaty commitment preferences and to their UNGA voting records. By contrast, my second dimension departs from these suggesting that it reflects more issue-area specific qualities than general international preferences.

Nonetheless, this chapter raises the question of how participation in climate institutions relates to states' actual cooperative behavior in climate politics, but it does not answer it. Deepening is cheap talk if these states do not actually undertake more deeply substantive mitigation obligations when given the chance. Therefore in the next chapter, I link these scores to countries' targets in the Paris Agreement on Climate Change. If the IRT model captures this salient attribute of institutional proliferation in climate politics, then the IRT scores will predict the ambition of countries' Paris GHG mitigation targets.

5

Sustaining and shattering 2°C

Contents

5.1	Introduction	157
5.2	Dense institutional environments	160
5.3	The broader-deeper tradeoff and bottom-up cooperation	166
5.4	The structure of cooperation under the Paris Agreement	172
5.4.1	Negotiations and target-setting at the UNFCCC	172
5.4.2	Pitfalls in comparing Paris pledges	174
5.4.3	Re-scaling INDCs to measure cooperation	178
5.5	Data and method	183
5.6	Results	186
5.7	Conclusion	198

5.1 Introduction

Two degrees Celsius has been described as “the maximum allowable warming to avoid dangerous anthropogenic interference in the climate.”¹ This temperature target has been adopted by policymakers, scientists, and communicators to structure climate negotiations, research, and advocacy. While it is useful to have a goal, this particular target is misleading. It creates a false sense of security for warming below 2°C and a false sense of finality for warming above 2°C. Instead, the impacts of

¹For a history of the 2°C temperature target, see Randalls 2010, p. 598.

climate change are already here and will continue for any temperature increases: 2 °C is not a threshold of catastrophe.² Recent studies show substantial climate damages at 1.5 °C,³ and climate damages increase above the 2 °C marker.⁴ Every additional ton of CO₂ emitted causes hundreds of dollars of damages;⁵ every additional degree of warming shaves percentage points off economic growth.⁶ Negative climate change impacts occur no matter what emissions trajectory the world follows over the next decades, regardless of the 2 °C target. The question is, rather, what level of warming we will reach. Collectively, countries' current GHG mitigation plans are expected to lead to 3.2 °C of warming.⁷

This research suggests that we should not conceptualize climate damages as a binary set of outcomes (i.e., known damages at 2 °C versus safety at less than 2 °C) and should instead think in terms of damages at continuous levels of warming. Similarly, we should also conceptualize international cooperation in terms of levels rather than a binary choice to cooperate or not. I note a persistent trope in the institutionalist literature that focuses on binary measures of state behavior when theories are often articulated in terms of levels. This may stem, in part, from early game-theoretic treatments of cooperation, which often sharpened actors' decisions into a few discrete choices (i.e., cooperate or defect) rather than more continuous levels of cooperative behavior.⁸ This type of dichotomy also structures contemporary research on membership in international institutions, particularly the broader-deeper tradeoff.⁹ In this chapter, I show how the 2015 Paris Agreement on Climate Change prompts us to relax these assumptions and allows us to consider states' levels of cooperative behavior more explicitly. Specifically, in the Paris Agreement states adopted their own policy targets, thereby revealing how willing they were to contribute to collective mitigation. These targets can be scaled to

²Wallace-Wells 2019, p. 12.

³IPCC 2018.

⁴Pretis et al. 2017; Shindell et al. 2018.

⁵Ricke et al. estimate the global damages per ton of CO₂ emitted to be \$417 with a 66% confidence interval of [\$177–815]. Ricke et al. 2018.

⁶Hsiang et al. estimate 1.2% of lost GDP growth for every degree of warming. Hsiang et al. 2017.

⁷Rogelj, den Elzen, et al. 2016.

⁸Snidal 1985a.

⁹Downs, Rocke, and Barsboom 1998; Gilligan 2004; Stone, Slantchev, and London 2008.

measure cooperative behavior in a more continuous way than existing research frequently uses. It also sidesteps conceptual questions about the relationship between cooperation and compliance.¹⁰

I use the Paris Agreement to link state participation across 65 climate institutions to their issue-area-specific cooperative behavior. I ask, *how is participation in climate institutions related to states' cooperative behavior in climate politics?* My argument about the nature of dissatisfaction in climate politics and how dissatisfaction conditions institutional proliferation suggests a natural relationship between participation in climate institutions and states' cooperative behavior. Dissatisfied deepeners will adopt more cooperative behavior than dissatisfied fragmenters. By contrast, the sum of a state's climate membership is likely to be unrelated their cooperative behavior since both types of states may participate extensively. I show that my climate ideal point measures can recover these motivations and predict the ambition of states' targets in the Paris Agreement.

State behavior across climate institutions helps us to better understand how states use dense institutional environments. I show that there is no unconditional relationship between the extent of state participation in climate institutions and the ambition of their GHG mitigation targets in the Paris Agreement. By contrast, when we consider the types of institutions that different states join, state participation across climate institutions is associated with both more and less cooperative behavior. States' patterns of participation are indicative of the ambition of their Paris targets. States that join more forums that work on implementation and capacity-building have stronger targets than states that join negotiating and networking forums. The ideal points developed in the previous chapter capture this pattern of participation as a dimension of climate memberships, whereas this is masked by more naive measures, such as the sum of memberships. Instead, when states choose to separate the governance of sub-topics into new standalone forums that allow motivated and ambitious states to pursue tangible goals, this is associated with a greater likelihood of ambitious cooperation in the Paris Agreement. I find no evidence

¹⁰Downs, Rocke, and Barsoom 1996; von Stein 2005; L. Martin 2013; von Stein 2013.

that participation in general is associated with GHG targets, which highlights the additional value of theorizing and specifying the reasons why states participate across dense institutional environments.

I develop this argument in three parts. In section 5.2, I explain how dense institutional environments may affect the prospects for international cooperation. Overlapping institutions could facilitate or undermine international cooperation and strong theoretical arguments support both sides of this debate. I use the concept-pair of deepeners and fragmenters to crystallize these debates and suggest how theorizing states' motivations for participation can help reconcile these perspectives. I develop three expectations for how participation in climate institutions may be related to the stringency of states' targets. In section 5.3, I explain how the stringency of institutional obligations conditions membership decisions. I show how states sidestepped this broader-deeper tradeoff through a novel institutional design in the Paris Agreement on Climate Change, whereby states set their own targets. States' target documents vary along a number of dimensions and I provide an overview of these in section 5.4. I present a new continuous quantitative measure of the ambition of countries' Paris GHG targets. In section 5.5, I describe the data and estimation used, and finally in section 5.6, I present statistical results of the relationship between participation in climate institutions and states' cooperative behavior in climate politics.

5.2 Dense institutional environments

Institutionalist theory has become increasingly interested in the rise in the number of international institutions globally. The dominant accounts of how international institutions affect international politics date from an era when a relatively limited number of international institutions enjoyed nearly unrivaled status within the issue-areas they governed.¹¹ By contrast, most issue-areas of world politics today are

¹¹Keohane 1984.

governed by several institutions.¹² Instances of rising institutional density in an issue-area, or when several institutions attempt to govern the same topic, are frequently referred to as overlapping institutions or regime complexes. The prospects for international cooperation are less clear as we transition from issue-areas dominated by a single, focal institution to situations where different institutions overlap and perhaps compete for authority within an issue-area.

While most institutionalist theory has been optimistic that individual international institutions facilitate cooperation among states, theorists of overlapping institutions are more pessimistic. Many studies have raised concerns that states may use overlapping institutions to shirk their obligations and undermine collective action.¹³ When multiple institutions within an issue-area set obligations for members, states may find themselves suspended between conflicting institutional obligations emanating from different forums.¹⁴ A state may be compelled to follow one set of rules as a member of one institution and another conflicting set of rules as a member of another. Such cases of legal inconsistency threaten to degrade coordination within an issue-area, as states may “shop” across forums and only comply with the most favorable rules for their circumstances.¹⁵ From the perspective of traditional institutionalist theory, overlapping institutions increase the number of possible coordination points within an issue-area and degrade previously constructed focal points that structured cooperation.¹⁶

Some studies go a step further and argue that states may intentionally use overlapping institutions to create conflicting coordination points.¹⁷ States may pursue cross-institutional strategies to create rival sets of rules and norms within an issue-area.¹⁸ By supporting alternative principles and establishing alternative rules within an issue-area, powerful states may attempt to shape the evolution of

¹²Raustiala 2013.

¹³Raustiala and Victor 2004; Benvenisti and Downs 2007; Alter and Meunier 2009; Drezner 2009; Pollack and Shaffer 2009; Drezner 2013.

¹⁴Jenks 1953; Koskenniemi and Leino 2002; ILC 2006.

¹⁵Busch 2007.

¹⁶Drezner 2013.

¹⁷Benvenisti and Downs 2007.

¹⁸Drezner 2013.

cooperation toward their preferred cooperative outcomes.¹⁹ Depending on the topic, this may mean shifting towards harder or softer forms of international law, governing through more or less formal international organizations, or simply supporting rules with advantageous distributional implications. In the worst-case scenario, recalcitrant states may use overlapping institutions to undermine international cooperation.²⁰ From this perspective, issue-areas with overlapping institutions are likely to be associated with worse cooperative outcomes. A proliferation of new international institutions may weaken international cooperation and a rule-based international order. For this forum shopping school, states that participate extensively across institutions are states that seek to undermine cooperation.

Other studies have argued that a greater number of institutions within an issue-area may facilitate cooperation. When states are members of more institutions, there are more opportunities for interaction, communication, and learning about counterparts' preferences.²¹ Reputational concerns may constrain opportunistic behavior more effectively when states interact repeatedly across forums.²² Furthermore, states may use these additional institutions to strengthen cooperation on particular topics.²³ States may choose to separate large, macro-level problems into smaller, more functional topics and use overlapping, but tailored institutions to govern these topics.²⁴ Smaller forums with narrow scope may be better suited to forging consensus and supporting cooperation than larger forums with more diverse membership and that span more topics.²⁵ If a subset of states uses overlapping institutions to accelerate cooperation among members, then the governance of an issue-area may develop a "multi-speed" structure.²⁶ Dense institutional environments, accordingly, may contain a core of states that pursue cooperation among themselves at a quicker pace than would be sustainable among all states. If this pattern of cooperation holds,

¹⁹Morse and Keohane 2014; Lipsy 2017.

²⁰Benvenisti and Downs 2007.

²¹Alter and Meunier 2009; C. Davis 2009; Orsini, Morin, and O. Young 2013.

²²Guzman 2008.

²³Kelley 2009.

²⁴Johnson and Urpelainen 2012.

²⁵Buchanan 1965; Stewart, Oppenheimer, and Rudyk 2013; Green 2017.

²⁶Alesina and Grilli 1993; Downs, Rocke, and Barsoom 1998; Stone, Slantchev, and London 2008.

then dense institutional environments may support cooperation. This separation perspective sees states that participate extensively across institutions as states that seek to support cooperation.

These theoretical arguments in the literature suggest that institutional proliferation could have negative or positive consequences for international cooperation. These two perspectives also structure debates about overlapping institutions within climate change. Some scholars worry that states will increasingly shift their attention from the UNFCCC, where strong norms of equity and fairness structure negotiations, to other forums where powerful states may use their relative power to their advantage.²⁷ Others argue that states may use membership in non-UNFCCC institutions to appear engaged and placate domestic environmental groups while doing little to drive down emissions.²⁸ An implication of this line of reasoning is that states that participate extensively across climate institutions will have worse cooperative behavior than states that concentrate on the UNFCCC.

However, institutional proliferation may also promote cooperative behavior, particularly when new institutions focus on building national capacity to implement climate policies. The UNFCCC sets broad goals for states—to “prevent dangerous anthropogenic interference with the climate system”—but does little to enable states to reach these goals. Other climate institutions may help states pool resources, develop joint outputs, coordinate research efforts, or simply support state interactions to drive climate action.²⁹ In short, new climate institutions may provide the institutional support that ambitious states seek but that the UNFCCC does not wholly provide. An implication of this line of reasoning is that states that participate extensively across climate institutions will display more cooperative behavior than states that concentrate on the UNFCCC. Nonetheless, existing scholarship has been pessimistic about the ability of actually existing non-UNFCCC climate institutions to catalyze meaningful climate action.³⁰ Most of this literature

²⁷Biermann et al. 2009.

²⁸Karlsson-Vinkhuyzen and Asselt 2009.

²⁹Abbott and Snidal 1998.

³⁰Biermann et al. 2009; Weischer, Morgan, and Patel 2012; Andresen 2015; Green 2017.

on overlapping climate institutions is normative, focusing on how to optimally design new climate institutions to supportive binding GHG cuts.³¹ As Steiner Andresen puts it, many observers recognize the “theoretical case in favour of the club approach,” but see “scant empirical evidence that it would work.”³² However, little attention has been paid to actually attempting to answer whether membership in non-UNFCCC climate institutions is associated with stronger or weaker climate policy. Climate politics, therefore, represents a test case for these two arguments about how states use dense institutional environments.

These two perspectives on the consequences of institutional proliferation match my theoretical argument in chapter 2 about how dissatisfaction with the pace of cooperative progress at the UNFCCC conditions state participation across climate institutions. I have argued that states that are dissatisfied because progress on mitigation commitments at the UNFCCC has been too slow join climate institutions focused on building capacity to implement ambitious climate policies. These states use overlapping institutions and dense institutional environments to drive cooperation forward. By contrast, states that fear the sovereignty costs of quick progress on substantive collective mitigation obligations at the UNFCCC join outside institutions in attempts to weaken coordination in climate governance and undermine efforts to develop an effective global response to climate change.

My argument implies that participation must be understood in more nuanced terms than simply the sum or extensiveness of institutional memberships. States use non-UNFCCC institutions to shape the evolution of climate politics, but they may use these institutions to deepen or to fragment cooperation. The extent of participation across institutions, therefore, tells us little about the link between participation and cooperation. I focus instead on the types of climate institutions that states join and their patterns of institutional memberships. I do so using the ideal point estimation developed in the previous chapter.

³¹Aldy, Barrett, and Stavins 2003; Keohane and Victor 2011; Victor 2011; Weischer, Morgan, and Patel 2012; Stewart, Oppenheimer, and Rudyk 2013; Andresen 2015; Nordhaus 2015.

³²Andresen 2015, pp. 25–26.

I link this conceptual argument about how states use dense institutional environments to states' cooperative behavior in climate politics using the Paris Agreement on Climate Change. I leverage a unique design feature of the Paris Agreement to measure states' willingness to contribute to collective mitigation in climate change, namely that states set their own targets. I elaborate on this design below (see section 5.4). This allows me to evaluate arguments about institutional proliferation and cooperative outcomes.

My argument about the nature of dissatisfaction in climate politics and how dissatisfaction conditions institutional proliferation suggests a natural relationship between participation in climate institutions and states' cooperative behavior. Dissatisfied deepeners will adopt more cooperative behavior than dissatisfied fragmenters. Deepeners join climate institutions outside the UNFCCC that focus on building national capacity to support ambitious national climate policies and this motivation should be reflected in their own GHG targets as well. Together, these arguments imply three linked expectations about the relationship between participation in climate institutions and states' cooperative behavior.

Expectation 1: The sum of climate memberships will not be associated with the stringency of states' targets in the Paris Agreement.

Reason: Participation in climate institutions is driven by two opposing motivations and therefore extensive participation may reflect intentions to fragment climate governance or to deepen it.

Expectation 2: States' patterns of climate memberships, as measured using IRT, will be associated with the stringency of states' Paris targets.

Reason: Different types of dissatisfied states will join climate institutions that focus on different kinds of tasks (e.g., forums that specialize in implementation or in negotiation). Deepeners and fragmenters will therefore join systematically different climate institutions, and the IRT model will recognize these membership patterns. States, effectively, sort themselves by type through their repeated membership decisions across climate institutions.

Expectation 3: Deepeners will have more ambitious targets than fragmenters, so states with lower second dimension scores will have more ambitious targets than states with higher second dimension scores.

Reason: The second dimension of the ideal point estimates capture the extent to which states participate in climate institutions intended to deepen climate governance by facilitating implementation and capacity-building outside the gridlocked UNFCCC. Dissatisfied deepeners will score lower on the second dimension and have more ambitious GHG targets than dissatisfied fragmenters.

Evaluating whether institutional proliferation undermines cooperation, or more specifically how participation across overlapping institutions relates to states' cooperative behavior, requires specifying the nature of cooperation. A unique element of the Paris Agreement's institutional design enables a crisp measurement of states' willingness to contribute to collective mitigation. States selected their own policy targets in the Paris Agreement, instead of setting a common policy target that all states must adopt or negotiating line-by-line over the precise terms of each states' policy adjustments. For my purposes, this design is useful since it acts as a mechanism revealing each state's contribution to mitigation. States may adopt bold, moderate, or lackluster GHG emissions mitigation targets in the Paris Agreement, thereby revealing their ambition in climate politics.

5.3 The broader-deeper tradeoff and bottom-up cooperation

The adoption of the Paris Agreement presents a new opportunity to reconsider the relationship between the stringency of institutional obligations, membership in international institutions, and the related concept of compliance. Existing work on international cooperation has tended to focus on situations where international institutions set common obligations for members. I explain how this feature of treaty-making obscures variation in states' willingness to cooperate and thus complicates empirical work on international cooperation. By contrast, I show how the model of

“bottom-up” cooperation adopted by the Paris Agreement, in which states set their own targets, allows for a more fine-grained and accurate measure of state cooperation.

One of the primary activities of international institutions is to delineate acceptable and unacceptable behavior for members.³³ This often involves setting a common policy level that all members must adopt.³⁴ The policy range of an issue being negotiated internationally can be relatively discrete, such as whether or not to ban torture, or more continuous, such as the levels of a tariff on an imported good or the maximum emissions quota of a pollutant. Assume that adjusting national standards to meet institutional obligations is costly and that reaching higher policy targets is more costly.³⁵ States consider the policies they must adopt when considering whether to join an institution.³⁶ It can be shown next that setting a common policy level for all members distorts membership and poorly reflects cooperation. Reforming national policies to meet common international standards will be more costly for some states than others.³⁷ Some states’ pre-membership domestic policy levels may be further from the coordination point, thereby requiring larger domestic policy reforms to meet institutional obligations. By contrast, other states’ domestic policies may already be compliant with institutional obligations. Since more demanding policy targets increase compliance costs and compliance costs are not uniform across states, more demanding policy targets can make compliance more costly than non-participation for states with high compliance costs. States that expect greater costs than benefits from membership in an institution will not join that institution.

When this relationship between targets and membership holds, a broader-deeper tradeoff manifests in international cooperation.³⁸ The broader-deeper tradeoff implies that maximizing the number of participating countries requires minimizing institutional obligations; inversely, imposing more onerous obligations will shrink participation. To obtain full membership in a multilateral, negotiators must set the

³³von Stein 2013.

³⁴Downs, Roche, and Barsoom 1998; Stone, Slantchev, and London 2008.

³⁵Urpelainen 2011.

³⁶Fearon 1998; Barrett 2003; Goldsmith and Posner 2005.

³⁷Downs, Roche, and Barsoom 1996; L. Martin 2013.

³⁸Downs, Roche, and Barsoom 1998; Gilligan 2004; von Stein 2008; Stone, Slantchev, and London 2008; Susskind and Ali 2014; Hovi, Ward, and Grundig 2015.

common policy level such that the state with the highest compliance cost is at least indifferent between participating and not.³⁹ For any policy level more demanding than the participation constraint of the state with the highest compliance cost, there will be a subset of states that find these institutional obligations too costly and do not join. Again, inversely, there will always be at least one state that would prefer to cooperate at a more demanding policy level. When institutions set common targets that all members must adopt, we never observe states' reservation cooperative policy levels—the maximum contribution they would be willing to make—and we only see whether states are willing to participate at a given common policy level. In this sense, our observations of the extent to which states are willing to contribute in a cooperative multilateral are censored at the common policy target.

Consider a set of four states negotiating an international emissions mitigation agreement. States have different preferences over the common level of emissions reductions they would be willing to accept as a member of an international institution. These preferences may be informed by the nature of their domestic political economy, exposure to negative externalities, pressure from domestic or transnational actors, or other factors. States' utility from joining an institution at different levels of a common emissions target are denoted by the quadratic loss curves in figure 5.1. States' utility from membership is a function of the distance between their preferred common policy level (the peak of their utility function) and the common policy level mandated by the institution (denoted by values along the x -axis). If the amount of emissions reductions that an international agreement prescribes differs substantially from a state's preferred coordination point, then complying may be prohibitively costly and that state will not join.

As shown in figure 5.1, for a 25% mandatory emissions reduction (vertical dashed line), only two states have positive expected utility from membership. We would expect the membership of the institution to be two: the two states with the right-most utility functions, colored in blue. Adjusting the target upwards or downwards may change membership, but for any target greater than roughly

³⁹Stone, Slantchev, and London 2008.

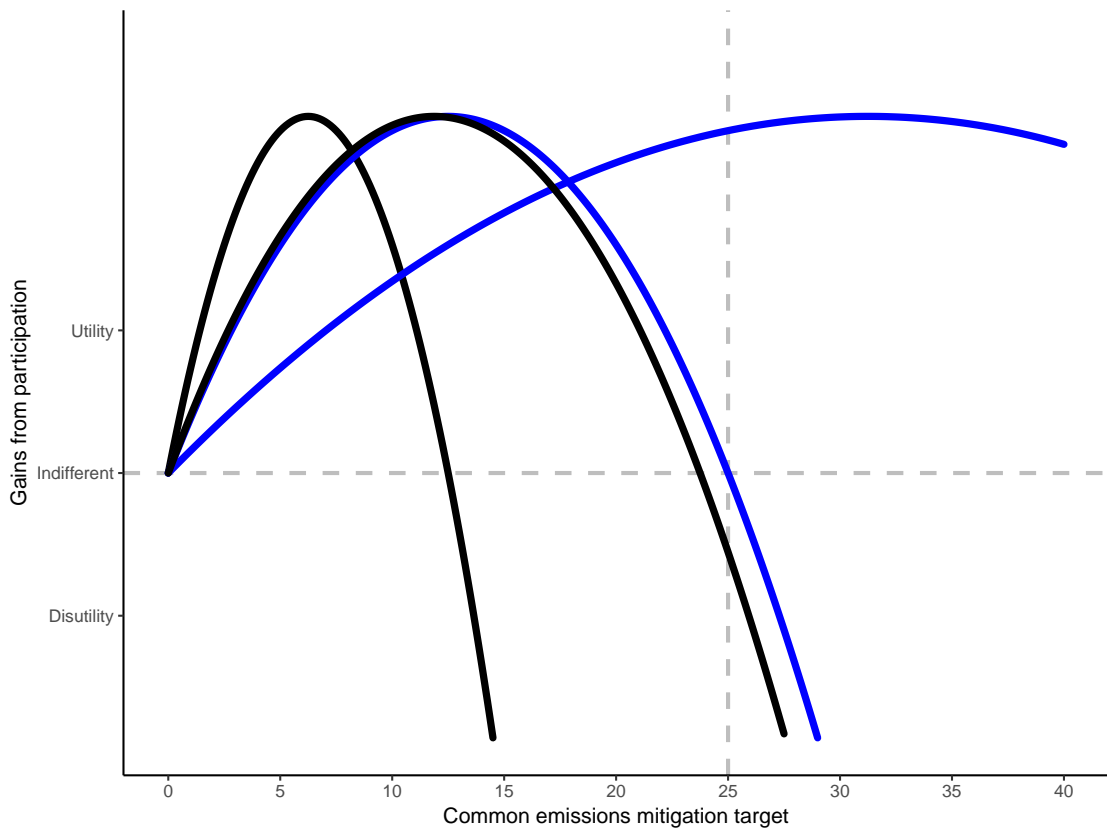


Figure 5.1: Broader-deeper tradeoff. States' utility from joining an international institution with a common policy depicted by curves for each country. When utility is positive (above the horizontal dashed line), states are expected to join; however, when utility is negative (below the horizontal line), states are not expected to join. States' utility is a function of the distance between their preferred cooperation (the peak of their utility function) and any chosen common policy target. For a hypothetical target set at 25%, only the two states with the right-most utility functions are expected to join (depicted in blue).

12%, the membership begins to shrink, as the target exceeds the participation constraint of the state with the highest compliance costs. Note as well that one state would rather set a common policy level that is more demanding than the 25% prescribed by the institution, but this would be beyond the participation constraints of all its peers. Strategies such as issue-linkage and side payments can be considered attempts to circumvent the participation constraints of states with high compliance costs by increasing the gains from cooperation.⁴⁰ Outside of this stylized example, states may also bargain over differentiated targets. Ultimately,

⁴⁰Sebenius 1983.

states consider the costs of compliance with their institutional obligations when deciding whether or not to join an institution.

The range of observed outcomes when an institution sets a common policy target, therefore, collapses to: (1) compliant members, (2) non-compliant members, and (3) non-members. Observations are truncated by the membership decision ($Ratification_{i,j} = \{0, 1\}$) and then censored at the common policy level ($Compliance_{i,j} | (Ratification_{i,j} = 1) = \{0, 1\}$). When an institution mandates the same policy target for all states, there will always be a subset of states that would have accepted coordinating behavior at a more substantive level than the common policy level and there will be another subset of states that find the common policy level too costly. However, these participation constraints are never observed directly. Only the decisions to join or not join an institution and then whether or not to comply are observed. We never observe just how far a state is willing to go when our measure of cooperative behavior is censored at the common treaty level. Ultimately, common targets bias membership near the treaty level when there is a relatively continuous distribution of preferred coordination points, but a discrete coordination point. Even two states with very similar cooperative preferences—states that would participate at very similar target levels (e.g., states 2 and 3 in figure 5.1)—may fall on opposite sides of membership in an institution if that institution’s policy level lies between these states’ participation constraints, the point at which a state’s utility from joining matches their utility from not joining. In the end, our observations are very different, but the willingness of each state to contribute to collective action may actually be very similar.

An alternative method of institutionalized cooperation may allow states to set their own targets. Instead of the “top-down” model described above where negotiations yield a single common policy target for all states, institutionalized cooperation may draw from a “bottom-up” approach, wherein states deliberate nationally and propose their own targets. Here, states propose to cut their GHG emissions by whatever level they want. Whereas, common policy targets distort membership for states that have participation constraints near the common policy

level, differentiated targets maximize participation though states' contributions are uneven. Some states set minimal targets, while others set intermediate ones, and still others set deep targets. In the process of selecting individualized, bottom-up targets, states reveal how willing they are to contribute to a common policy goal, conditional on the cooperation of others. The task of institutionalized cooperation is to set expectations that all participants will select meaningful targets and to push states to select commitments nearer their true participation constraints. Bottom-up approaches reveal actors' preferences with respect to levels of cooperation more finely than when institutions commit members to common targets since we observe a broader range of cooperative policies.

The policy targets that states adopted in the Paris Agreement are paradigmatic examples of the bottom-up approach to treaty making. Ahead of the Paris climate conference in 2015, members of the UNFCCC were tasked to submit Intended Nationally Determined Contributions (INDCs) that communicated the national policy targets governments intended to implement if a new climate agreement was adopted at the 2015 UN climate conference. In these documents, states actually articulated how willing they were to contribute to the collective good of climate mitigation. Granted, these documents vary in content, detail, and ambition, but they represent summaries of each state's proposed contribution to manage climate change. Indeed, the variation across documents allows us to measure states' willingness to contribute to collective action without the problems of censoring and truncation that common policy targets introduce. Instead of engaging in protracted and rancorous negotiations over the aggregate level of GHG emissions and their allocation across countries, states elected to enable national deliberation over the set of policies national governments were prepared to implement. The bottom-up design of the Paris Agreement suggests conceptualizing the Agreement as a mechanism for eliciting states' willingness to contribute to collective mitigation. I leverage the variation in states' pledged Paris targets to measure states' support for conditional cooperation in climate governance.

5.4 The structure of cooperation under the Paris Agreement

5.4.1 Negotiations and target-setting at the UNFCCC

States have used the COPs to negotiate GHG mitigation targets, often in the form of a binding international treaty. One of the Paris Agreement's key innovations lies in how it structured negotiations to have states select their targets before the COP instead of haggling over targets multilaterally.⁴¹ Previous COPs had attempted to negotiate targets multilaterally. At COP3, states met to adopt the first climate treaty with legally binding quantified emissions limitations targets for developed countries. These negotiations were protracted, as countries navigated issues ranging from the total emissions concentration goal, whether different countries ought to have different targets, which gases to include, and how emission cuts could be implemented in the most cost-effective ways. Since the UNFCCC left the emissions goals under-specified, at COP3 parties continued to express different positions on the absolute level of emissions (i.e., warming) to aim for, as well as more contentious issues over the allocation of emissions cross-nationally and over time.⁴² Some states proposed flat rate emissions cuts for all Annex 1 parties, as these were considered the simplest, had precedent in other international environmental agreement, and opening negotiations on differentiated targets held the possibility of derailing negotiations by adding unnecessary complexity. Yet, variation in states' emissions profiles led states to propose various self-serving differentiated targets designed to minimize their compliance costs with any binding treaty. States suggested weighting Kyoto targets by GHG emissions per capita, by the GHG emissions intensity of economic output, and by GDP per capita, among others.⁴³ Differentiated targets became the overriding subject of the COP3 negotiations. While differentiated targets were ultimately adopted, no formula was used to arrive at their precise levels, and the exact targets were the product of negotiation.⁴⁴ All Annex 1 parties eventually

⁴¹Falkner 2016b.

⁴²Grubb, Vrolijk, and Brack 1999, pp. 68–72.

⁴³Oberthur and Ott 1999, pp. 115–121.

⁴⁴Oberthur and Ott 1999, p. 120.

accepted targets, and some were inevitably more demanding while others were more lax. The outcome of these negotiations was a somewhat arbitrary set of national targets that were laborious and fractious to negotiate, and yet presented only an incomplete solution to global warming.

Negotiators attempted to utilize the COP3 negotiation template in the intervening years to elaborate new targets, particularly at COP15 in Copenhagen, but this template proved inadequate. Large developing countries emerged as major GHG emitters in the 2000s which meant they had to be included in any new emissions targets. The larger number of important actors increased the complexity and dimensionality of the negotiations. The increasing urgency of the climate challenge shrunk the bargaining space to mandate more stringent cuts. Ultimately, states failed to reach consensus on a new treaty that could include binding GHG emissions targets for any subset of countries. Attempting to negotiate GHG targets for over 190 states at COP21 would likely have been completely unworkable given the historical record.

The negotiation process over the Paris Agreement differed markedly from previous target-setting at the COPs. Instead of negotiating country-level GHG targets multilaterally—as was done with the 1997 Kyoto Protocol and was attempted at the 2009 United Nations climate conference in Copenhagen—governments selected their own contributions to addressing climate change before meeting in Paris. At COP20, parties tasked themselves to submit Intended Nationally Determined Contributions outlining their climate policy pledges, which the UN climate secretariat would collect and publicize before COP21 the following year. Therefore, states arrived in Paris with a very clear idea of what individual countries were willing to contribute to mitigating climate change. As a result, the negotiations at COP21 focused more on the legal form the agreement would take, how binding different provisions would be, such as on finance, reporting and mitigation, and the mechanics for ratcheting up ambition. The Paris Agreement attempted to scuttle the broader-deeper tradeoff by allowing each country to set their own target. This design led to maximum participation—the agreement was adopted by consensus—though states' contributions are highly uneven.

Under the UNFCCC's rules states must first adopt an agreement by consensus and then ratify it domestically before it has any legal force. Therefore, states were not bound to implement whatever they submitted in their INDC until, first, an agreement containing the INDCs has been adopted by all the parties as a COP decision (i.e., the Paris Agreement), second, they have ratified the agreement domestically, and third, enough other states have also ratified that the agreement enters into force.⁴⁵ Under the bottom-up approach, if a coalition of states finds their counterparts' nationally determined targets acceptable—each participant expects the benefits from collective fulfillment of these nationally determined obligations to exceed their individual compliance costs—then that coalition ratifies the agreement and implements its provisions. We can imagine a counterfactual scenario where states' INDCs were so minimal or so skewed that the delegates at COP21 refused to adopt a new international agreement based on them—indeed, since COP decisions are taken by consensus, concerned states may threaten to obstruct the whole process, as Nicaragua actually did when it declared the INDCs too weak and threatened to block consensus. The distinction between top-down and bottom-up targets does not imply that one is necessarily better or that the Paris Agreement (bottom-up) will succeed where the Kyoto Protocol (top-down) failed. The Kyoto Protocol's failure does not stem from its top-down target setting, though some other policy target may have lead to greater participation and effectiveness.

5.4.2 Pitfalls in comparing Paris pledges

The INDC model of target setting reflects a compromise that allowed for the highest level of state participation in the agreement at the expense of transparency and reciprocity in states' obligations.⁴⁶ Many states had reservations about accepting costly mitigation commitments given that there was uncertainty about their counterparts' willingness to contribute as well. While the 2014 Lima climate conference outcome document invited parties to include “quantifiable information

⁴⁵Targets are “intended” until a country ratifies the Paris Agreement, at which point they become “Nationally Determined Contributions.” Countries may submit new NDCs upon ratification, but evidence to date suggests countries are not changing their GHG targets upon ratification.

⁴⁶Keohane and Oppenheimer 2016.

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.⁴⁷ Governments interpreted this guidance loosely and submitted INDCs that vary tremendously in their content, detail, as well as ambition.⁴⁸ In this section and the next, I discuss a measurement approach to extract countries’ ambition from their INDCs, while guarding against the documents’ imprecision. I first discuss certain practical considerations in extracting actual emissions targets from the INDCs, and in the next section I discuss how to scale states’ INDCs using considerations of equity.

As a result of the bottom-up design, states’ INDC documents vary in substance and form. Variation in the substance of INDCs provides valuable information about states’ willingness to contribute to climate mitigation; however, variation in form impedes extracting a simple measure of ambition from these documents. The format of states’ Paris targets can be classified into three types of goals: (1) explicit GHG targets, (2) non-GHG policy targets, (3) actions states intend to pursue to mitigate and adapt to climate change.⁴⁹ All Annex 1 countries, and nearly all large emitters, submitted explicit GHG emissions reductions targets, as did many developing countries. Overall, 150 countries submitted explicit GHG targets.⁵⁰ An INDC’s GHG target could pledge, for example, to reduce national GHG emissions by 20% from current levels. Some developing countries communicated policy goals with mitigation co-benefits (e.g., to increase energy efficiency by 20%) or adaptation targets (e.g., to improve management of coastal areas facing flooding and sea level rise). These non-GHG or actions targets cannot be compared with, for example, absolute emissions reductions from a specified base year without a host of non-trivial forecasting and modeling decisions.

⁴⁷UNFCCC 2014, para. 14.

⁴⁸Rogelj, den Elzen, et al. 2016.

⁴⁹WRI 2016.

⁵⁰WRI 2016.

Countries with explicit GHG targets expressed these targets in a number of different formats. The two most prominent formats are base year targets and scenario targets. With base year targets, countries pledge to reduce their GHG emissions by a certain percentage from a given reference year. For example, Canada has pledged to reduce GHG emissions by 30% from 2005 GHG emissions levels by 2030, while Russia will cut by 25–30% from 1990 GHG emissions levels by 2030. Canada and Russia's targets may be similar in headline percentage terms (30% and 25–30%, respectively), but the choice of base years (2005 and 1990, respectively) informs the real size of emissions reductions. Governments may strategically choose base years with higher emissions levels to make any emissions reduction seem larger in percentage terms.⁵¹ Switching Canada and Russia's base years but holding the actual absolute emissions target level constant for each country would imply a 16.5% cut from 1990 levels for Canada and a 8.7–16.6% increase from 2005 levels for Russia. Absolute emissions reductions are essentially unrelated to the headline target percentages. Nonetheless, different countries' base year targets can easily be compared by standardizing targets with common base years. Base year targets have the same structure as the Kyoto targets.

Scenario targets specify emissions reductions from a hypothetical business as usual (BAU) GHG emissions growth scenario. This type of target is common among non-Annex 1, developing countries. For example, Brazil announced its intention to cut GHG emissions by 37% relative to BAU levels by 2025. In a sense, this target structure reflects effort since it provides an indication of how emissions under compliance differ from a no-agreement counterfactual. However, governments are not transparent about how they calculate BAU emissions growth and some countries forecast much quicker GHG growth in the 2015–2030 period than in the previous 20 years. The BAU forecasts are not simple extrapolations of historical growth rates. Just as countries may select base years opportunistically by selecting reference years with higher absolute emissions, they may also forecast exceptionally fast BAU emissions growth to make a nominal emissions cut seem

⁵¹Of the 59 countries with base year targets in the Paris Agreement, 44.1% of countries selected one of the three most favorable years as their base year.

larger. Furthermore, 35 countries do not specify a future BAU emissions level that they intend to cut emissions from, thereby making their targets fundamentally non-quantifiable. Without an emissions reference point, it will not be possible to assess whether actual GHG emissions in 2030 are below BAU levels by the target amount.

Three other GHG target types are worth mentioning. Fixed level targets pledge to keep emissions under a certain level in the future. These are easily re-arranged algebraically to match the structure of base year targets. Trajectory targets intentions to peak emissions by a certain year. However, if no hard cap is given to this peaking level, then peaking cannot be compared to other targets *ex ante*, and will require many additional time periods after the target year to verify that emissions have actually peaked. Finally, intensity targets specify GHG emissions in relation to another variable, often either national gross domestic product (GDP) or population. Forecasting future emissions levels that are consistent with these targets requires forecasting the index variable (i.e., GDP or population) as well and this will inevitably add uncertainty to the forecast. A 30% reduction in the emissions intensity of GDP is not the same as a 30% reduction in absolute emissions even if both can be evaluated *ex post*.

Comparing GHG emissions reductions targets across countries requires knowing the percentage reduction, the reference absolute emissions level from which emissions are to be cut, the target year, and historical emissions levels. Knowing this information allows GHG targets to be scaled on a common metric and compared cross-nationally. However, due to the vagueness of the INDC system, the necessary information for standardizing targets is not available for many countries which makes it impossible to compare some GHG targets with others. In such a case, the percentage reduction could be highly misleading since observers have no reference point to compare emissions with. These uncertainties around target emissions are additional to recognized uncertainties in GHG accounting that stem from land use, uncertainty in historical emissions, and the conditionality of targets.⁵²

⁵²Rogelj, Fricko, et al. 2017.

5.4.3 Re-scaling INDCs to measure cooperation

Comparing a pledge's level of effort and credibility is crucial for sustained conditional cooperation. Widespread under-participation or free-riding on others' costly reforms is likely to undercut collective efforts to reduce GHG emissions. Ideally, a single indicator would capture the effort embodied in a country's INDC; however, identifying a single comprehensive measure has eluded researchers.⁵³ Some metrics are easy to observe, but are relatively removed from actual policy effort and conflate other trends (e.g., aggregate greenhouse gas emissions levels). Some other metrics are closer to the concept of underlying effort, but harder to measure (e.g., marginal cost of abating an additional ton of CO_{2,eq}). Joseph Aldy and his co-authors argue that the best way to counteract this is to use a suite of metrics, much as one would use to assess the health of a country's macroeconomy (e.g., economic growth, inflation, unemployment, trade balance, etc.).⁵⁴ Unfortunately, systematic cross-national data on the marginal abatement cost per ton of CO_{2,eq}, implicit or explicit carbon prices, energy prices, or emissions abatement relative to future trends is not widely available.⁵⁵ Furthermore, to capture the stringency of countries' INDC targets, we would need time-series data for before and after INDC implementation to measure the extent to which states' post-Paris climate policy reflects effort to reduce emissions.

I consider an alternative approach that compares the substance of countries' INDCs against other known parameters to assess the adequacy and ambition of countries' targets. To my knowledge, the nearest approximation to Aldy et al.'s recommendation to use a suite of metrics is to judge a country's Paris pledges against a diverse set of equity standards that reflect different priorities or normative positions as to how future emissions should be allocated between countries to prevent dangerous climate change. Concretely, adopting different normative

⁵³Aldy and Pizer 2016.

⁵⁴Aldy, Pizer, and Akimoto 2017.

⁵⁵Bernauer and Bohmelt develop a state-level indicator of climate cooperation based on emissions trends and adherence to obligations under the UNFCCC and Kyoto Protocols. Their data has not been updated beyond 2008 and it is not clear that it captures ambition in the same sense as the measures based on the Paris pledges. Bernauer and Bohmelt 2013

positions entails assigning weights to different variables that are salient, in this case GHG emissions and wealth. The rationale for focusing on the allocation of future GHG emissions stems from the known natural probabilistic relationship between atmospheric concentrations of GHGs and mean global temperature. Changes in the atmospheric concentration of GHGs are related to changes in temperatures. The Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) has noted that keeping the average global temperature increase below 2°C with a 66% likelihood requires atmospheric concentrations of GHGs to stay below roughly 480–530 ppm, depending on the proportion of CO₂ to non-CO₂ greenhouse gases in the atmosphere.⁵⁶ This creates a carbon budget that may be divided among states following different formulas.

To measure cooperation, I build on data from climate scientists to develop a new indicator of cooperative behavior.⁵⁷ Yann Robiou du Pont and his co-authors develop GHG emissions quotas for states that are consistent with different normative positions on how to allocate remaining GHG emissions consistent with 2°C of warming.⁵⁸ INDCs are difficult to compare because of their different formats and because of the different demands mitigation places on states. The solution to the first issue is to be careful in extracting emissions targets. A solution to the second considers how close this emissions goal is to different ethical ways of allocating emissions. When standards set more or less stringent quotas for countries, and these are developed out of the view of states, we can measure which states set more and less ambitious targets. Robiou du Pont et al. evaluate states' INDCs against five normative positions outlined by the IPCC.⁵⁹ I build on this to extract a measure of the ambition of a country's GHG emissions target in the Paris Agreement on Climate Change by comparing their target to five different emissions trajectories that would be consistent with the Paris Agreement's goals of limiting temperature rise to under 2°C. These nationally determined policy targets indicate a state's

⁵⁶IPCC 2015b, fig. SPM.5.

⁵⁷Robiou du Pont et al. 2017.

⁵⁸Robiou du Pont et al. 2017.

⁵⁹Robiou du Pont et al. 2017; IPCC 2015a, ch. 6.

		GHG per capita	
		No	Yes
GDP per capita	No	CER	EPC (present GHG) CPC (historical GHG)
	Yes	CAP	GDR (historical GHG)

Table 5.1: Inputs to the PRIMAP equity quotas

willingness to contribute to collective mitigation, since states selected their own targets in the Paris Agreement.

This exercise entails allocating finite future GHG emissions to countries based on different combinations of their historical and contemporary GHG emissions per capita and wealth per capita (see table 5.1). Robiou du Pont et al. calculate what amount of GHG emissions would be equitable for each country to emit by 2030 based on the different combinations of the above variables. The capabilities standard (CAP) requires countries with high GDP per capita to undertake stronger mitigation reductions. The equal cumulative per capita emissions standard (CPC) requires countries with high historical per capita emissions to accept stronger mitigation objectives. The equality standard (EPC) requires countries' GHG emissions per capita to converge from their present values to common low levels. The greenhouse development rights standard (GDR) is designed to encompass responsibility and capability and requires countries with high historical per capita emissions and high GDP per capita to emit less. Finally, the constant emissions ratio standard (CER) requires all countries to reduce their emissions at the same constant rate from current levels (e.g., all countries reduce their emissions by 5% from 2010 levels by 2030). Accordingly, each country has five different 2030 emissions quotas informed by an equity standard, each consistent with a distribution of the fixed global emissions budget in 2030.

Most equity standards allow developing country emissions to grow in the near future, before plateauing and declining around mid-century. Developed countries' quotas generally call for stringent emissions reductions. These standards are not designed to be combinable (i.e., if all states simply implemented the standard with

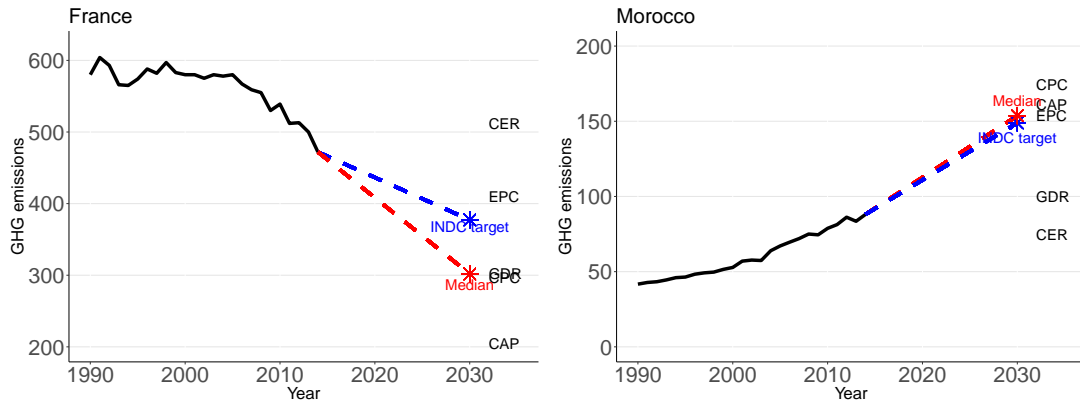


Figure 5.2: GHG trajectories and PRIMAP quotas. France and Morocco’s INDC targets are depicted with blue stars and their 5 PRIMAP quotas are denoted with labels. France’s INDC target is slightly less ambitious than the median of its 5 quotas, whereas Morocco’s is slightly more ambitious. The value of the ambition dependent variable is the percentage gap between each country’s INDC target and the median of their 5 quotas.

their most generous allowance, then expected atmospheric CO₂ concentrations would likely exceed levels compatible with 2°C of warming), but using a combination of standards for different states may reflect a political compromise that improves upon the status quo. I refer to these equity standards as PRIMAP standards, following the name of one of the collaborating research centers that developed the ratings. In figure 5.2, I plot the greenhouse gas emissions levels of France and Morocco, as well as their INDC targets and their assigned 2030 quotas. The plots give an indication of the trajectory of national emissions, as well as the scale of necessary emissions reductions. Both countries’ INDC targets are consistent with some standards, but fall short of meeting others. France, as a wealthier country with greater historical and contemporary per capita GHG emissions, has a more stringent allocation of GHG emissions than Morocco.

I use these quotas as benchmarks to measure states’ ambition in GHG emissions mitigation. Robiou du Pont et al. evaluate whether a country’s INDC passes different equity standards, essentially creating a set of binary pass/fail indicators. I note that this measurement discards useful information about the gap between states’ INDCs and their equity quotas. I construct a continuous indicator of a country’s willingness to contribute to preventing climate change by measuring the distance between a country’s INDC target level and their five PRIMAP quotas.

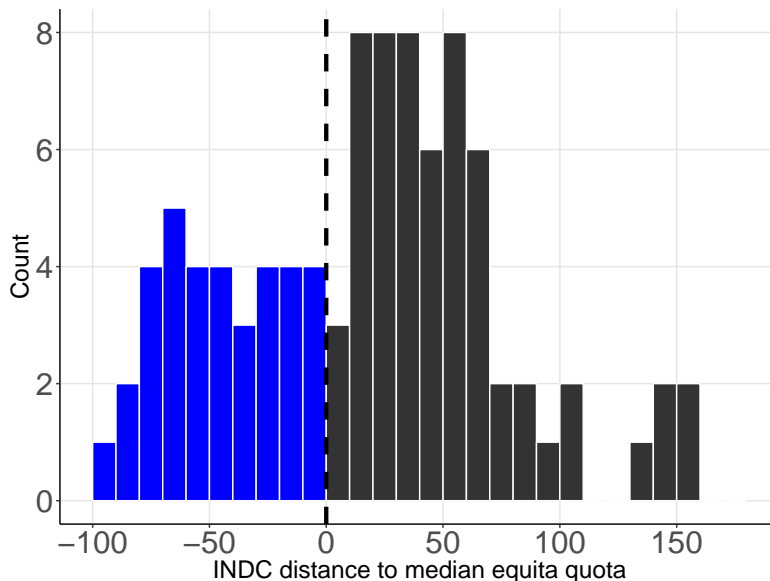


Figure 5.3: Distribution of INDC ambition. Ambition has a meaningful zero indicating INDC targets that are as ambitious as the median of countries’ 5 PRIMAP quotas. Positive values indicate INDCs that are less ambitious; negative values indicate targets that are more ambitious.

I transform the PRIMAP measures to create a new indicator of the percentage difference between a state’s INDC and their five quota levels. The new measure has a meaningful zero, indicating parity between an INDC target and that quota, while negative values indicate INDC targets that propose greater emissions cuts than an assigned quota, and positive values indicate lesser cuts than assigned.⁶⁰ Since individual quotas are favorable to different states, I use each country’s distance to the median of their quotas as my main outcome variable, a measure of effort. This new indicator also has a right-side tail, indicating that many countries have worse targets than the median of their equity quotas and that the most outlying countries have very weak, rather than very strong, targets (see figure 5.3).⁶¹

⁶⁰For a country whose INDC targets $750\text{MtCO}_{2,eq}$ in 2030 and a quota of $1000\text{MtCO}_{2,eq}$ in 2030 for one of their standards, their score on my continuous indicator for target depth is -25 , indicating an INDC 25% more ambitious than their quota. Algebraically: $750\text{MtCO}_{2,eq}/1000\text{MtCO}_{2,eq} = 0.75$; $0.75 - 1 = -0.25$; $(-0.25) \times 100 = -25$.

⁶¹The United States’ value on this indicator is $+43$, indicating that Washington’s INDC target overshoots the median of its equity quotas by 43%. Paraguay has a particularly outlying value at $+684$ (nearly 8 times less ambitious than the median of its equity quotas. Paraguay is omitted from later analyses except where indicated otherwise.

5.5 Data and method

The PRIMAP data yields an indicator of the ambition of countries' Paris GHG targets. However, as explained above, estimating the relationship between participation in climate governance and the ambition of states' Paris targets is complicated by the fact that states submitted their INDCs in very different formats. This ultimately creates the potential for nonrandom sample selection, as only a subset of all INDCs are comparable quantitatively. Of the 195 Parties to the UNFCCC, only 112 have quantifiable GHG targets in their INDCs.⁶² However, 16 of these countries were not scored by Robiou du Pont et al., meaning that they have no data on the outcome variable and cannot be compared using the metric outlined above. A handful of states did not submit INDCs before COP21 in Paris, while many others did not include explicit GHG targets in their submissions. Furthermore, some countries communicated percentage cuts from BAU, but failed to specify forecasted reference levels that emissions would be cut from. These targets are not quantifiable and therefore cannot be compared to other countries' targets on the same metrics. When the Paris Agreement expires, there will be no objective way to assess these countries' compliance with their INDCs. This information may be missing by chance, but given the discretion countries have been permitted under the INDC system, I suspect it may reflect subtle efforts to mask low levels of ambition.

Accordingly, I treat the ambition of countries' INDCs targets as two nested dependent variables: first, a binary decision whether to have a quantifiable GHG target, and second, a continuous decision reflecting ambition. I address missing observations of the outcome variable by modelling the determinants of selection into comparable targets directly using the Heckman estimator for nonrandom sample selection. In a first stage, I estimate a selection equation that specifies the probability of having a quantifiable target. In a second stage, I then estimate the relationship between participation and cooperation, correcting for any bias from that arises from nonrandom sample selection—though I find little evidence of bias. The analysis

⁶²Information on the types of targets contained in countries' INDCs comes from the World Resources Institute. WRI 2016.

is a single cross-section, with the outcome of interest (mitigation pledges) being observed in 2015. Participation in climate institutions is also measured in 2015. Control variables are measured in 2000, the same as in the previous chapter.⁶³ I use multiple imputation to address missing covariate data.

The Heckman model requires both that all variables in the second stage be in the first stage and that a variable be in the first stage that is not in the second stage, an exclusion restriction. This variable must predict sample selection, but not cause the ultimate outcome. I take advantage of the dynamic nature of climate governance, where agreements have been negotiated repeatedly over time, and use an indicator for whether a country had a GHG target in the Cancun Agreements following COP15 in Copenhagen as this variable. 61 countries had GHG targets, whereas a further 37 countries proposed other kinds of targets in the Cancun Agreements, according to the World Resources Institute.⁶⁴

Countries with COP15 GHG targets are more likely to have quantifiable GHG targets in the Paris Agreement and I consider the fact of having a target in 2009 as unrelated to current ambition. There are several reasons why having a COP15 target affects the likelihood of having a quantifiable COP21 target, but not the level of ambition contained in the COP21 target. First, the subset of countries with COP15 targets includes all Annex 1 countries, who had targets under the Kyoto Protocol and all have quantifiable COP21 targets besides Turkey. These countries were almost certainly going to have quantifiable COP21 targets as they carried over the same base year target templates from Kyoto to COP21, changing the reference years and percentage reductions. Annex 1 countries vary in their ambition. Second, non-Annex 1 countries' COP15 GHG targets are almost all vague and non-quantifiable. Accordingly, the Cancun Agreements tasked the UN climate secretariat to organize workshops aimed at clarifying their pledges and their underlying assumptions. Existing developing countries pledges were, thus, inspected in detail and these countries were pushed to adopt the recommendations on transparency.

⁶³Robustness checks allow covariates to be measured in any year from 2000 to 2014.

⁶⁴WRI 2016.

Variable	Obs.	Mean	St. Dev.	Min.	Max.
Ambition (median)	94	15.42	58.33	−94.60	158.82
Copenhagen GHG target	187	0.32	0.47	0.00	1.00
Ambition observed	173	0.54	0.50	0.00	1.00
Ambition (mean)	94	7.69	54.44	−95.95	152.02
Ambition (CER)	94	26.79	65.61	−61.89	323.16
Ambition (CPC)	94	14.67	67.17	−95.05	246.30
Ambition (EPC)	94	5.45	54.51	−94.60	158.82
Ambition (GDR)	94	64.31	296.18	−87.15	2,696.67
Ambition (CAP)	94	60.24	96.59	−98.71	296.77
Ambition observed (2)	162	0.58	0.50	0.00	1.00
Ambition observed (3)	133	0.71	0.46	0.00	1.00
Sum of climate memberships	190	11.85	8.18	3	43
Share of climate memberships	190	21.37	14.00	5.50	71.70
IRT 1D: joiners	190	−0.01	0.99	−2.10	2.38
IRT 2D: deepeners/fragmenters	190	0.01	1.00	−2.07	1.84

Table 5.2: Summary statistics for targets regressions. Missing data is addressed with the same multiple imputation as in chapter 4, for covariates only. Summary statistics for covariates are available in table 4.2. Ambition observed refers to whether a country’s target is quantifiable. Ambition observed (2) drops countries with indexed GHG targets from the analysis; ambition observed (3) drops also countries with non-GHG targets from the analysis.

Finally, as described in the previous section, the lack of structure in the INDC documents allows countries discretion on a number of parameters, such that they may submit substantively weak targets that nonetheless appear moderate or even stringent. Most governments consider GHG mitigation costly and they have taken steps in the INDCs to soften their obligations. For example, Kazakhstan and Kyrgyzstan are both non-Annex 1 countries who submitted non-quantifiable GHG targets at COP15. Kazakhstan went on to submit a quantifiable GHG target in the Paris Agreement that pledged a 15% reduction in GHG emissions from 1990 levels, which amounts to a 2% increase from 2010 levels—Kazakhstan has, effectively, pledged to hold emissions constant though their statement implies that they will cut emissions by 15%. Kyrgyzstan at COP21, by contrast, pledged to reduce its emissions by 29% compared to a business as usual counterfactual, but they did not include this forecasted counterfactual emissions level, making their target

non-quantifiable. The discretion of the INDC system allows countries latitude to mask the levels of their contributions to collective mitigation without resorting to submitting fully non-quantifiable targets.

Having submitted mostly vague targets after COP15, many countries, but not all, shifted to quantifiable targets at COP21, though these targets are not all more stringent or ambitious than countries without COP15 targets. Some countries, such as Brazil, pledged more rapid GHG reductions in their COP15 targets than in their COP21 targets. The COP15 targets were never formalized in international law, as they were also only taken note of in the COP16 decision and collected in a supplementary document. Countries have not been bound to implement or fulfill them. The Cancun Agreements' main successes were the establishment of the Green Climate Fund with new climate finance objectives for developed countries, as well some additional guidance on deforestation, adaptation, and the long-term target of keeping temperature rise under 2°C. The COP15 targets start countries on a pathway toward more quantifiable targets, but not inevitably more ambitious targets.

5.6 Results

The Heckman estimator proceeds in two stages: first, estimating a selection equation that predicts the probability that a country's Paris GHG target is quantifiable, and second, estimating an outcome equation that predicts the ambition of a country's Paris GHG target, accounting for any bias that may arise from some countries not reporting quantifiable targets in the first stage and whose ambition is therefore not observable in the outcome stage. I predict the ambition of countries' Paris targets as a function of three measures of participation in climate governance: (1) a state's count of climate memberships, (2) their share of climate memberships, and (3) their IRT ideal point estimates. The sum and share measures represent naive measures of the extensiveness of a state's engagement with climate governance. If all institutions are alike, then each should count equally, and this is what the sum and share indicators capture. If instead, institutions are of different types and different kinds of states systematically join different kinds of climate institutions,

then the sum and share measures will poorly reflect participation decisions. In this case, the ideal point measures will provide good summaries of state participation. This measurement strategy matches the structure of my expectations in section 5.2.

Specifically, I estimate the following econometric model:

$$\Pr(\text{Selection}_i = 1 | \text{Participation}_i^k, z_i) = \text{probit}(\text{Participation}_i^k \beta_s + z_i \delta + \nu_i) \quad (5.1)$$

$$E(\text{Ambition}_i | \text{Participation}_i^k, z_i, s_i = 1) = \text{Participation}_i^k \beta_o + \lambda_i \rho + \mu_i \quad (5.2)$$

where i indexes states, k indexes the measures of participation in climate institutions ($k = \text{sum, share, IRT}$), while z_i is a vector of country-level data that predicts selection and is taken to be exogenous in the outcome stage (i.e., the Cancun GHG target indicator). The s and o subscripts on the coefficients indicate that the coefficients in the selection stage (equation 5.1) differ from those in the outcome stage (equation 5.2). ρ estimates the correlation between the error terms of both equations (ν_i, μ_i) and provides an estimate of the extent of sample selection bias. If ρ is statistically significant, then there is evidence of nonrandom sample selection. Following Wooldridge, equation 5.2 shows that the expected value of ambition, given z_i and the observability of ambition, is equal to $\text{Participation}_i^k \beta_o$, plus an additional term ($\rho \lambda_i$) that captures sample selection and is evaluated for each country at $z_i \delta$ in equation 5.1.⁶⁵ In subsequent models I add covariates (\mathbf{x}_i) to both stages and re-estimate the association between participation and ambition.

Recall, we are interested in predicting the ambition of countries' Paris targets (the outcome variable in the outcome stage) as a function of participation in climate institutions; however, only a subset of countries have quantifiable GHG targets in their INDCs leading to nonrandom sample selection. The estimation strategy above attempts to estimate this relationship between participation and cooperation, accounting for any bias resulting from sample selection.

⁶⁵The λ_i term is the inverse Mills ratio and ρ is its coefficient. Wooldridge 2013, pp. 615–621.

	I		II		III	
	Selection	Outcome	Selection	Outcome	Selection	Outcome
Climate memberships: sum	0.030 (0.017)	-0.581 (0.410)				
Climate memberships: share			0.017 (0.010)	-0.311 (0.249)		
IRT 1D ideal point					0.117 (0.143)	26.901** (4.712)
IRT 2D ideal point					-0.282* (0.111)	20.063** (4.723)
Copenhagen GHG target	1.345** (0.242)		1.346** (0.241)		1.300** (0.301)	
ρ		-0.469** (0.113)		-0.468** (0.112)		-0.107 (0.180)
Intercept	-0.647** (0.204)	40.077** (10.403)	-0.656** (0.213)	39.650** (10.628)	-0.271* (0.131)	15.022* (6.968)
Observations	173	173	173	173	173	173
Cases observed	94	94	94	94	94	94
Cases censored	79	79	79	79	79	79
Log-likelihood	-607.4	-607.4	-607.5	-607.5	-592.2	-592.2

Table 5.3: 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 PRIMAP equita quotas. Robust standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$

In table 5.3, I first estimate the relationship between participation and targets without covariates. These regressions provide a direct test of my theoretical argument that different types of dissatisfaction condition state participation in climate governance, since dissatisfaction is linked to the ambition of countries' Paris targets. Neither the sum of climate memberships (model I) nor the share of climate memberships (model II) predicts either quantifiable GHG targets (selection stage) or the ambition of Paris GHG targets (outcome stage). These models support my first expectation, that straight counts of membership will not be associated with the stringency of countries' targets. Since participation is driven by two opposing motivations, the straight count conflates the reasons why states join climate institutions. There is no obvious, unconditional relationship between the extensiveness of states' participation in climate governance and the ambition of their Paris targets.

I move on to estimate the relationship between participation and cooperation using the two dimensional ideal point estimates developed in the previous chapter (model III). If the ideal points provide good summaries of states' climate preferences, then they will predict targets on their own. Indeed, the ideal point estimates predict both selection and ambition. This is support for my second expectation, that patterns of state membership in climate institutions, as measured using IRT, will be associated with the stringency of countries' targets. The ideal point estimates capture how states sort themselves within climate governance, where certain clusters of states join similar institutions, irrespective of each state's straight count of memberships. States sort themselves by type through their repeated membership decisions in climate governance. Knowing the patterns of states' institutional memberships before states submitted their INDCs would have helped observers and practitioners predict the ambition of states targets. Crucially, this is true when states' sum and share of climate memberships—more direct measures of engagement, but measures that poorly reflect the nature of participation decisions—do not predict target stringency. This is support for the added value of the IRT model.

The relationships in model III also support my third expectation, that deepeners—countries with low second dimension scores—will have stronger targets than fragmenters. The positive coefficient on the second dimension ideal point indicates that countries with lower second dimension scores have targets that cut emissions below the median of their five PRIMAP quotas: they have more ambitious targets. By contrast, the first dimension score—which more closely captures states' general propensity to participate in global governance—has a positive coefficient. Joiners—states that score higher on the first dimension—have less ambitious targets. Countries that score lower on the second dimension are also more likely to select quantifiable GHG targets in the Paris Agreement, as indicated by the coefficient in the selection stage of model III. However, note that there is a lack of evidence of non-random sample selection in model III, as indicated by the non-statistically significant ρ term. ρ is the estimated correlation coefficient between the error term in the selection equation (equation 5.1) and the error term in the outcome

equation (equation 5.2). The negative sign on ρ is consistent with the exposition in section 5.5, where states may pool on non-quantifiable targets to avoid revealing their unwillingness to contribute to collective mitigation. The Copenhagen GHG target instrument is a strong predictor of observability in all three models. These models demonstrate that mere participation across climate governance is not associated with the quality of states' mitigation targets in the Paris Agreement, and that we need to be attentive to the types of institutions states are joining to understand the relationship between participation and cooperation.

In table 5.4, I add covariates and re-estimate the relationship between participation and cooperation in climate governance. I add the same variables from the multivariate regressions in table 4.4 in chapter 4, except for GDP, since GDP is already indexed as part of the PRIMAP equity quotas and including it as a regressor may induce simultaneity bias.⁶⁶ Since participation in climate governance could impact the covariates, I lag the variables to the year 2000.⁶⁷ The covariates capture structural features of states' positions in climate governance that may raise or lower the costs of undertaking ambitious climate policies and the costs of participating in climate institutions. For example, states that ratify more international environmental agreements (IEAs) may have less costs to participating in climate institutions as well, and they may have more pro-environmental stances to begin with. The opposite may be true for states that depend heavily on fossil fuel extraction.

In regression models with covariates, the raw count and share measures of participation are not statistically significant predictors of Paris targets—further supporting expectation 1. The extent to which states participate in climate institutions is unrelated to the ambition of their mitigation pledges, after controlling for observable variables that may influence both states' underlying propensities to participate in climate institutions and the ambition of their pledges. The ideal point measures remain statistically significant predictors, though the magnitude of the

⁶⁶I add GDP in robustness checks.

⁶⁷I show in robustness checks that the year the covariates are measured in has no effect on the ideal point coefficients.

	IV		V		VI	
	Selection	Outcome	Selection	Outcome	Selection	Outcome
Climate memberships: sum	0.030 (0.024)	-1.072 (0.707)				
Climate memberships: share			0.017 (0.014)	-0.556 (0.406)		
IRT 1D ideal point					0.068 (0.179)	15.189* (7.175)
IRT 2D ideal point					-0.297 (0.152)	11.143* (5.531)
IEA ratifications	0.011 (0.009)	-0.437 (0.292)	0.011 (0.009)	-0.489 (0.277)	0.008 (0.009)	-0.534* (0.264)
Renewable electricity	0.001 (0.003)	-0.331* (0.153)	0.000 (0.003)	-0.335* (0.153)	-0.002 (0.003)	-0.304* (0.148)
Climate vulnerability	-0.009 (0.028)	-2.303 (1.664)	-0.008 (0.028)	-2.326 (1.676)	-0.012 (0.029)	-1.636 (1.552)
EPI	-0.003 (0.019)	0.563 (1.254)	-0.003 (0.019)	0.558 (1.263)	-0.001 (0.020)	0.443 (1.182)
NGOs	-0.009 (0.027)	0.555 (0.776)	-0.009 (0.027)	0.534 (0.807)	-0.012 (0.025)	0.058 (0.751)
Democratic institutions	0.001 (0.049)	2.713 (2.897)	0.001 (0.049)	2.792 (2.902)	0.009 (0.051)	1.934 (2.887)
Fossil fuel rents	-0.150 (0.120)	20.543** (7.173)	-0.151 (0.120)	20.687** (7.306)	-0.149 (0.123)	18.505** (6.304)
Copenhagen GHG target	1.000** (0.328)		0.995** (0.329)		1.036** (0.345)	
ρ		-0.149 (0.177)		-0.155 (0.175)		-0.031 (0.196)
Intercept	-0.198 (2.427)	93.827 (147.358)	-0.231 (2.426)	96.156 (148.501)	0.335 (2.477)	65.210 (136.423)
Observations	173	173	173	173	173	173
Cases observed	94	94	94	94	94	94
Cases censored	79	79	79	79	79	79

Table 5.4: 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 PRIMAP equita quotas (see figure 5.2). Covariates are measured in 2000 and missing data is accounted for using multiple imputation. Robust standard errors in parentheses. * $p < 0.05$; ** $p < 0.01$

coefficients shrink by roughly half. The statistically significant coefficients on the ideal point estimates support expectation 2. States' patterns of climate memberships are important predictors of the ambition of their climate policies. This is especially novel given that more direct measures such as the sum and the share of their climate

memberships are unrelated to their targets. Again, the second dimension ideal points are statistically significant and in the right direction: deepeners have more ambitious Paris GHG targets than fragmenters, which supports the theoretical argument I have advanced in this study and supports the identification of the IRT model parameters, with the second dimension capturing states' support for deeper climate cooperation.

The coefficients for the covariates are mostly as expected. Holding all other variables constant, states that ratify more IEAs have more ambitious targets than states that ratify fewer IEAs and the effect is large substantively. Similarly, states that rely more heavily on fossil fuels have less ambitious targets than states that rely less on fossil fuels, and the effect is again large substantively. Finally, states with more electricity generated from renewable sources have more ambitious targets than states that generate a smaller share of their electricity from renewable sources, though the effect is weaker substantively. I find no evidence relating states' vulnerability to climate impacts, their domestic environmental performance, democratic political institutions or domestic environmental NGOs to the ambition of their Paris targets. It could be the case that the IRT estimates account for the effect of these variables on states' climate policies, however, only climate vulnerability and domestic NGOs were statistically significant predictors of participation in table 4.4. Furthermore, if this were the case, then we might expect these variables to be statistically significant in models IV or V, where I evaluate more naive measures of participation. Future work could consider the conditions under which these variables influence climate policy more explicitly.

In models IV–VI, I again find no statistical evidence of sample selection bias. The high p -value of the ρ term suggests that the pattern of missingness on the dependent variable is not systematically related to its observability. States that did not submit quantifiable GHG targets in their INDCs are expected to have less ambitious targets than states that submitted quantifiable GHG targets, but the effect is not statistically significant. This is an interesting finding in light of the presumption that states could use the discretion and vagueness of the INDC system to obfuscate the depth of their willingness to contribute to collective

action. Furthermore, neither of the covariates nor the measures of participation are statistically significant predictors of observability. It may be the case that information related to quantifiability is missing more or less at random and that obfuscating states mask the depth of their contributions through other means, such as the choice of base year, which is accounted for directly in the PRIMAP measure.

Figure 5.4 summarizes the results of a series of robustness checks of these main results. I plot the outcome stage coefficient and the 95% confidence intervals for the ideal point parameters for different regression specifications. The top models present the results displayed above in tables 5.3 and 5.4. The extended controls specification is table 5.4 and the controls specification retains only the statistically significant coefficients from model VI. In subsequent models, I add additional covariates, consider alternative criteria for observability, evaluate alternative operationalizations of the dependent variable, and consider two different estimation options. The results are statistically and substantively consistent.

I begin by adding domestic GHG emissions (logged) to the model and re-estimating the relationship. I find no statistically significant relationship between GHG emissions and the ambition of states' targets, and that the coefficients on the ideal points remain stable. I next add GDP per capita (logged) and then its square term to estimate the relationship between wealth and the ambition of countries targets. I find that states with higher GDP per capita adopt less ambitious targets than countries with lower GDP per capita, but then find evidence in favor of a downward opening non-linear relationship between GDP per capita and ambition in the next model. Holding other variables at their mean values, states adopt less ambitious targets as they grow wealthier, but the relationship peaks around 14,000USD per capita—roughly, the level of Barbados, the Czech Republic, or South Korea in the year 2000—before declining again. The second dimension ideal point estimate is no longer statistically significant in the model with the non-linear relationship between GDP per capita and Paris targets ($p = 0.0523$). This is provisional support for the environmental Kuznets curve, where environmental quality is high in poor and rich countries, but environmental quality is worse in

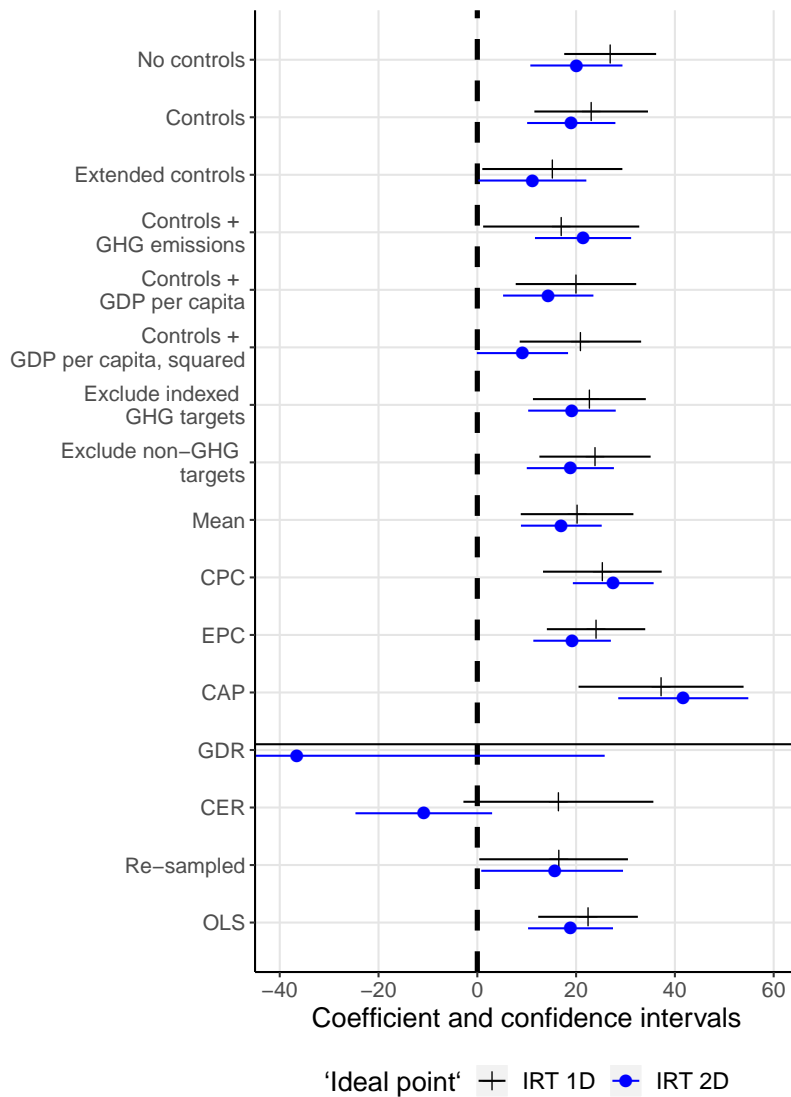


Figure 5.4: Robustness of outcome stage ideal point coefficients. Regression coefficients and 95% confidence intervals for different model specifications. Coefficients for first dimension scores are plotted in black and second dimension scores are plotted in blue. Confidence intervals are truncated for the GDR standard, but are IRT 1D: 79.6 [-59.1, 218.3] and IRT 2D: -36.5 [-98.8, 25.8].

middle income countries. However, it should be re-iterated that GDP per capita is indexed in the outcome variable, which likely introduces simultaneity bias as GDP per capita is now on both sides of the regression equation.

The results are also robust to using more restrictive criteria for sample selection. I first exclude countries that have indexed GHG targets from the analysis and re-estimate the relationship. The ideal point coefficients are substantively and

statistically unchanged, and ρ is not statistically significant. I then exclude countries with non-GHG target or that pledged actions only, leaving the subset of countries with non-quantifiable targets to be only countries that expressed their targets as deviations from business as usual, but that did not specify a future emissions level. This is a very sharp comparison where only countries with scenario targets missing forecasted future emissions levels are the unobserved cases, but I find no evidence of nonrandom sample selection, as indicated by the non-statistically significant ρ term. Again, the ideal point coefficients are unchanged.

I also investigated the distance between each country's INDC target and each of the PRIMAP equity quotas individually, as well as for the mean as an alternative measure of central tendency. The results are broadly similar. The CPC and EPC standards require stronger mitigation for countries with high historical and present GHG emissions per capita. Ideal points are strong predictors of target stringency for these two standards. The CAP standard allocates future emissions based on GDP per capita and ideal points are again strong predictors. Ideal points are not strong predictors of states' distance from their GDR quota, which allocates emissions using both GDP per capita and historical GHG per capita. The GDR outcome is not estimated precisely, as indicated by the wide confidence intervals, which have been truncated in figure 5.4.⁶⁸ The CER measure allocates emissions on the basis of a common percentage cut for all countries, and the ideal points do not predict targets using this standard. Note that the CER results are the same as using each country's real percentage emissions reduction from 2010 levels as the outcome variable. The results for the mean are very similar to those using the median.

Since the ideal point estimates contain uncertainty, I re-sampled countries' ideal points from their highest posterior density interval 1,000 times to assess how the uncertainty in the point estimates in the regression outputs. In this respect, the ideal points that are more precisely estimated to count for more in determining coefficients. The results are nearly unchanged. In the appendix, I detail this procedure. Since the ρ term is never statistically significant when including the

⁶⁸The regression coefficients and 95% confidence intervals for the ideal point estimates using the GDR outcome variable are IRT 1D: 79.6 [-59.1, 218.3] and IRT 2D: -36.5 [-98.8, 25.8].

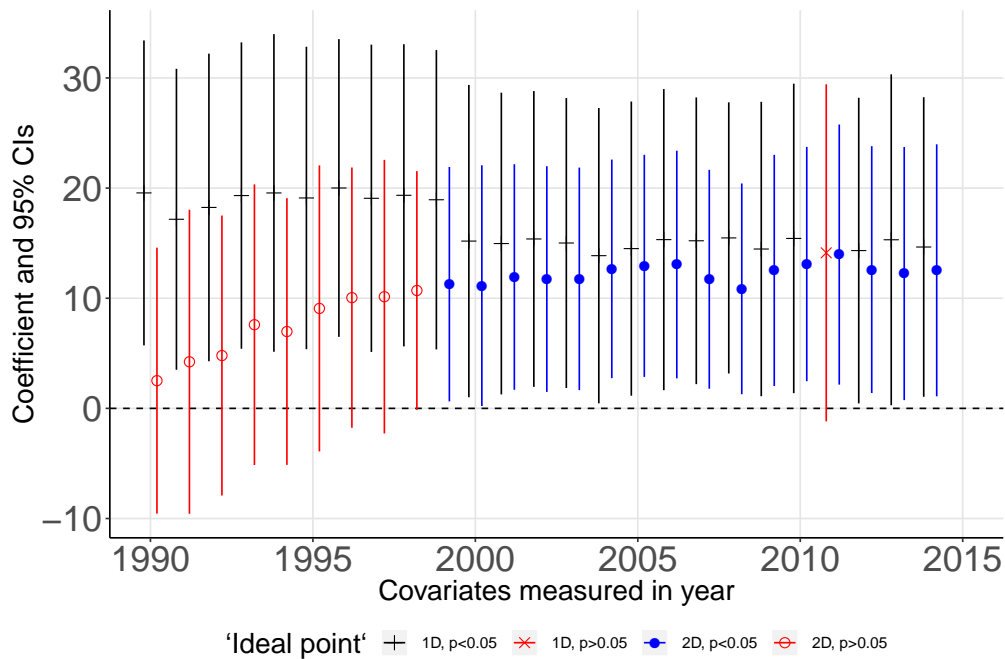


Figure 5.5: Outcome stage regression coefficients for IRT ideal points in model VI when covariates are measured in different years from 1990–2014.

ideal point estimates or covariates, I also estimate the model using ordinary least squares (OLS) without a correction for nonrandom sample selection and find the same results. I also re-estimate the relationship measuring the covariates in every year from 1990 to 2014. I plot the coefficients in figure 5.5. The coefficients for the ideal point estimates in both dimensions are stable, substantively and statistically significant for all years from 2000 onward.

The results in table 5.3 support considering states' ideal points as accurate summaries of states' preferences. Knowing states' patterns of institutional climate memberships helps predict the ambition of their Paris targets. This holds even though the sum and the share of states' climate memberships are not statistically significant predictors of targets. This finding runs contrary to a set of arguments made by proponents of the transactions costs approach, the expressive theory, and scholars concerned about forum shopping in dense institutional environments. Though not stated directly, these arguments all imply that the extent of states' memberships should be a good indication of their preferences. I show instead

that patterns of institutional memberships predict cooperative behavior rather than the extent.

The results in table 5.4 nuance this finding. They suggest that membership in climate institutions is associated with the stringency of countries' targets, accounting for country-specific traits that lead states to join climate institutions. Membership in climate institutions is not randomly assigned, so these results are not causally identified, but they point to a strong and consistent relationship between the type of institutions that states join and their targets. Scholars have been concerned that states use dense institutional environments to weaken their international obligations, while others have been more optimistic about how coordinating across an issue-area could support cooperation. The results I present help adjudicate these arguments. Essentially, I show that states have weaker targets the more they participate in climate institutions (first dimension scores, joiners), consistent with those concerned about forum shopping and that states use dense institutional environments to weaken their obligations. However, holding this general propensity to participate constant, states with portfolios of climate institutions that are more tilted toward implementation (second dimension scores, deepeners) have stronger targets. Deepeners have more ambitious targets than fragmenters.

These results are consistent with my theoretical argument about dissatisfaction driving institutional proliferation. States join climate institutions in response to the pace of cooperative progress at the UNFCCC. States that perceive cooperation to be proceeding too slowly join new climate institutions that focus on implementation and capacity-building. States that consider cooperation to be proceeding too quickly at the UNFCCC also join new climate institutions, but they join a different subset of these. These states join institutions that focus on networking and negotiations, thereby duplicating existing functions of the UNFCCC and fragmenting the global response to climate change across forums. Accordingly, I call this type of states fragmenters and the previous type of states deepeners. States' preferences for fragmentation versus substantive cooperation are summarized in their ideal point estimates, particularly along the second dimension. The statistical analyses above

demonstrate that deepeners consistently adopt more ambitious Paris targets than fragmenters. This finding holds controlling for a number of variables that might influence both participation decisions and the ambition of states' climate policies.

5.7 Conclusion

In this chapter, I bring my theoretical argument full circle. I connect my argument about states' motivations for participating across climate institutions to their cooperative behavior in the Paris Agreement. I have argued that state participation in climate institutions stems from their perspectives on the pace of cooperative progress at the UNFCCC. Some states are fearful of looming legally binding mitigation obligations and join outside institutions to weaken coordination and undermine collective action. These states, which I have termed fragmenters, should also pledge weak targets in the Paris Agreement. By contrast, states that would prefer climate cooperation to proceed at a quicker pace than the UNFCCC allows join outside institutions to build capacity and support cooperation. These deepeners should adopt more ambitious targets.

Indeed, this is what I find empirically. Deepeners have more ambitious targets than fragmenters. This sheds light on how states use dense institutional environments. It is not the case that ambitious states or non-ambitious states join more climate institutions in general, but instead that states sort themselves in climate governance through their patterns of institutional membership. Dissatisfied deepeners join different climate institutions than dissatisfied fragmenters. The latter join institutions that focus on networking and negotiations, while the former join forums that focus on building capacity to implement climate policy.

Is international cooperation shallow or deep? Critics assert that international institutions do little more than codify behaviors states would have taken already. This position is difficult to evaluate since we cannot observe states' behavior in the non-institutionalized counterfactual. However, this argument also assumes a particular mode of international cooperation, wherein institutions set common policy targets that all members must adopt. Spatial bargaining models show how

this style of treaty-making leads cooperation to converge to the policy preferences of states with the highest compliance costs.

Yet, not all institutions set policy this way. In the Paris Agreement on Climate Change, states set their own policy targets. While we still do not observe their policies in the non-institutionalized counterfactual, we can scale the depth of their nationally determined policy goals. This measure diverges in some respects from the question of whether international institutions induce behavioral change among members, but it sheds light on the key question of which states are willing to contribute to collective action. Rather than considering whether international cooperation in general imposes deeply substantive obligations, we can consider whether individual states are willing to undertake deeply substantive policies to address an externality. Treaty design may allow for finer measures of states' cooperative behavior.

6

Conclusion

From states' speeches at the United Nations to their domestic policies, it is apparent that states have different preferences in climate politics. In this study, I have highlighted another domain within which we can observe this clash of views playing out—namely, across the increasingly distributed international climate architecture. Institutional theory argues that a key function of international institutions is to screen states by type, separating states with cooperative preferences from those with more opportunistic interests. The major UN climate treaties do not act in this way. They lack the costly membership criteria that screening theory requires. Different types of states, therefore, pool in the universal membership UN climate treaties.

I offer another angle into debates about institutional screening by drawing attention to the proliferation of international institutions within climate politics. States have created over 65 different international institutions to manage climate change. These institutions are not exact replicas of the UNFCCC. They articulate alternative principles, address neglected topics, and have very different sets of state members. In this latter respect—variation in state membership—extra-UNFCCC climate institutions refract existing debates about institutional screening. Existing theory highlights how costly membership criteria in individual institutions impose prohibitive costs on states that do not actually want to cooperate leading these

states to forgo joining. These individual costly criteria are lacking in climate politics, though they have been proposed by countless observers.

Yet, observers need not be in the dark about state preferences. My analysis suggests instead that states sort themselves by type through their repeated membership decisions across the dense institutional landscape. I offer two new categories of states—deepeners and fragmenters—that help explain membership. Deepeners are dissatisfied with the slow pace of collective mitigation obligations at the UNFCCC and they join new climate institutions to accelerate climate governance. Fragmenters, by contrast, fear the sovereignty costs of deeply substantive mitigation obligations and they use new climate institutions to obstruct cooperation. These two categories would be purely semantic were they not observable in some way.

I propose that states' patterns of institutional memberships convey this information. These types of dissatisfied states join climate institutions that focus on different kinds of tasks. Fragmenters join new negotiating and networking venues. They use these forums to appear engaged in climate politics, articulate and build support for rival norms, and ultimately obstruct collective action. Deepeners have no time for this. They join new institutions that focus on building domestic capacity to implement ambitious climate policy. This leads deepeners and fragmenters to have different patterns of participation across climate governance, even though both types of states may participate extensively. To the casual observer, extensive participation may appear to be an indication of intense support for climate cooperation. However, when seen through the lens of contested multilateralism, extensive participation is a suspicious flag.

I develop a new measure of participation based on my theoretical argument for how dissatisfaction relates to participation. I use a statistical measurement model to identify deepeners and fragmenters. The key advantages of this model are that it uses the full set of states' institutional memberships in climate change to estimate their preferences and that it can account for these different motivations, which more naive measures conflate. The institutionalist literature, I argue, has focused too much on individual institutions, and often on prominent or "important" institutions

that are not representative of institutions in general. Considering participation at a higher level of aggregation more accurately reflects how states are situated within issue-areas. It also has theoretical and empirical payoffs for understanding why states join international institutions and how participation relates to cooperation.

My analysis shows that measuring participation at the level of the issue-area helps predict states' subsequent behavior. States set their own policy targets in the Paris Agreement and I show that the ambition of states' targets matches their participation across climate institutions. My measure of climate preferences derived from institutional memberships demonstrates that deepeners adopt stronger GHG targets than fragmenters. By contrast, the extent of state participation—measured as the sum or the share of institutional memberships—is unrelated to targets. This highlights the added value of modeling state membership decisions multidimensionally.

My study of international climate politics also helps to adjudicate how states use dense institutional environments. There are two competing ideas about how overlapping institutions relate to cooperative outcomes. The first school sees overlapping institutions creating fragmentation and undermining cooperation, while the second sees them as complementary and supporting cooperation. I argue that the key to resolving these debates lies in understanding why states join climate institutions. Participation and cooperation are intimately related when seen conceptually through the lens of deepeners and fragmenters. The experience of climate politics suggests that carefully theorizing states' motivations for creating overlapping institutions clarifies whether overlapping institutions support or undermine cooperation.

Climate politics is a productive issue-area in which to study institutional proliferation because its distributed institutional architecture intersects with the centralized, UN-led governance process. Essentially, states make many participation decisions across climate institutions, the subset of members then interact in the forums they join, and finally all states return to the annual COPs to deliberate over collective governance outcomes. Climate politics takes on a multi-speed element

where members tailor the depth of their engagement with the issue-area as a whole and then all states converge at the UN climate conferences, where we can observe all states' behavior at the same time. Researchers of other dense issue-areas should search for instances where states converge to study how institutional proliferation affects cooperation.

To study the link between participation and cooperation, I exploit an unconventional institutional feature of the Paris Agreement that may help scholars in other issue-areas. The Paris Agreement is a boon to applied researchers since it takes this convergence of the universal governance process (i.e., COPs) and the distributed, parallel governance process (i.e., extra-UN climate institutions) one step further and asks each state how much they are willing to contribute climate change mitigation. Most institutions set common policy targets that all members must adopt, which skews membership and leads policy-making to match the policy preferences of the lowest common denominator. The Paris Agreement, by contrast, allows states to declare their own policy targets. Some states set ambitious goals, while others set poor ones. Scholars can gauge levels of cooperative behavior more precisely in these instances of nationally determined contributions. To the extent that this institutional design has analogues in other issue-areas, scholars may find a new ingress to debates about the depth of international cooperation.

The Paris Agreement's target-setting system partially recasts climate politics in terms of national action instead of internationally-coordinated collective action. Instead of negotiating targets multilaterally, the Agreement lets states tailor their commitment to meet their domestic policy constraints. However, it remains to be seen how successful this shift from the international level to the national level will be. The UN-led climate process retains elements of its traditional top-down structure alongside its more modern focus on national action. This mirrors in an interesting way recent debates about how international institutions affect state behavior, which have partially shifted from thinking about the inherent constraints that institutions might impose on members to how institutions can enforce obligations

by channelling domestic politics.¹ Elements of these two designs may be synergistic, but can also introduce tensions.

Consider the implementation and ratcheting of states' NDC commitments over time. The Paris compromise lets states pursue climate action at the speed they are comfortable with, but still expects states to implement their NDCs. To this end, negotiations continue at the COPs over the procedures for holding states accountable for their targets. Accountability, monitoring, transparency, and reciprocity are a package of concepts that go together to support collective action. However, intrusive rules on transparency may dissuade states from setting ambitious targets, especially if states will be reproached for failing to meet them. Future work could consider how the level of detail of states' current NDCs relates to their positions on transparency in the post-Paris negotiations.

And yet, clear rules on transparency may also strengthen implementation to the extent that they provide information for domestic and transnational advocacy groups about the gap between states' climate policies and their commitments. The Paris Agreement creates an obligation to implement NDCs, even if it does not bind states to meet their GHG targets. NGOs, such as the Climate Action Tracker, note that states' current policies fall well short of those needed to reach their NDCs, while the NDCs collectively fall well short of the 1.5°C and 2°C temperature goals. The NDCs may act as hooks for activists, linking states' international obligations to domestic judicial litigation that holds states accountable for their climate goals. The international and the domestic levels may sync up to facilitate climate action, using domestic activists and courts to drive compliance with international law. Future research could consider how states' Paris targets filter through domestic politics, perhaps as a function of their level of ambition and detail.

The Agreement also creates an obligation on states to submit new NDCs in cycles and contains provisions to monitor the consistency of collective progress with the 2°C temperature goal. Here again the enduring top-down elements intersect with the new logic of domestic climate action. Rules on transparency and monitoring

¹Contrast, for example, Andrew Guzman's focus on reputation with Beth Simmons's focus on domestic mobilization. Guzman 2008; Simmons 2009.

will allow states to gauge the contributions of their peers more accurately and take this into account when selecting the level ambition of their next NDCs. The success of these oversight mechanisms will depend on whether states use them to learn from their peers about low cost mitigation and adaptation opportunities or to jealously guard their sovereignty. However, developing clear rules on transparency has proven contentious and may dissolve the fragile consensus that enabled the Paris Agreement. As states maneuver between the international and domestic sides of the new climate politics, they will be torn by competing logics.

These considerations all highlight that international climate politics will continue to play out over time. The Paris Agreement has not solved climate change with a new set of coherent rules. Instead it has changed some of the ways states interact, raised the salience of some issues, and diminished that of others. I expect states will continue to use outside climate institutions to shape the interpretation of new rules.

Appendices

A

List of climate governance institutions

Table A.1: List of climate governance institutions

Climate governance institution	Year created	Number of members
Asia Forest Partnership	2002	12
Activities Implemented Jointly	1995	51
Alliance of Small Island States	1990	37
Asia-Pacific Partnership on Clean Development and Climate	2005	7
Africa Renewable Energy Initiative*	2015	.
Adaptation for Smallholder Agriculture Program	2012	33
BioCarbon Fund	2004	13
Bonn Challenge	2011	23
Cartagena Dialogue	2010	54
Congo Basin Forest Partnership	2002	20
Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants	2012	50
Clean Development Mechanism	2001	82
Clean Energy Ministerial	2009	23
Climate Investment Funds (Clean Technology Fund + Strategic Climate Fund)	2008	71
Carbon Partnership Facility	2009	13
Carbon Pricing Leadership Coalition	2015	19
Carbon Sequestration Leadership Forum	2003	24
Climate Technology Initiative	1995	10
Doha Amendment to the Kyoto Protocol	2013	59
Efficient Electrical End Use Equipment Initiative	2008	11
Forest Carbon Partnership Facility	2008	61
Food Security Climate Resilience Facility	2015	5
Global Alliance for Clean Cook Stoves*	2010	.
Global Alliance For Climate-Smart Agriculture	2014	24

Global Bioenergy Partnership	2007	24
Global Climate Change Alliance	2008	11
Green Climate Fund*	2010	.
GEF Climate Window	1992	153
GEF Special Climate Change Fund and Least Developed Countries Funds	2001	128
Global Facility for Disaster Reduction and Recovery	2006	51
Global Geothermal Alliance	2014	32
Global Gas Flaring Reduction Partnership	2002	16
Great Green Wall for the Sahara and the Sahel Initiative*	2008	.
Global Methane Initiative	2004	43
Global Research Alliance on Agricultural Greenhouse Gases	2009	46
Global Resilience Partnership	2014	2
International Carbon Action Partnership	2007	15
International Energy and Climate Initiative - Energy+	2010	17
International Partnership for Energy Efficiency Cooperation	2009	15
International Partnership for the Hydrogen Economy	2003	18
International Partnership on Mitigation and Measuring, Reporting and Verification	2010	96
International Renewable Energy Agency	2009	101
International Zero-Emission Vehicle Alliance	2015	4
Joint Implementation	2002	31
Johannesburg Renewable Energies Coalition	2002	90
Kyoto Protocol	1997	190
Low Emission Development Strategies Global Partnership	2011	23
Major Economies Forum on Energy and Climate (formerly, Major Economies Meeting)	2007	16
Mitigation of Climate Change in Agriculture Programme	2010	3
Mission Innovation	2015	21
Prototype Carbon Fund	2000	17
Petersberg Climate Dialogue	2010	43
Partnership for Market Readiness	2011	31
REDD+ Partnership	2010	56
Renewable Energy and Energy Efficiency Partnership	2002	47
REN21	2005	10
Soils for Food Security and Climate	2015	30
SIDS Lighthouses Initiative	2015	32
Tropical Forest Alliance 2020	2012	8
United Nations Framework Convention on Climate Change	1992	193
UNIDO-UNEP Green Industry Platform	2009	28
UN-REDD Programme Fund	2009	68
Zero Routine Flaring by 2030 Initiative	2015	19

* indicates membership not available

C

Additional IRT considerations

Contents

C.1	Strengths and weaknesses of IRT modeling	215
C.2	Discrimination parameters	220
C.3	Alternative item constraints	222
C.4	Ideal points of simulated states	225
C.5	IRT ideal point uncertainty	227

C.1 Strengths and weaknesses of IRT modeling

Modeling membership in climate institutions has a number of advantages over using more naive sum or share measures of membership. A sum or share implies that every climate institutional membership is equal, since each institution counts the same in the measure, namely 1 or $1/J$ 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. Granted, if we observe that Belarus is a member of 4 climate institutions and Morocco is a member of 20, then we might start to make some inferences about their preferences. Nonetheless, 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 mischaracterize the extent of membership and the share of memberships would be a more suited measure. However, the share may be sensitive to floor and ceiling effects. A state that is a member of 65% of all institutions could have 42 memberships (out of 65), 29 memberships (out of 45) if eligibility varies widely across states.¹ 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. 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 donor's side and a recipient's side, where only Annex 2 parties to the UNFCCC are eligible to be donors and only non-Annex 1 parties are eligible as recipients.

I considered using more eligibility restrictions, but decided against it. First, there are an enormous number of possible eligibility considerations, each of which may be difficult to justify, and all of which would require gathering lots of new data to implement. Second, states that are distant may nonetheless have significant resources and interests in governing with actors well outside their region—Norway's extensive engagement with forestry governance in developing countries stands out, some of which is bilateral and is therefore not included in my study. Finally, these new climate governance institutions are quite easy to set up, and therefore, states that are unhappy with their menus of choice can create a new institution more

¹45 is the minimum of eligibility in the dataset.

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.

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, I think this actually mis-characterizes the nature of affinity in climate politics. Two states may differ on some structural characteristics (e.g., forests), but share others (e.g., vulnerability) 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. States are positioned in the IRT model based on their shared and divergent membership choices. 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 attempts to measure. 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 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.

Using IRT to study membership in climate governance has an under-appreciated advantage over existing uses in legislative and judicial politics, where the measurement technique was first widely adopted in political science. 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 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. Regression analysis suggests separation of climate ideal points along structural lines, but visual inspection highlights that this separation is not perfect or even obvious as in the legislative context. This actually illustrates a strength of using IRT to measure membership since states are positioned based

on their membership choices across a range of institutions instead of elevating a handful of individual institutions that may not be representative of the population.

C.2 Discrimination parameters

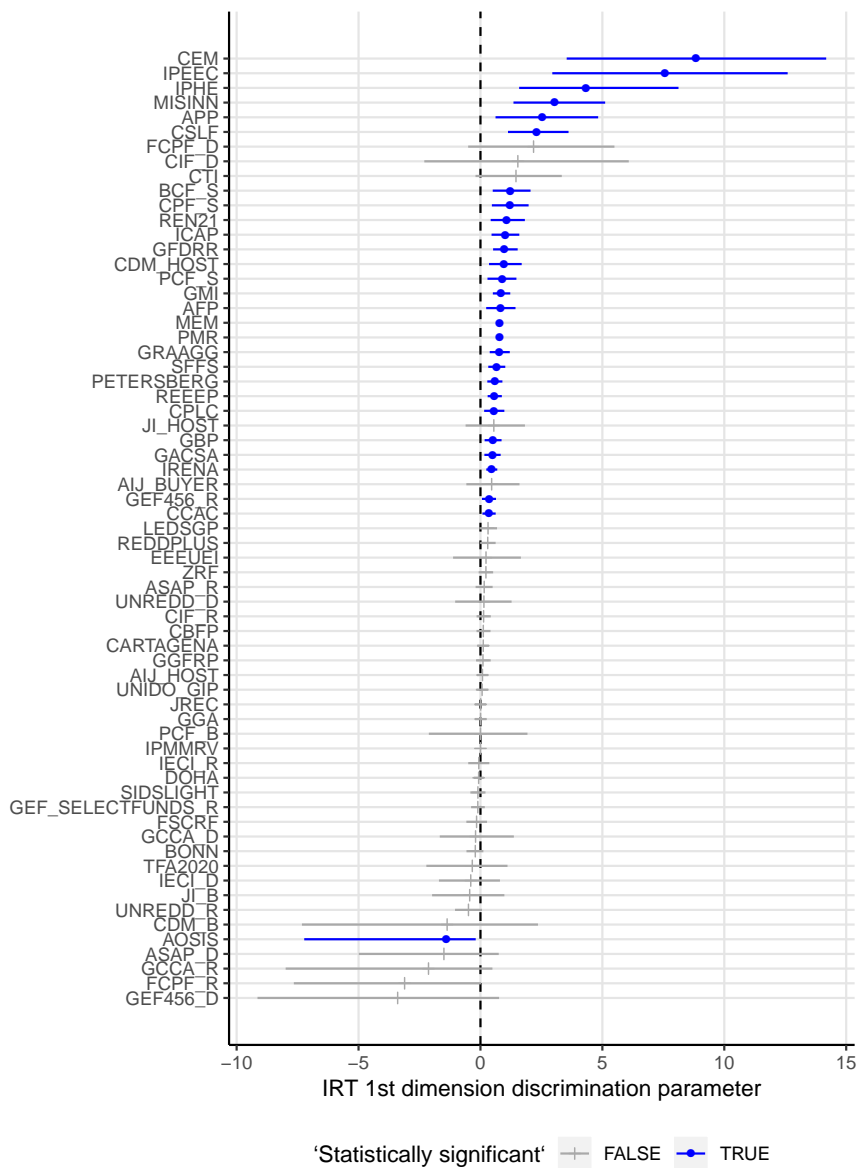


Figure C.1: First dimension discrimination parameters. Suffixes in institutions' names refer to climate finance institutions that have donors (_D) or recipients (_R); hosts of climate finance projects (_H), sellers of mitigation offsets (_S) or buyers of these (_B).

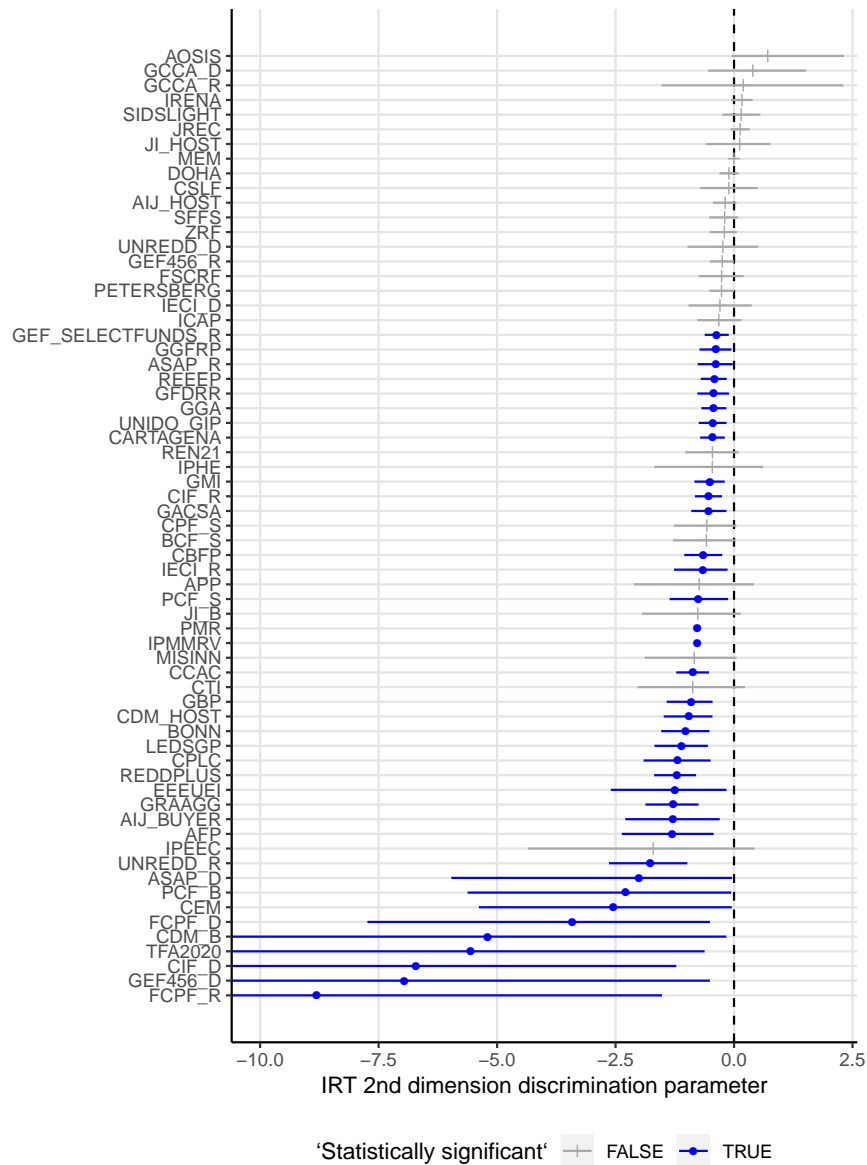


Figure C.2: Second dimension discrimination parameters. Suffixes in institutions' names refer to climate finance institutions that have donors (_D) or recipients (_R); hosts of climate finance projects (_H), sellers of mitigation offsets (_S) or buyers of these (_B).

C.3 Alternative item constraints

In section 4.3.3, 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 conventional solution to this conceptual issue is to use constraints on a subset of discrimination parameters to orient the model (east-west, and north-south). 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 the chapter, states that join the Major Economies Forum 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 ($\beta_{MEF,d=1,2} = 1, 0$); 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 be unaffected by this membership ($\beta_{IPMMRV,d=1,2} = 0, -1$); and finally, states that join the Partnership for Market Readiness will score high on the first dimension and low on the second dimension ($\beta_{PMR,d=1,2} = 1, -1$). 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 ($\beta_{GFDRR,d=1,2} = 1, 0$); I constrain the Cartagena Dialogue to have a positive first dimension discrimination parameter and a negative second dimension discrimination parameter ($\beta_{Cartagena,d=1,2} = 1, -1$); and I leave the IPMMRV constraints unchanged ($\beta_{IPMMRV,d=1,2} = 0, -1$). I then re-estimate the IRT model. With these constraints, the first dimension still separates high participants from low participants—joiners—and the second dimension still separates deepeners from fragmenters.

The Cartagena Dialogue (54 members) was formed in 2010 by an ambition subset of UNFCCC Parties frustrated by the lack of progress at COP15 in Copenhagen. The forum has consciously sought to assemble a mix of engaged and ambition developed and developing countries. As the Dialogue selects more engaged members, a positive $\beta_{j,d=1}$ helps orient the joining dimension and by selecting more ambitious members, a negative $\beta_{j,d=2}$ helps orient the ambition dimension. Cartagena has been open to new members and issues joint statements from coordination meetings before the annual COPs.

The GFDRR (51 members) is an initiative managed by the World Bank that “helps developing countries better understand and reduce their vulnerability to natural hazards and climate change.”² Membership is again a blend of developed and developing countries. The GFDRR does not advertise itself on the basis of GHG mitigation or raising ambition in the climate regime. It is mostly focused on adaptation and a cynical perspective would note that its members include many countries with high fossil fuel extraction, such as Kuwait, Qatar, Russia, Saudi Arabia, and the United Arab Emirates, 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 three sets of $\beta_{j,d}$ constraints specified in the two-dimensional model have values near the center of the distribution of estimated discrimination parameters, meaning that they beyond setting the rotation of the

²GFDRR 2018.

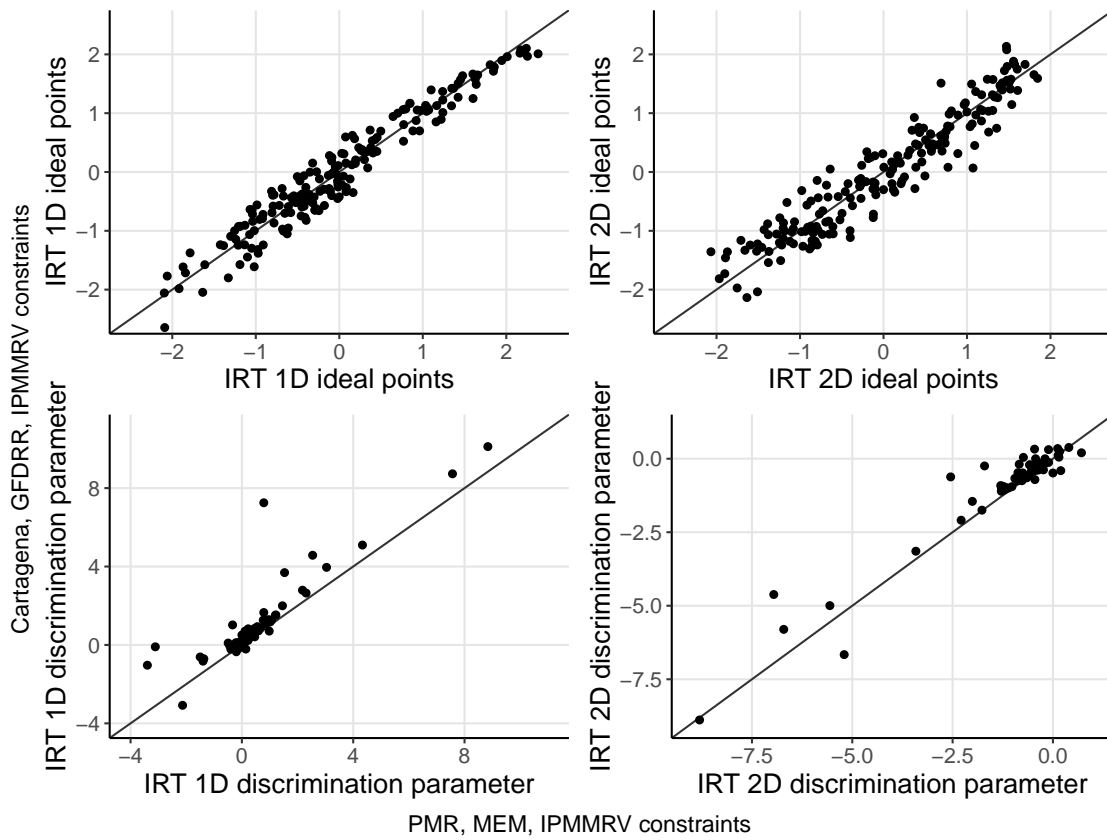


Figure C.3: Ideal points and discrimination parameters are robust to different item constraints. Background diagonal line is $y = x$. Constraints used in chapters 4 and 5 are along the x -axis.

outputs, they are not themselves a main determinant of state ideal points and the other discrimination parameters.

Figure C.3 shows that the two set of ideal points are virtually identical. The Pearson correlation between first dimension scores across models is $r_{x,d=1} = 0.97$ and between second dimension scores is $r_{x,d=2} = 0.95$. 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 ($r_{\beta_j,d=1} = 0.89, r_{\beta_j,d=2} = 0.96$). Using these ideal points in the regression models in table 5.3 and 5.4 produces stronger statistical results than the ones presented in text. In further tests, not show, I also establish that the ideal points are not sensitive to the choice of starting seed.

C.4 Ideal points of simulated states

I now consider the ideal points of a handful of simulated states. I create new observations in the climate institutions dataset corresponding to simulated states that join different subsets of institutions. Specifically, I create states that join every climate institution that focuses on (1) forests, (2) fossil fuels, (3) providing climate finance (donors), (4) receiving climate finance (recipients), and finally (5) a state that joins the ten largest membership climate institutions. I then re-run the IRT model.³ I plot these new states in blue at the location of their estimated ideal points in figure C.4. All simulated states ratify the UNFCCC and Kyoto Protocol and then only join the schemes that match their simulated condition.

Note that the “fossils” state is estimated to have a very high second dimension score, situating it as a fragmenter.⁴ This reflects that the states that join institutions that focus on fossil fuels cluster together, otherwise the ideal point would drift toward the center. It also reflects an expectation that this state would be hesitant to accept deeply substantive climate cooperation. It shares common memberships with states that rely heavily on fossil fuels, such as Bahrain, Russia and Saudi Arabia. It also has a high first dimension score, despite joining only the UNFCCC, Kyoto Protocol, and four climate institutions, which reflects that it shares membership with states that join the most institutions.⁵ While it is parsimonious to refer to the first dimension as the “joiners” dimension, first dimension scores actually reflect both the number of climate institutions a state joins weighted by how often the other members of those institutions join lots of institutions. The simulated state that joins the ten largest institutions helps illustrate this point. The “largest” state has an ideal point around (-1, -0.5), placing it near the center of the climate governance space. Since it joins institutions that have lots of members ($\approx 60+$) and since most institutions actually have small memberships, its ideal point shifts

³The ideal points of actual states are unchanged by the inclusion of these simulated states, which provides further support for the robustness of the ideal points across model specifications.

⁴This state joins the Carbon Sequestration Leadership Forum, the Global Gas Flaring Reduction Partnership, the Global Methane Initiative and the Zero Routine Flaring Initiative.

⁵The difficulty parameters and first dimension discrimination parameters of these schemes are relatively high.

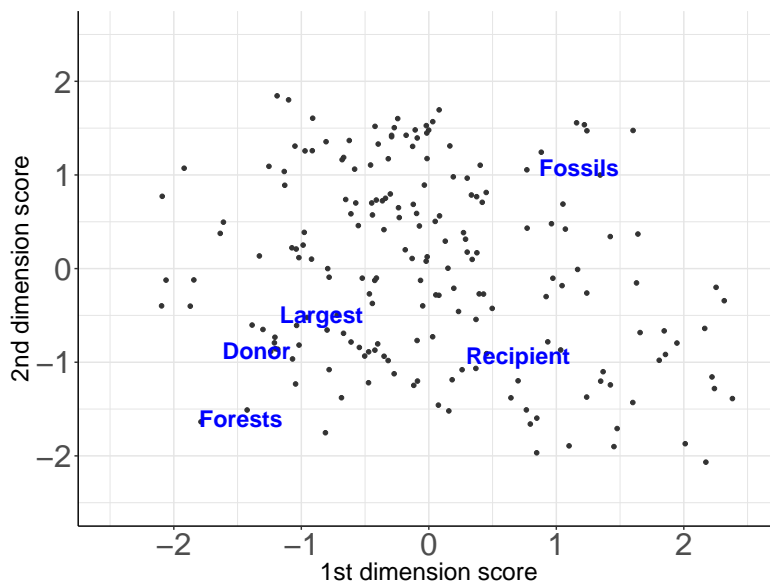


Figure C.4: Ideal points of simulated states

left. These largest institutions appear to be relatively unrelated to deepening and fragmenting. We can think of this state as pooling—it participates to a moderate degree, blending into the climate landscape, rather than standing out.

Institutions that provide climate finance are among the closest conceptually to implementation and capacity-building forums. These institutions, such as those developed by the World Bank’s Carbon Finance Unit to help navigate the new world of carbon offsetting, identify and fund specific projects that can reduce GHG emissions, in this case in developing countries. The simulated donor and recipient states score low on the second dimension, associating themselves with deepeners. Interestingly, the simulated donor scores low on the first dimension, which reflects how it shares no climate memberships with other Annex 2 states outside of climate finance, thereby being pushed further from the Annex 2 core in the bottom-right quadrant.

C.5 IRT ideal point uncertainty

In the regression models in chapter 5, I use the point estimates from the IRT models as regressors. However, the IRT estimates contain uncertainty, summarized by a highest posterior density interval within which the true ideal point is most likely to lie—analogous to a standard confidence interval. Using an estimated regressor introduces bias into regression models. One way to address this uncertainty would be to use error weights for each country in the regression models, following the advice of Andrew Martin and Kevin Quinn.⁶ An alternative strategy to incorporate uncertainty is to re-sample each countries' ideal point repeatedly from their highest posterior density interval (the confidence interval around their point estimate, for brevity).

I re-sample countries' ideal points from the matrix normal distribution. Unlike sampling from a normal distribution centered on country's ideal point estimate with a standard deviation corresponding to the size of their confidence interval, the matrix normal specification attempts to match the covariance structure of ideal points across countries and across dimensions. Since ideal points are estimated from an underlying matrix of affinity (shared and exclusive climate memberships), I feed this underlying covariance back into the re-sampling technique. Specifically, I take the cross-country and cross-dimension covariance matrices from the 500,000 iterations of the IRT model and use these covariance matrices to re-sample 1,000 ideal points for each country. I then run the controls specification in figure 5.4 for each of the 1,000 new ideal points.

I plot the distribution of the coefficients for the first and second dimension ideal points in figure C.5. This distribution is analogous to the bootstrapping re-sampling technique that is often used to construct confidence intervals around point estimate. The red vertical line represents the regression coefficient from the controls specification in figure 5.4, and the dashed lines are its 95% confidence intervals. The blue vertical line represents the median regression coefficient from the re-sampling, and the dashed lines are again the 95% confidence interval around

⁶A. Martin and Quinn 2005.

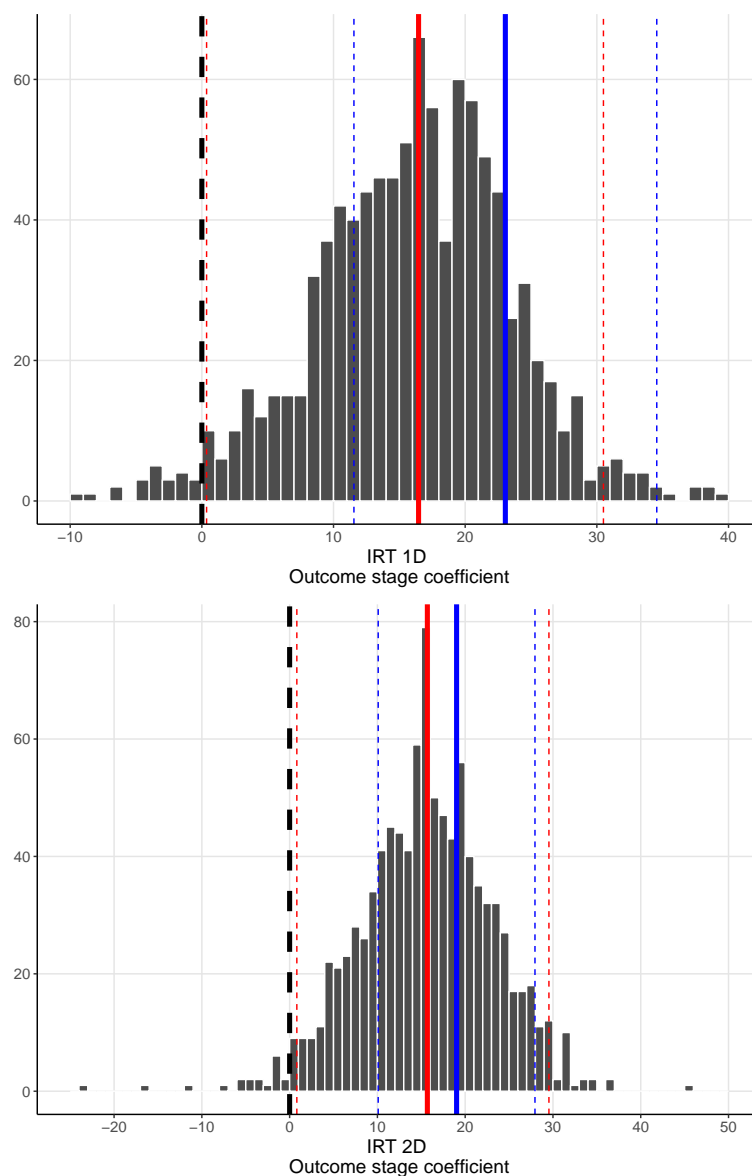


Figure C.5: Regression coefficients for ideal points resampled from their posterior distribution

this estimate. We see that the re-sampled ideal points have greater uncertainty than using the point estimates, and that the effect is attenuated somewhat (see table C.1). This attenuation could stem from randomness introduced into the ideal points—which would push the coefficients nearer to zero, no relationship—by a failure to match the exact underlying covariance that structures the ideal point estimates. Nonetheless, in these extended regression model, both dimensions remain statistically significant predictors of the ambition of countries’ targets.

Specification	Dimension	Lower CI	Point estimate	Upper CI
IRT point estimates	1D	11.6	23.1	34.6
IRT point estimates	2D	10.1	19.0	28.0
Re-sampled ideal points	1D	0.4	16.5	30.5
Re-sampled ideal points	2D	0.8	15.7	29.5

Table C.1: Heckman sample selection models with re-sampled ideal points. Specification matches the “controls” specification in figure 5.4. The solid blue vertical line indicates the regression coefficient using the point estimate, and the blue dashed lines are the coefficient’s 95% confidence interval. The solid red line is the median coefficient in the re-sampling, and the red dashed lines are the 2.5% and 97.5% quantiles from the distribution of coefficients from re-sampled ideal points. Covariates are IEA ratifications, renewable electricity, and fossil fuel rents, measured in 2000 with missing data multiply imputed.

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