Participation and cooperation in global climate governance: New evidence from the regime level

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Abstract

Much empirical work on whether participation in international institutions affects state behavior is confounded by selection bias, as membership in international institutions is not randomly assigned. However, I argue that two other methodological issues deserve greater attention than they have received and that resolving these enables better estimation of the relationship between participation and subsequent cooperative behavior. First, institutions often set common obligations for all members, which limits the ability to estimate just how willing states are to contribute to cooperation. Second, many of the institutions scholars are interested in have nearly universal membership, which leaves insufficient variation in participation to explain outcomes with. Two novel sources of variation in climate governance allow these problems to be circumvented and allow better estimation of institutional effects. First, since states selected their own greenhouse gas emissions reductions targets under the Paris Agreement, states' differential willingness to contribute to cooperation can be measured more continuously. Furthermore, states are members of sixty different climate governance institutions, which allows for a more precise measure of participation than the conventional binary indicators of ratification that are often used. Using a new measure of participation at the regime level and finer data on cooperative behavior, I find strong evidence that states that participate more extensively across a regime accept more demanding treaty-based obligations subsequently. This finding runs contrary to a literature that asserts states use overlapping institutions to weaken their international obligations.

Keywords

climate change, international cooperation, treaties, ideal point estimation

1. Introduction

With twenty-five years of experience and no effective international solution, climate change governance seems like an easy case for arguments that international cooperation has no effect on state behavior. The climate regime has a focal institution, namely the United Nations Framework Convention on Climate Change (UNFCCC), with universal membership and dynamic governance procedures, but it is not obvious that membership has motivated states to undertake costly cooperative policy measures. Since the UNFCCC is so central in climate governance, the history of international climate politics is often told as a succession of Conferences of the Parties to the UNFCCC (COPs), with some conferences demonstrating progress towards an effective response to climate change and others scuttled by differences.[1] The 2015 Paris Agreement reached at COP21 is the most recent example of progress in climate governance, but the targets contained in the Agreement are not sufficient to prevent dangerous climate change.

However, climate governance is not coterminous with the UNFCCC-led process. Today, outside this process, over one hundred transnational initiatives pursue governance objectives in climate change, the operations of an array of non-environmental international organizations increasingly intersect with climate governance, and states can be members of up to sixty different climate governance institutions. When states met in Paris in 2015 to negotiate a follow-up treaty on climate change, their behavior was the product of dynamics specific to membership in the UNFCCC, but it was also influenced substantially by their embeddedness in the broader climate regime. There is a world, or rather, there are worlds of climate governance outside the United Nations Framework Convention on Climate Change. Does this proliferation of climate governance institutions impact on the major multilateral climate governance process anchored in the UNFCCC? Do states that participate more extensively across climate governance adopt deeper greenhouse gas emissions reductions targets? How do these extra-UNFCCC climate governance institutions affect state behavior in climate governance?

In this paper, I demonstrate that participation in international institutions affects states' behavior productively. States that participate more extensively in climate governance adopt better greenhouse gas mitigation targets than states that participate less. This finding holds when using instrumental variable estimation to control for unobserved heterogeneity that jointly determines both state participation in international institutions and their subsequent cooperativeness. To measure participation, I deploy a relatively novel—to International Relations—scaling method taken from legislative and judicial politics. Using Bayesian item response theory (IRT), I situate states in climate governance, as well as the sixty institutions that together constitute the climate regime. I exploit a unique design feature of the Paris Agreement to measure of states' willingness to cooperate, namely the bottom-up targets that states proposed in the Agreement. While

[1] Grubb et al. 1999; Downie 2014; Gupta 2014; Sweet 2016; Bodansky et al. 2017.

IR scholars have had difficulty accurately estimating the causal effect of participation in international institutions on state behavior, I skirt two of the fundamental problems related to operationalizing participation and cooperation by using new measurement techniques and novel data.

Since the mandate of international institutions is often to facilitate international cooperation, it is a natural question to ask whether, in fact, membership in an institution leads members to pursue more cooperative behavior than they would have otherwise. The empirical support for claims that participation affects cooperation is mixed. Scholars are often concerned with selection bias when estimating the relationship between observed participatory and cooperative behavior,[2] as states the decision to join international institutions may be the product of the same trait that leads them to undertake cooperative behavior subsequently. However, selection bias is only one of many methodological problems in the empirical study of international institutions. Incomplete specifications of participation and censored observations of cooperation are at least equal important in distorting empirical findings. In this paper, I re-conceptualize participation and cooperation and operationalize these concepts using novel variation in global climate governance. I demonstrate that participation increases cooperation, even controlling for the decision to join institutions.

Participation is often conceptualized as state membership in an international institution. As such, it is often operationalized as ratification of an international treaty or sustained membership in a particular institution. Measuring participation is then a matter of finding the dates of ratification. However, international influences on state behavior are often much broader than membership in a particular institution. Indeed, many scholars have called for greater attention to be paid to the proliferation of international institutions over recent decades and how dynamics at a higher level of aggregation may influence state behavior.[3] This insight has rarely been taken up and unevenly at that. I focus explicitly on participation at the regime level and develop a new measure of state membership in the international institutions that together compose a regime. Specifically, I consider patterns of participation in the sixty climate governance institutions that together constitute the climate regime. I wager that participation at the regime level varies more and in a more informative manner than ratification of a single international treaty. A more complete specification of participation has descriptive and explanatory payoffs for research in international cooperation, and climate governance in particular.

Cooperation has been variously defined, but the crux of the concept lies in departures of state behavior from the status quo ante. Cooperation is not membership; cooperation necessitates reforming existing policies to bring them in line with a regime's

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2 See von Stein 2005; Simmons and Hopkins 2005; Simmons 2009; Hill 2010; Lupu 2013; Franzen and Maden 2016; Fuhrmann and Lupu 2016.

3 Alter and Meunier 2009; Keohane and Victor 2011; Raustiala 2013; Abbott et al. 2016.

goals, and specifically the precise obligations of lain out in an international treaty.[4] Here, I distinguish between regime-level observations—membership in up to sixty climate governance institutions—and the legal commitments states accept in international treaties—states' targets in the Paris Agreement. Institutional obligations are often common for all members. This both distorts membership and poorly reflects cooperation, since reforming national policies to meet common international standards can be more costly for some states than others.[5] Effectively, common institutional policy targets compress a range of possible behavior into three values: compliant, non-compliant, not a member. A better indicator of cooperation emerges when institutions allow states to set their own policy levels and encourage states to set ambitious policies that deviate from the status quo ante. Precisely such targets have been set in the Paris Agreement on climate change, where negotiations followed a bottom-up process of pledge and review. These targets can be studied to assess which states agree to the most pro-cooperative behavior. Of course, not all states will set ambitious policies, but this is precisely the question under study: how willing is a state to accept costly commitments in institutionalized international cooperation?

Climate change is an intrinsically important topic since climate change is one of the most pressing and universal global challenges. However, climate governance's two unique sources of variation-in terms of participation across a vast array of institutions and nationally selected mitigation targets-allow for a new contribution to a long-standing debate on whether and how institutions affect state behavior. My findings also speak to debates in regime complexity, as to whether states use overlapping institutions to weaken or facilitate cooperation.[6] I demonstrate that a plurality of institutions within an issue-area does not weaken cooperative outcomes, as the separation of sub-issues into different forums allows actors to pursue more ambitious policies in other forums when headline institutions are obstructed.[7] The measurement technique that I utilize in this paper has many advantages over existing panel regression approaches that use a binary indicator for ratification of a particular international treaty and can be deployed by researchers in other domains where a multiplicity of international institutions exist. The bottom-up targets enshrined in the Paris Agreement are relatively unique, however, my study demonstrates the value of seeking more continuous and universal measures of cooperative behavior than binary indicators of compliance.

I begin by explaining how regime-level measures of participation improve upon considerations of participation in single, headline institutions (section two). I then explain how common policy targets make it more difficult to study cooperative behavior (section three). In these two sections, I introduce novel features of climate governance that circumvent these two methodological problems. In section four, I develop new measures

4 Keohane 1984; Urpelainen 2011; Martin 2013.
5 Downs et al. 1998; Stone et al. 2008; Martin 2013.
6 Benvenisti and Downs 2007; Kelley 2009; Pollack and Shaffer 2009; Drezner 2013.
7 Depledge 2006; Kelley 2009; Johnson and Urpelainen 2012.

of participation (using ideal point estimation) and cooperation. I then estimate the relationship between participation and cooperation using these new continuous indicators (section five).

2. Participation at the regime level

There has been a trend towards universalism in the membership of international institutions, which perversely makes it more difficult to study how international institutions affect cooperation. To estimate the effects of participation on behavioral outcomes, studies ought to observe cases with different scores for membership—that is, studies should strive to compare members and non-members, or states at varying degrees of membership (such as, membership in an executive committee).[8] Chilton and Tingley note that state membership in many of the international treaties that researchers study is nearly universal, which makes it very difficult to find enough variation in the main explanatory variable—participation—to account for variation in outcomes.

One response to this problem has been to study states before and after ratification and then analyze changes in behavior after ratification. However, first, as has been noted by Chilton and Tingley, widespread ratification can proceed quite quickly leaving little actual time in which to observe changes in practices, especially if outcomes only change slowly in response to reforms. Second, if a state ultimately ratifies a particular treaty, it is unclear how important it is that it took a state longer to do so than another, especially if state characteristics remain relatively stable during this period. It may be that time to ratification contains "information about governments' preferences and calculus,"[9] but time to ratification is confounded by variation in domestic ratification procedures and other elements of domestic politics. The link between time to ratification and the effect of membership is not self-evident theoretically.

Nonetheless, I argue that a more important theoretical concern is that ratification of a single international agreement rarely constitutes the entirety of international influences on a state's behavior in that issue-area.[10] It is unlikely that only a single treaty influences state practice in an issue-area, no matter how tailored the treaty to a particular practice. It is possible to search for the effect of specific international treaties (e.g., World Trade Organization) on specific practices (e.g., trade flows), but it is more likely that practices respond to a state's broader portfolio of international commitments in that issue-area (e.g., international trade). Since states are often embedded in a variety of international institutions in each issue-area, researchers ought to be attentive to participation at the regime level. State participation across the regime is likely to vary more, and in a more informative manner, than variation in a single institution, no matter

8 See Voeten 2014 for variation in state engagement at the institution level.

9 von Stein 2008.

10 Raustiala 2013; see also Jenks 1953; Kingsbury 1999; Raustiala and Victor 2004; ILC 2006; Pollack and Shaffer 2009; Keohane and Victor 2011; Drezner 2013; Carcelli et al. 2014.

how focal that particular institution may be to the governance of a particular issue.[11] Indeed, ratification of a highly visible and salient treaty may be motivated by a host of idiosyncratic factors that ultimately bear little relation to the behavioral change that researchers are interested in. The sources of behavioral change may be located in the more diffuse regime level influences than a single treaty. States that are members of more institutions have more obligations, more resources devoted to that issue, and more pressure points. Activists can use these overlapping obligations to snare recalcitrant states with states' own statements and positions.[12] In situations of incomplete information, other states can easily observe institutional memberships and interpret these as signals of underlying preferences and intentions, allowing them to separate more from less motivated states.[13]

While many researchers have noted that states are often suspended in a web of institutions, this insight has rarely been applied to study state behavior. The literature on how institutions affect state behavior is overwhelmingly focused on identifying the effects of individual memberships, rather than patterns of participation at the regime-level. Accordingly, nearly every empirical study of institutions uses a simple binary indicator of membership in a particular institution as its main explanatory variable.[14] In this paper, I shift the analytical focus to the regime level. On top of being a more accurate account of climate governance, shifting the focus to the regime level allows me to skirt the problem is insufficient and uninformative variation in membership in major multilaterals that has been a key methodological problem in the study of international institutions.

I argue that to understand states' preferences in climate governance researchers must be attentive to states' broader portfolios of institutional memberships in climate governance. This is much like how to understand a country's trade preferences researchers would do well to study the breadth of their international trade agreements, which are often broader than membership in the World Trade Organization and include plurilateral and regional agreements as well.[15] I exploit variation in state membership across sixty climate governance institutions to analyze how participation in international institutions affects states' willingness to cooperate in climate governance. Such a measure provides a better indication of the institutional influences on states, while sidestepping the problem of insufficient (and often uninformative) variation in state membership in headline institutions. The multiplicity of international institutions with explicit focuses on climate change makes global climate governance an ideal setting to test theories of how participation in international institutions at the regime level influences state behavior.

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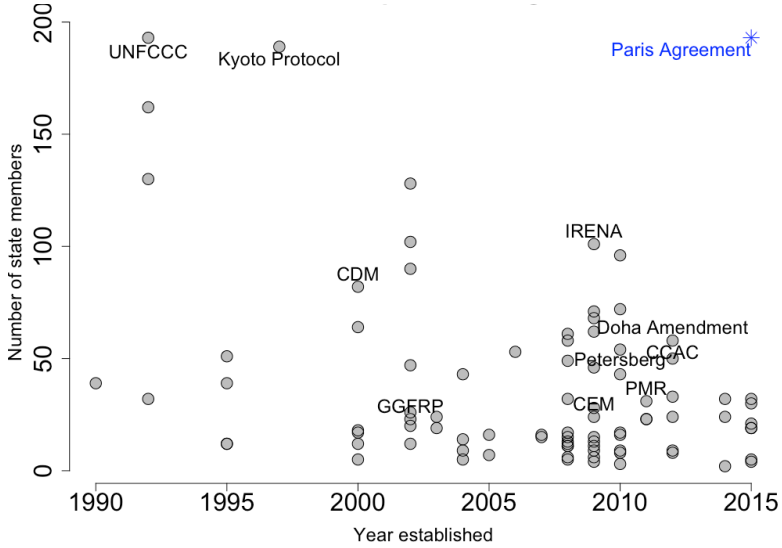
11 Carcelli et al. 2014.
12 Dai 2005; Simmons 2009.
13 von Stein 2005; Gray 2009; Glaser 2010;
14 Simmons 2000; Simmons 2009; Hill 2010; Cole 2015; Lupu 2013; Fuhrmann and Lupu 2016; von Stein 2016; though see Voeten 2014 for a different take.
15 See Dur et al. 2014; Kono 2007.

Figure 1. Proliferation of climate governance over time



A number of scholars have already noted the proliferation of governance efforts in climate change. However, the lion's share of existing research on the topic has focused on transnational climate governance (TCG)[16] or situations where rules negotiated in other issue-areas, such as international trade or migration, impact back upon climate governance.[17] These scholars have been right to argue that climate governance is not coterminous with the UNFCCC-led process, but they have largely overlooked the expansive set of international institutions with state members that focus explicitly on climate issues. Yet, one need not look to the sub-state level or other issue-areas to find a diversity of climate governance institutions, as the international and state-led response to climate change is much broader than one might expect given all the scholarly and public attention the UNFCCC receives. The UNFCCC may be the most important element in this institutional landscape, but extra-UNFCCC climate governance institutions are important venues that states use to coordinate their behavior. These new initiatives have been described as "weakly nested" under the UNFCCC framework as they "pursue the same broad goals," but are nonetheless rarely linked to the UNFCCC in any formal sense and often emphasize different issues and targets than the UNFCCC.[18] This implies that, while no two institutions are identical, they can be categorized and studied as a "loosely coupled" global response to climate change.[19] Methodologically, the combination of these initiatives' distinctness from the UNFCCC and their common climate governance subject matter multiplies the number of observables researchers have access to in studying climate governance. Moreover, membership in these institutions provides a wealth of additional variation in how states engage with governing the climate. I plot the membership of these

16 See Hale and Roger 2013a; Bulkeley et al. 2014.
17 See Michonski and Levi 2010; Keohane and Victor 2011; Clapp and Helleiner 2012.
18 Abbott 2012: 581.
19 Keohane and Victor 2011.

new institutions in figure 1, which demonstrates just how significant the variation in membership is.[20] Later, I scale these membership decisions and use this new data to better assess the relationship between participation in international institutions and states' cooperative behavior.

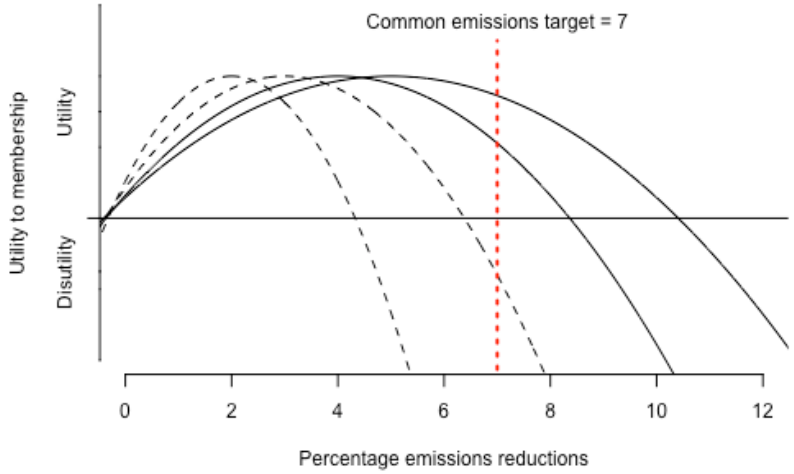
3. Cooperation and institutional obligations

International cooperation is the process of adjusting national policies to meet internationally agreed-upon standards of behavior. Cooperation is not membership, but rather behavioral changes.[21] Accordingly, one of the primary activities of international institutions is to delineate acceptable and unacceptable behavior for members. [22] This often involves setting a common policy level that all members must adopt. Let m be the policy issue being negotiated and $\bar{m}$ denote a common policy level, such as a maximum emissions quota for a pollutant.[23] However, common policy levels both distort membership and poorly reflect cooperation, since reforming national policies to meet common international standards can be more costly for some states that others.[24] Rationalist approaches to international cooperation suggest that states only join an institution if they expect greater benefits from cooperation than the costs associated with compliance. 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.[25] 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. The broader-deeper tradeoff implies that maximizing participation requires minimizing obligations, while maximizing obligations will minimize participation. To maximize participation requires setting the common policy level such that the state with the highest compliance costs is at least indifferent between participating and not.[26] For any policy level more demanding than that level, there will be a subset of states that find membership too costly, while there will always be at least one state that would prefer to cooperate at a more demanding policy level. When treaties set common targets, we never observe states' reservation cooperative policy

20 A list of these institutions is provided as table A1 at the end of the paper.
21 Keohane 1984; Urpelainen 2011; Martin 2013.
22 Sometimes refered to as setting focal points—rules around which expectations converge. See Schelling 1960; Garrett and Weingast 1993.
23 The common policy level could also apply to other issue-areas, such as setting a maximum import tariff level, a quota for a certain type of weapon, or it could refer to a discrete protection for minorities or some other kind of right.
24 Downs et al. 1998; Stone et al. 2008; Martin 2013.
25 Alesina and Grilli 1993; Downs et al. 1998; Stone et al. 2008; Urpelainen 2011.
26 Barrett 2003; Stone et al. 2008; Susskind and Ali 2014.

Figure 2. Membership in an institution with a common target



levels—the maximum contribution they would be willing to make—and we only see whether states are willing to contribute at the common policy level. In this sense, our observations of the extent to which states are willing to contribute in a cooperative equilibrium are censored at the treaty level.

Consider a hypothetical emissions target as in figure 2. Four states have different preferences over the common level of emissions reductions they would be willing to accept in an international institution. Each of the four quadratic loss curves represents one of the states' utility from joining an institution at different levels of a common emissions targets. States' utility to joining that institution 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. States' utility functions are single-peaked and symmetrical around their preferred coordination point. If the amount of emissions reductions that members are obligated to pursue differs significantly from a state's ideal point, then complying may be prohibitively costly and a state will not join. As shown in figure 2, for a 7% mandatory emissions reduction ($\bar{m} = 7$), only two states have positive expected utility from membership, and we would expect the membership of the institution to be two: the two states with the right-most utility functions. Adjusting the target upwards or downwards may change membership but for any target greater than roughly 4.6%, the membership begins to shrink.

When an institution mandates the same target $\bar{m}$ for all states, there will always be a subset of states that would have accepted coordinating behavior at a further distance from the status quo ante than $\bar{m}$ and there will be another subset of states that find the common level of $\bar{m}$ too costly.[27] However, these participation constraints are never observed directly—only the decisions to join or not join an institution 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

[27] Unless creative ways of linking issues or provides side payments are devised.

membership near the treaty level when there is a relatively continuous distribution of ideal points, but a discrete coordination point ($\bar{m}$). Even two states with very similar spatial preferences—states that would participate at very similar levels of $\bar{m}$—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 observation ($y_{ij} = \{0,1\}$) is very different, but the underlying trait is very similar.

Yet institutionalized cooperation may also allow different targets for different states.[28] Instead of the "top-down" model where negotiations yield a single headline target ($\bar{m}$) for all participants to ratify or not, institutionalized cooperation may draw from a "bottom-up" approach, wherein states deliberate nationally and propose their own targets.[29] Here, states choose their own targets and cut their GHG emissions by whatever percentage they select. Whereas, common targets distort membership around the treaty level, differentiated targets maximize participation though their contributions are uneven. Some states set minimal targets, while others set intermediate ones and others still set deep targets.[30] 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 constraint. Bottom-up approaches also reveal actors' preferences with respect to levels of cooperation more finely than treaties that commit members to common targets since we observe a broader range of cooperative policies.

The greenhouse gas targets that states adopted in the Paris Agreement are paradigmatic examples of the bottom-up approach to treaty making. Ahead of the Paris climate change conference in 2015, all state members of the United Nations Framework Convention on Climate Change were tasked to submit their own climate change mitigation targets, called Intended Nationally Determined Contributions (INDCs). Here, states actually articulated how willing they were to contribute to the collective good of climate governance. Under the UNFCCC's rules states must first adopt an agreement by consensus and then ratify it domestically. Therefore, states are not bound to implement whatever they submit in their INDC until an agreement containing the INDCs has been adopted by all the parties as a COP decision (i.e., the Paris Agreement), they have ratified the agreement domestically, and enough other states have also ratified that the agreement enters into force. 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

[28] See Gilligan 2004; Hare et al. 2010; Rayner 2010; Winkler and Beaumont 2010; Bodansky 2011; Green et al. 2014; Andresen 2015.

[29] Bodansky et al. 2017: 22–26.

[30] Gilligan 2004; Bodansky et al. 2017: 61–64.

and implements its provisions. The nationally determined policy level communicated in the INDC need not equal the maximum possible contribution that a state would be willing to make to governing an issue, as these commitments are endogenous to expectations of others' behavior. Indeed, this is the crux of the issue: which states have stronger beliefs that if they set strong targets, theirs will be reciprocated by others?

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. Differentiated targets are useful for social scientists because they maximize participation and allow for more observations.

Differentiated targets are a key, if understudied, resource for research on international cooperation since they scuttle the problem of censoring, where observers only see behavior at the compliance level, non-compliance, or non-participation—further, non-compliance is quite rare.[31] With differentiated targets it is possible to observe the degree to which different states are willing to deviate from their decentralized, non-cooperative policy level in a cooperative multilateral solution. When states set their own targets, observers can distinguish the greater willingness of leaders to set targets beyond the lowest common denominator level of the top-down approach ($\bar{m}$), as well as cooperative policy level of states that would have declined membership in a multilateral with a common treaty level of $\bar{m}$. This is not to suggest that nationally selected policy levels are not in any sense strategic; however, states do reveal some of the depth of their willingness to cooperate conditionally in an issue-area when they ratify targets they have themselves tailored nationally. Where common obligations bias membership around participants closest to their participation constraint, differentiated obligations extend membership and provide indications of states' underlying willingness to cooperate conditionally in climate governance. I leverage the variation in states' pledged Paris targets to measure states' support for conditional cooperation in climate governance. This measure is less sensitive to the problem of censoring which studies of treaties with common obligations face.

4. Data

To understand the relationship between participation and cooperation requires appropriate measures of each concept. In section 4.1, I use ideal point estimation to create a common scale that measures the extent and content of states' participation in climate governance. I then investigate the determinants of state ideal points in section 4.2. In section 4.3, I operationalize cooperation by comparing states' Intended Nationally Determined Contributions to a set of "fair" greenhouse gas emissions quotas for each

[31] See Chayes and Chayes 1995; Downs et al. 1996.

state to develop a common measure of cooperative intent. These two continuous measures of participation and cooperation improve upon binary indicators of ratification and compliance that are often used in empirical studies of international cooperation, as shown in section 5.

4.1 Scaling membership with item response theory

Over 190 states making up to sixty decisions over twenty-five years creates a problem of how to extract a useful means for comparing states from this abundance of information. To reduce this complexity, I assume that membership decisions follow a spatial logic, where states join institutions they have affinity towards and do not join institutions whose goals diverge from their own. Spatial models of political behavior have been applied to diverse topics, such as legislative and judicial voting, bargaining, and the ratification of international treaties. These models assume that institutions and political actors populate the same latent policy space, and that actors' observed membership decisions can be analyzed statistically to recover the unobserved characteristics of the actors and institutions that structure these decisions. The statistical techniques used to analyze these choices are not unlike those used to analyze other discrete choices. Since many states are observed making many binary choices across a set of institutions, this information can be coded, organized and analyzed to extract meaningful parameters. Accordingly, I operationalize membership in global climate governance using a scaling model developed in legislative and judicial politics.[32] Specifically, I use Bayesian item response theory to recover states' ideal points in global climate governance from their membership decisions. These outputs allow states to be situated relative to their peers. Ultimately, I show that state memberships decisions are systematic and informed by knowable country-level traits.

Bayesian item response theory (IRT) is based on the spatial theory of voting that has long been used to understand diverse political behavior,[33] and here I apply this model to institutionalized international cooperation.[34] In this model, political actors (indexed $i \in 1, \ldots, n$) are assumed to have ideal points (x_i) in a latent policy space. Any policy proposal can also be situated in this policy space, with a Yea outcome coordinate (O_{yj}) corresponding to the situation where the bill passes and a Nay outcome coordinate (O_{nj}) corresponding to the situation where the bill fails.[35] The distance between their ideal point and bill outcome locations, plus an error term (ε_{ij}), determines a legislator's utility

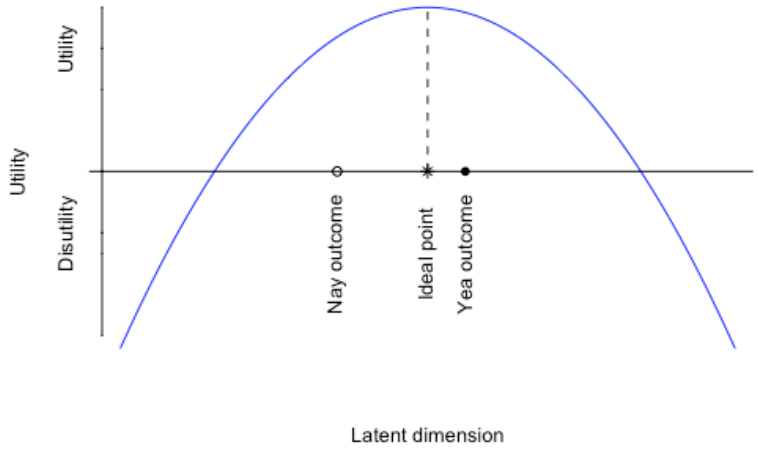
[32] Poole and Rosenthal 1997; Martin and Quinn 2002; Clinton et al. 2004. See also Lupu 2013; 2016.

[33] See Gehlbach 2013: chs. 1, 6.

[34] On scaling international behavior using spatial theory, see Voeten 2000; Lupu 2013; Lupu 2016; Fuhrmann and Lupu 2016; Bailey, Strezhnev and Voeten 2017.

[35] This section draws heavily from Clinton et al. 2004; Armstrong et al. 2013: 221–224; and Poole and Rosenthal 1997: appendix A.

Figure 3. Spatial voting model



(u_{ij}).[36] The spatial theory of voting posits that legislators' utility for a policy decreases as the distance between the policy level and the legislator's ideal point increases, $u_i(O_{yj}) = -(x_i - O_y)^2 + \varepsilon_{ij}$, and $u_i(O_{nj}) = -(x_i - O_n)^2 + \varepsilon_{ij}$. Legislators consider their utility from the Yea outcome and the Nay outcome and vote so as to maximize their utility, $Prob(y_{ij} = 1) = Prob(u_i(O_{yj})) > Prob(u_i(O_{nj}))$. Accordingly, the spatial theory of voting posits that legislators vote for the policy outcome that is nearer their ideal point (figure 3). Let $y_{ij} = 1$ if an actor votes Yea and $y_{ij} = 0$ if an actor votes nay. Of course, states are not voting in climate governance; yet, their decisions to join climate governance institutions represent analogous choices between policy alternatives. States decide whether to join an institution (vote for the Yea outcome) or not join an institution (vote for the Nay outcome), which recreates the binary data structure of legislative and judicial voting.

As Clinton and his colleagues note, the fundamental difficulty in such a context is that only the votes are ever observed: it is not possible to observe ideal points, bill locations, or utilities.[37] Normally, we would predict binary outcomes using a logistic or probit regression, but in the case of legislative voting, we do not observe the parameters that drive choices—ideal points and bill locations. This problem can be circumventing by grounding the data generating process in existing theory. The spatial theory of voting provides structure to these decisions that ultimately allows estimation of the values of these missing parameters with statistical techniques based on the probit regression. Long-time observers might have opinions that certain legislators, or certain proposals, are more extreme than others, but it is difficult to systematically compare legislators and policies. However, because many legislators are observed voting on many roll calls, this information can be used to recover the ideal points of political actors and characteristics

[36] Clinton et al.'s Bayesian IRT algorithm assumes a quadratic loss utility function, so actors' utility declines sharply as the distance between their ideal point and a policy location increases.

[37] Clinton, Jackman and Rivers 2004.

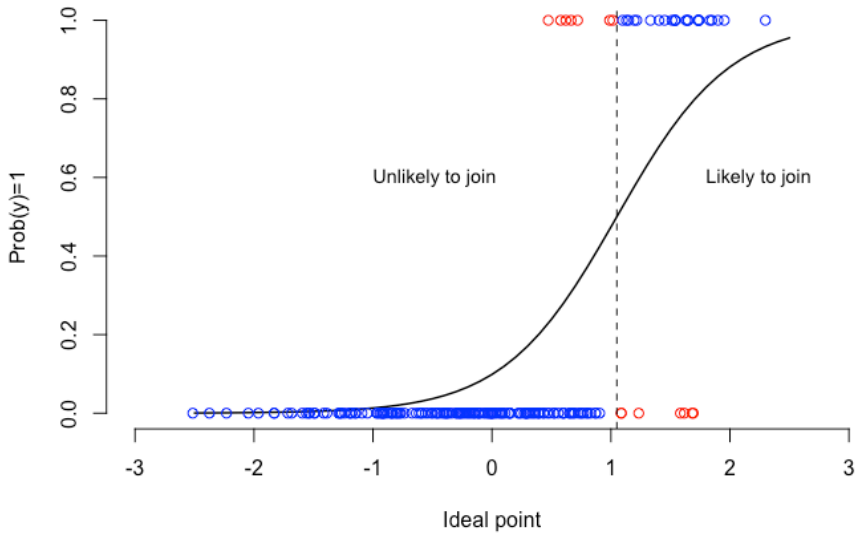
of policy proposals in the latent space. By imputing values for two of these three unknown parameters (ideal points, intercepts and slopes) it is possible to estimate the remaining one by regression. The estimation is akin to a probit regression with an unobserved regressor. The Markov Chain Monte Carlo algorithm in Clinton et al.'s Bayesian item response theory model repeatedly imputes values for the unobserved parameters and uses regression to estimate the third, alternating between which parameters to impute and which to estimate. The final outputs are the values for the unobserved parameters that maximize the posterior density of the observed data.

Bayesian IRT uses political actors' observed binary decisions (Vote Yea/Nay; Join/Not join) to estimate actors' ideal points, the characteristics of policy proposals, and the midpoint along the latent dimension that separates likely supporters from likely opponents. IRT models estimate actors' spatial preferences (their ideal points) as an "ability parameter" (x_i) for each actor, indexed i. For each item (roll call vote/institutional membership, indexed j), IRT also estimates a "difficulty parameter" (a_j) and a "discrimination parameter" (b_j). To do so, the Yea and Nay outcome locations are rearranged algebraically such that the midpoint is a fraction of two parameters, the difficulty and discrimination parameters (a_j/b_j).[38] The difficulty parameter works like an intercept, and the discrimination parameter denotes the slope of the function. Steeper slopes separate states more decisively than flatter slopes. The combination of ideal points and bill parameters generates predicted probabilities that legislator i will vote Yea on a given bill j ($Prob(y_{ij} = 1)$. A state i's likelihood of joining an institution j is therefore given by a function (F) linking state i's ideal point (x_i) to the institution j's discrimination parameter (b_j) and its difficulty parameter (a_j), $Prob(y_{ij} = 1 \mid x_i, a_j, b_j) = F(x_i b_j - a_j)$.[39] Arranged as such, the IRT model resembles the probit regression model, with the discrimination parameter being the function's slope and the difficulty parameter being the intercept.

Figure 4 presents this graphically, illustrating the membership in the Partnership for Market Readiness—an institution established in 2011 with 31 members and 93.4% of membership decisions correctly classified. The solid curve represents the probability that a state joins the Partnership as a function of their ideal point estimate. The Partnership has a discrimination parameter of 2.1, which indicates the steepness of the curve, and a difficulty parameter of 2.2 which locates the midpoint along the x-axis, $a_j = 2.2, b_j = 2.1$. The positive sign of the discrimination parameter (b_j) indicates that states with high ideal points are more likely to be members than states with low ideal points. The difficulty parameter (a_j) situates the institution in the unidimensional policy space, with the midpoint between its O_{yj} and O_{nj} coordinates at 1.05 ($a_j/b_j = -1.2/2$). The midpoint is the ideal point score at which a state is equally likely to join and not join ($Prob(y_{ij}) =$

[38] Armstrong et al. 2013: 221–224; Clinton et al. 2004: 356; Clinton and Jackman 2009: 594.
[39] See Clinton et al. 2004 for the full presentation.

Figure 4. IRT membership prediction



0.5). Blue dots represent states that are correctly classified and red dots represent states that are incorrectly predicted by the model.

The scale of the ideal points is arbitrary, though generally these are specified to have a mean of 0 and a standard deviation of 1. As such, the ideal points range from roughly -2.5 to 2.5. In my analysis, state ideal points are strongly correlated with the sum of memberships in climate governance institutions. In practice, this implies that we may interpret ideal points as a new scale for participation, running from -2.5 to 2.5 rather than 0 to 60 (raw count) or 0 to 100% (percentage share). The IRT ideal points improve upon a raw count of memberships as they better account for uneven access to institutions and they assign weights to different institutions based on the configurations of their members, allowing for a better indication of institutional affinities.

4.2 Determinants of ideal points

To study institutional memberships at the regime-level, I created a new dataset of global climate governance that tracks state membership in extra-UNFCCC institutions over time using publically available documents from these institutions' websites.[40] My dataset tracks the population of climate governance institutions that have state members, be they formal intergovernmental organizations with only state members or transnational schemes where states govern alongside non-state actors. To be included in my study, an institution must have states as members,[41] must explicitly pursue governance objectives in

[40] Most of the institutions in my dataset were found through mentions in the existing literature. I am particularly grateful to Thomas Hale and Charles Roger 2013 for sharing their dataset that got my database started.

[41] States need not be the only members. Transnational schemes that include states along with non-state actors (firms, NGOs, IOs, sub-national governments, etc.) are eligible for inclusion.

relation to climate change, [42] meet regularly outside UNFCCC negotiations,[43] and membership must stem from a decision to join that institution.[44] My population of cases was selected to follow and complement the work that has been done in transnational climate governance, except in my case the focus is on state membership.[45]

While a complete picture of global influences on state behavior might include non-state transnational initiatives and bilateral arrangements,[46] such topics are beyond the scope of this paper. Here, my focus is on how states network in climate governance and how this changes states' information about their counterparts' preferences. I wager that focusing on these institutions allows for a new understanding of the international determinants of state behavior, as distinct from domestic battles over climate policy. The extra-UNFCCC climate governance institutions that I study contain overlooked but substantial variation in how states engage with climate governance. I show below that this variation allows researchers to better understand outcomes.

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. At present, 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.[47]

Using IRT to study membership in climate governance has an underappreciated advantage over uses in legislative and judicial politics. Legislative and judicial politics have strong agenda effects stemming from institutional rules and procedures. These rules

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42 On the governance criteria, see Hale and Roger 2013b in their study of transnational climate governance.

43 So intra-COP negotiating groups are not climate governance institutions unless they also hold regular meetings outside the COP process.

44 States have to join institutions, instead of becoming members of an institution automatically (such as in the IPCC, where all UN and/or WMO member states become members by virtue of that membership) or be members of an institution that simply incorporates (mainstreams) climatic considerations into their existing work (such as the World Bank's mainstreaming of climate change into their projects).

45 Hale and Roger 2013b 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.

46 On bilateral initiatives, see Keohane and Victor 2011: 9.

47 I considered using more eligibility restrictions, but decided against it for a couple reasons. First, there are an enormous number of possible eligibility considerations, some of which would require gathering lots of new data to justify. 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. 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 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.

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. However, 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 not treaty-based, are funded out of the budgets of existing intergovernmental organizations, have low levels of formality (such as lacking permanent headquarters or secretariats), and are not established as explicit rivals to pre-existing focal institutions, I argue the costs of establishing a new climate governance institution is low.[48] While establishing new formal intergovernmental organizations is costly,[49] 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 in can create new open multilaterals that express their preferences more clearly than existing opportunities.[50] 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 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.

The IRT algorithm estimates state ideal points and parameters for institutions in the number of dimensions that the research specifies. I recover unidimensional ideal points, but also investigated two- and five-dimensional models, which added little to the model's fit and whose outputs were difficult to interpret. The researcher does not pre-specify the meanings of the recovered dimensions that structure the latent space. It is up to the researcher to determine what these recovered dimensions correspond to in the world. In the legislative context, this exercise may be straightforward, since a body of work on legislative behavior and spatial voting yield strong theoretical priors as to how a given legislature is structured. As Lupu notes, interpreting ideal points for states in international politics is likely to be more difficult since competing theories of international politics suggest that different factors motivate state behavior.[51] However, for Lupu who considers a set of "universal" treaties across all aspects of international cooperation nearly everything could be a plausible determinant of ideal points. My study is bounded to climate governance and here there is a stronger set of theoretical expectations about what factors motivate state behavior. Scholars of climate governance have identified a number of clear factors, such as domestic emissions profiles, wealth, regime type, fossil fuel rents, sources of energy production, environmental vulnerability,

48 See Vabulas and Snidal 2013 on informal intergovernmental organizations as lower cost alternatives to formal intergovernmental organizations.
49 Jupille et al. 2013.
50 Benvenisti and Downs 2007; Helfer 2009; Drezner 2013.
51 Lupu 2016.

and domestic environmental policy, as inputs into climate policy.[52] Accordingly, a variable that is a major determinant of climate governance preferences should be strongly correlated with states' ideal point estimate.

To interpret the recovered dimension, I study the relationship between ideal point estimates and known state parameters. I use ordinary least squares regression models to adjudicate which country-level traits are strongest predictors of ideal points when controlling for the influence of other predictors. Ideal points are normally distributed since identifying IRT models generally involves constraining the ideal point estimates to have a mean of zero and a standard deviation of one.[53] This identification also informs the scale of the new measure, which ranges roughly 2.5 standard deviations from the mean of 0 in both directions. Higher scores are associated with higher raw participation rates, though some institutional memberships contribute more to locating the ideal points in the unidimensional policy space than others.

In multiple regressions (table 1), the main determinants of states' estimated ideal points are economic size, fossil fuel rents, participation in other international organizations, and electricity production from renewable energy sources. Wealthier states that are members of more international organizations and rely less on fossil fuel rents for government income have greater recovered ideal points; whereas states that are more dependent on fossil fuel rents, are poorer and are members of fewer institutions have lower recovered ideal points. The substantive effects of both fossil fuel rents and renewable electricity production are minimal. Greenhouse gas emissions, regime type, vulnerability and domestic environmental policy are not statistically significant predictors of state ideal points in climate governance. State ideal points in climate governance are therefore structured most strongly by opportunity (with larger economies having more resources to devote to climate governance), pre-existing internationalist dispositions (the extent to which a state participates extensively in global governance, irrespective of the issue-area), and more climate-specific factors (reliance on fossil fuels for government revenue and electricity generation). The only statistically significant correlate of second dimension scores in a two-dimensional model was vulnerability to climate change impacts, however, it is a weak predictor of second dimension scores. I set aside two-dimensional ideal points since their meaning was difficult to interpret and they added little to the IRT model's fit or the fit of later regression models.

In figure 5, I provide some examples of states across the range of ideal points. I group the states roughly by GDP per capita along the vertical axis, which is not a statistically significant predictor of ideal points when controlling for the effects of other

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52 See von Stein 2008; Battig and Bernauer 2009; Harrison and Sundstrom 2009; Bailer and Weiler 2015; Franzen and Mader 2016; Kaya and Schofield 2015.

53 I considered multidimensional IRT models that estimate additional dimensions for ideal points; however, these additional dimensions are rarely statistically or substantively important predictors of behavior and are often correlated with the same pretreatment variables as the unidimensional ideal points used in this paper.

Table 1. Determinants of unidimensional ideal points

GDP, market rates (logged)	0.233**
	(0.065)
GHG emissions (logged)	0.007
	(0.052)
IGO memberships	0.019**
	(0.004)
Fossil fuel rents (logged)	-0.102*
	(0.042)
Renewable electricity output	0.003*
	(0.001)
Environmental Performance Index	-0.007
	(0.007)
Climate change vulnerability	0.854
	(0.958)
Region	
Eastern Europe	-0.150
	(0.209)
MENA	-0.212
	(0.232)
Sub-Saharan Africa	-0.091
	(0.245)
Latin America	-0.298
	(0.185)
Asia	0.275
	(0.233)
Constant	-6.688**
	(1.422)
R^2	0.68
N	171

Reference category is Western
*** = p <0.01*
** = p <0.05*

variables, to provide an indication of how states organize themselves in climate governance. Least developed countries (LDCs) and Small Island Developing States (SIDS) are often found near minimum values of the ideal point estimates. These states do not participate extensively in climate governance outside the UNFCCC, but when they do join climate governance institutions, they most often join institutions with other LDCs or SIDS and not with states that participate the most extensively. States that are members of only two or three institutions (often, in practice, these are the UNFCCC and the Kyoto Protocol, and perhaps recipients of funding from one of the big multilateral climate finance funds) cluster around -1. As participate rates increase, so do ideal points, all else being equal.

4.3 Scaling cooperation using INDCs

COP20 in Lima concluded with states agreeing to submit Intended Nationally Determined Contributions (INDCs) that would outline each state's proposed contribution to preventing dangerous climate change. Instead of negotiating common

Figure 5. Illustration of state ideal points

Bahamas	Brunei	Bahrain	Latvia	Qatar	Saudi Arabia	New Zealand	Denmark	US
Nauru	Seychelles	Venezuela	Iran	Czechia	Turkey	Costa Rica	Brazil	UK
Timor-Leste	Eritrea	Namibia	Sierra Leone	Bolivia	Nepal	Morocco	India	.
-2		**-1**		**0**		**1**		**2**

emissions reductions targets, states selected their own targets in what would become the Paris Agreement. Sustained conditional cooperation depends on reciprocity and widespread under-participation would likely undercut the delicate assurance that each state has made to their peers to implement costly domestic reforms.[54] Comparing a pledge's level of effort is also a means of determining which states adopt the most pro-cooperative policies. However, since states have different energy profiles, historical and contemporary emissions profiles, and resources, simply comparing reductions from a historical baseline is a poor indicator of effort. Ideally, a single indicator would capture the effort embodied in a country's INDC; however, identifying a single comprehensive measurable, replicable and universal measure has eluded researchers.[55] 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); whereas others are closer to the concept of underlying ambition and effort, but harder to observe and measure (e.g., marginal cost of abating an additional ton of CO2eq). Aldy and Pizer 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.). Unfortunately, systematic cross-national data on the marginal abatement cost per ton of CO2eq, implicit or explicit carbon prices, energy prices, or emissions abatement relative to future trends is not widely available.

To my knowledge, the nearest approximation to Aldy and Pizer's recommendation to use a suite of metrics is to consider states' 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 positions entails assigning weights to different concepts that are salient, in this case GHG emissions and wealth. The rationale for focusing on the allocation of future GHG emissions stems from the scientific position that keeping the average global temperature increase below 2C with a 66% likelihood requires atmospheric concentrations of GHGs to stay below roughly 480-530 ppm, depending on the

54 Keohane 1984; Tingley and Tomz 2014.
55 Aldy and Pizer 2016; Aldy et al. 2017.

Table 2. Constituents of PRIMAP equity standards

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

proportion of CO_2 to non-CO_2 greenhouse gases in the atmospheric.[56] This creates a carbon budget that may be divided among states following different formulas.

Yann Robiou du Pont and colleagues developed a set of ratings to score INDCs in light of different ethical positions outlined in the IPCC's 5th Assessment Report.[57] Robiou du Pont et al. consider INDCs in light of five different tests of equity.[58] Each standard corresponds to a different normative position on how to allocate the future greenhouse gas emissions budget consistent with keeping mean global temperature increases below 2C with a 66% likelihood. The authors calculate emissions trajectories for all countries to 2100, then assess each INDC target in light of the trajectories plotted for the five different equity distributions. For each country-equity standard pair, a 2030 emissions quota is specified and the INDC is scored against this quota. Accordingly, each country has five different 2030 emissions quotas, each consistent with a different distribution of the emissions budget in 2030. I refer to these standards as PRIMAP standards, following the name of one of the collaborating research centers that developed the ratings.[59]

The five different PRIMAP equity standards are based off either or some combination of the following indicators: GDP per capita, present GHG emissions per capita, and historical GHG emissions per capita (see table 2). 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 a constant rate from current levels, thereby maintaining existing emissions ratios (e.g., all countries reduce their emissions by 5% from 2010 levels by 2030). Most equity standards

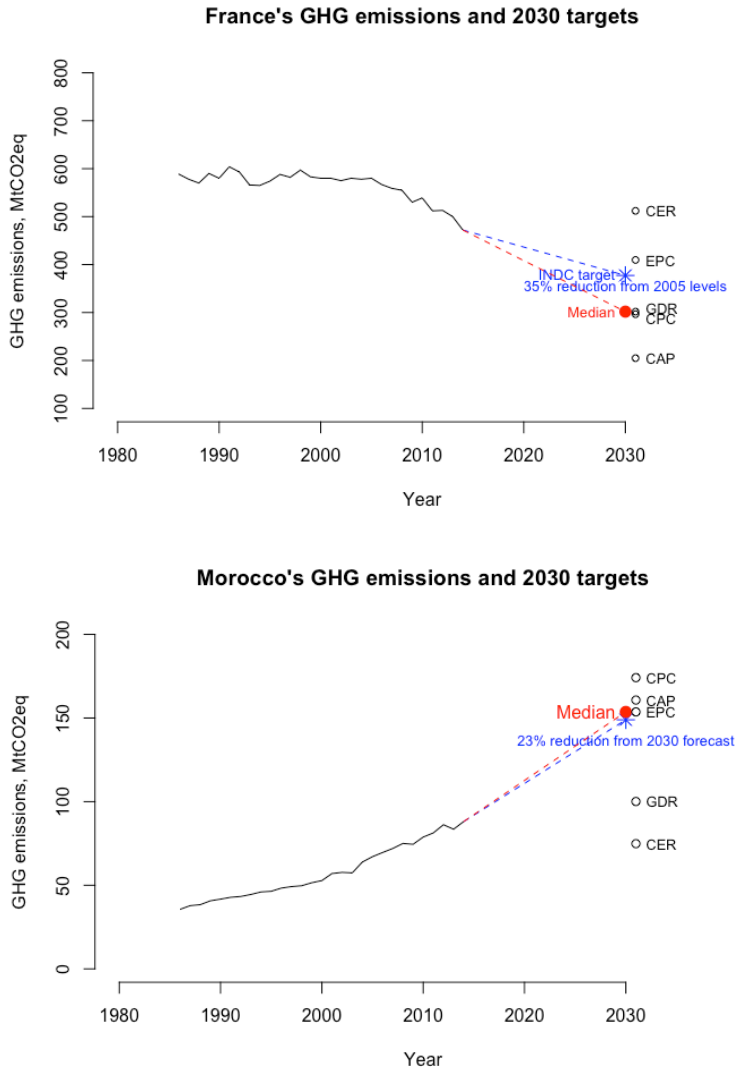
56 IPCC 2015b: figure 5.

57 Robiou du Pont et al. 2016; 2017; Meinshausen et al. 2016.

58 IPCC 2015a: ch.6. The positions outlined in the IPCC are obviously not the complete spectrum of normative theorizing in relation to climate change, though as a document that is mandated to synthesize existing research it ought to be meaningfully inclusive in scope. For further readings on the ethics of global climate change, see Gardiner et al. 2010.

59 Meinshausen et al. 2016.

Figure 6. Emissions and targets for France and Morocco



allow developing country emissions to grow in the near future, but often at paces below those outlined as targets in developing countries' INDCs. Developed countries' quotas generally call for stringent emissions reductions. Robiou du Pont et al. have not designed the standards to be combinable (i.e., if all states simply implemented the standard with their most generous allowance, then mean temperature increases would likely exceed 2C), but recognize that using a combination of standards for different states may reflect a political compromise that improves upon the status quo.

In figure 6, I plot the greenhouse gas emissions levels of France and Morocco, as well as their INDC targets, and their assigned targets from PRIMAP. The plots give an indication of the trajectory of national emissions, as well as the necessary future trajectories for managing climate change effectively. Countries' INDC targets are consistent with some PRIMAP standards, but fall short of meeting others. However, as I

Table 3. Distribution of INDC ambition indicator

Percentile	Value	Example countries
5th percentile	-78	Ghana, Nepal
25th percentile	-37	Costa Rica, Kenya, Switzerland
Median	15	Brazil, Estonia, UK
Mean	19	Algeria, Colombia, Netherlands
75th percentile	55	Australia, South Africa Zimbabwe
95th percentile	159	Russia, Saudi Arabia, Turkey

show below, strictly measuring whether a state's target passes a standard throws away useful information about target setting.

I use these quotas as benchmarks to measure how willing a state is to contribute to preventing dangerous anthropogenic climate change. 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. In the INDCs, countries express their future emissions levels, though they may do so in different formats, such as emissions reductions from 2005 levels, or reductions from projections of future emissions levels. The PRIMAP project standardizes INDCs and quotas in terms of percentage changes from 2010 emissions levels. I transform these 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. Thus, for a country whose INDC targets 750 Mt CO_2eq in 2030 and a quota of 1000 Mt CO_2eq 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.[60] I create a new variable for each of the five PRIMAP scores, as well as for the mean and the median. If states that participate more in global climate governance have better targets than states that participate less, then there will be a negative relationship between measures of participation and my indicator for target depth. This new indicator also has a right-side tail (table 3), 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.[61]

5. Results

What is the relationship between state participation across the spectrum of climate governance and their willingness to adopt meaningful mitigation obligations in major

[60] Algebraically: 750Mt CO_2eq/1000Mt CO_2eq = 0.75; 1 - .75 = -0.25; (-0.25)*100 = -25.

[61] The 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 6 times less ambitious than the median of its equity quotas. Paraguay is omitted from later analyses except where indicated otherwise.

international agreements? Are states that participate more extensively more likely to adopt more ambitious greenhouse gas reduction targets than states that are less embedded across the climate governance regime? Has the proliferation of climate governance institutions enabled states to commit to better emissions reductions targets, or are these new institutions mere distractions? The existing literature on international institutions suggests any of three possible relationships could exist. First, following von Stein's study of international financial commitments, there may be no statistically discernable relationship between commitments and later behavior, after controlling for factors lead states to make those commitments in the first place. Secondly, it may be the case that states use international climate governance institutions opportunistically to deflect attention from their behavior at the UNFCCC. If this is the case, then states that participate extensively in climate governance ought to have worse targets than states that participate less, all else being equal. Finally, if participation enables states to upgrade their targets and set more ambitious goals, then extensive participation will be associated with better targets, holding all other factors constant. I argue that the level of a bottom-up target is a function of states' support for the goal of the regime (contributing to the collective good that the multilateral seeks to govern) and their beliefs about the contributions others will make. If a state is willing to cooperate conditionally and believes it will face other like-minded states, then it will select a more ambitious bottom-up target than if it believes it will face other states that will only make minimal contributions.

I use a range of indicators and regression models to analyze how participation influences states' bottom-up targets. The results support the argument that states that participate more have better targets. Since countries that participate in the most institutions have the highest IRT scores, I expect a negative relationship between states' IRT scores and my measure of target depth.

Table 4 presents ordinary least squares regression models for different measures of the dependent variable: the percentage difference between a country's INDC and their 2030 emissions quota. I evaluate all five PRIMAP equity quotas, plus the mean and median quota, which improve the robustness of the estimation. The effect of ideal points on targets is statistically significant and negative, indicating that states with higher ideal points have targets closer to their quota. Substantively, a shift in a state's ideal point from one standard deviation below the mean to one standard deviation above the mean, while holding all other variables at their mean values, is associated with a 48 percentage point drop in their INDCs, as measured against the median of their assigned emissions quota, a difference that is statistically significant at the p <0.05 level. This effect is strongest for the CAP standard, which assigns emissions cuts on the basis of per capita GDP, but holds across two other equity standards, as well as the mean and median.

Table 4. INDC target depth

	Median	Mean	CAP	CPC	EPC	GDR	CER
IRT ideal point	-26.663**	-25.026**	-39.573**	-24.481**	-28.076**	32.472	-3.988
	(6.952)	(7.464)	(10.473)	(7.482)	(6.669)	(41.424)	(21.329)
IGO memberships	-0.994*	-0.863*	-2.353**	-1.223**	-1.275**	1.532	-1.272
	(0.389)	(0.418)	(0.586)	(0.419)	(0.373)	(2.320)	(1.194)
GDP per capita (logged)	30.429**	34.818**	53.178**	34.710**	28.540**	53.570	-23.283
	(6.461)	(6.937)	(9.732)	(6.953)	(6.197)	(38.495)	(19.821)
GHG emissions (logged)	18.023**	16.238**	33.120**	20.752**	20.844**	4.043	12.536
	(3.452)	(3.707)	(5.200)	(3.715)	(3.311)	(20.570)	(10.591)
Fossil fuel rents (logged)	7.612	2.807	6.562	7.943	9.268*	-45.309	0.087
	(4.062)	(4.361)	(6.119)	(4.372)	(3.897)	(24.204)	(12.462)
Environmental Performance Index	-0.090	0.337	0.662	-0.216	-0.231	-4.895	0.860
	(0.657)	(0.706)	(0.990)	(0.707)	(0.631)	(3.917)	(2.017)
Vulnerability	-73.255	-83.903	-110.99	-15.793	-56.116	-158.89	238.58
	(99.95)	(107.31)	(150.56)	(107.56)	(95.873)	(595.52)	(306.63)
Eastern Europe	29.151	36.299	41.435	29.226	14.502	167.608	-51.772
	(20.452)	(21.958)	(30.806)	(22.009)	(19.617)	(121.85)	(62.741)
MENA	50.928*	74.707**	67.831*	24.069	33.269	200.50	17.112
	(20.672)	(22.194)	(31.138)	(22.246)	(19.828)	(123.17)	(63.417)
Sub-Saharan Africa	37.552	76.347**	41.037	13.098	23.149	203.515	19.598
	(22.719)	(24.392)	(34.222)	(24.449)	(21.792)	(135.37)	(69.698)
Latin America	42.108*	67.102**	45.109	8.042	26.875	187.13	4.124
	(17.435)	(18.719)	(26.263)	(18.763)	(16.724)	(103.88)	(53.488)
Asia	38.929	88.091**	30.672	11.965	14.828	240.39	-30.362
	(20.808)	(22.340)	(31.343)	(22.392)	(19.959)	(123.98)	(63.834)
Constant	-364.09**	-444.91**	-624.02**	-415.58**	-351.79**	-281.96	63.70
	(107.64)	(115.57)	(162.15)	(115.84)	(103.25)	(641.36)	(330.23)
R^2	0.63	0.60	0.72	0.63	0.64	0.08	0.17
N	161	161	161	161	161	161	161

** = p< 0.01; * = p <0.05
Reference category is Western

The effect of participation in climate governances holds when controlling for the sum of existing IGO memberships, which reflects a state's underlying propensity to join international organizations. Wealthier states and states that emit more GHGs have worse targets than states that emit less and have lower per capita income.[62] States that depend more on fossil fuel resources for government revenue have worse targets. These results are statistically significant at the p <0.05 level. There is some regional variation, with most regions having worse targets than Western countries. Neither a country's domestic environmental performance nor their vulnerability to the impacts of climate change is a statistically significant predictor of target depth when controlling for other covariates. Ideal points are not statistically significant predictors of target depth when measured using the GDR or CER standards, but neither are any other variables.

[62] I use logged total GHG emissions instead of logged GDP market in my regressions even though in the previous section I demonstrated that GDP is a better predictor of ideal points. The two variables are highly correlated (r = 0.93), but GHG is less correlated with other variables than GDP—multicollinearity is less of a problem. The direction and statistical significance of ideal points are consistent across specifications, but the R^2 statistics are better with GHG than GDP.

Figure 7. Marginal effect of predictors on INDC target depth

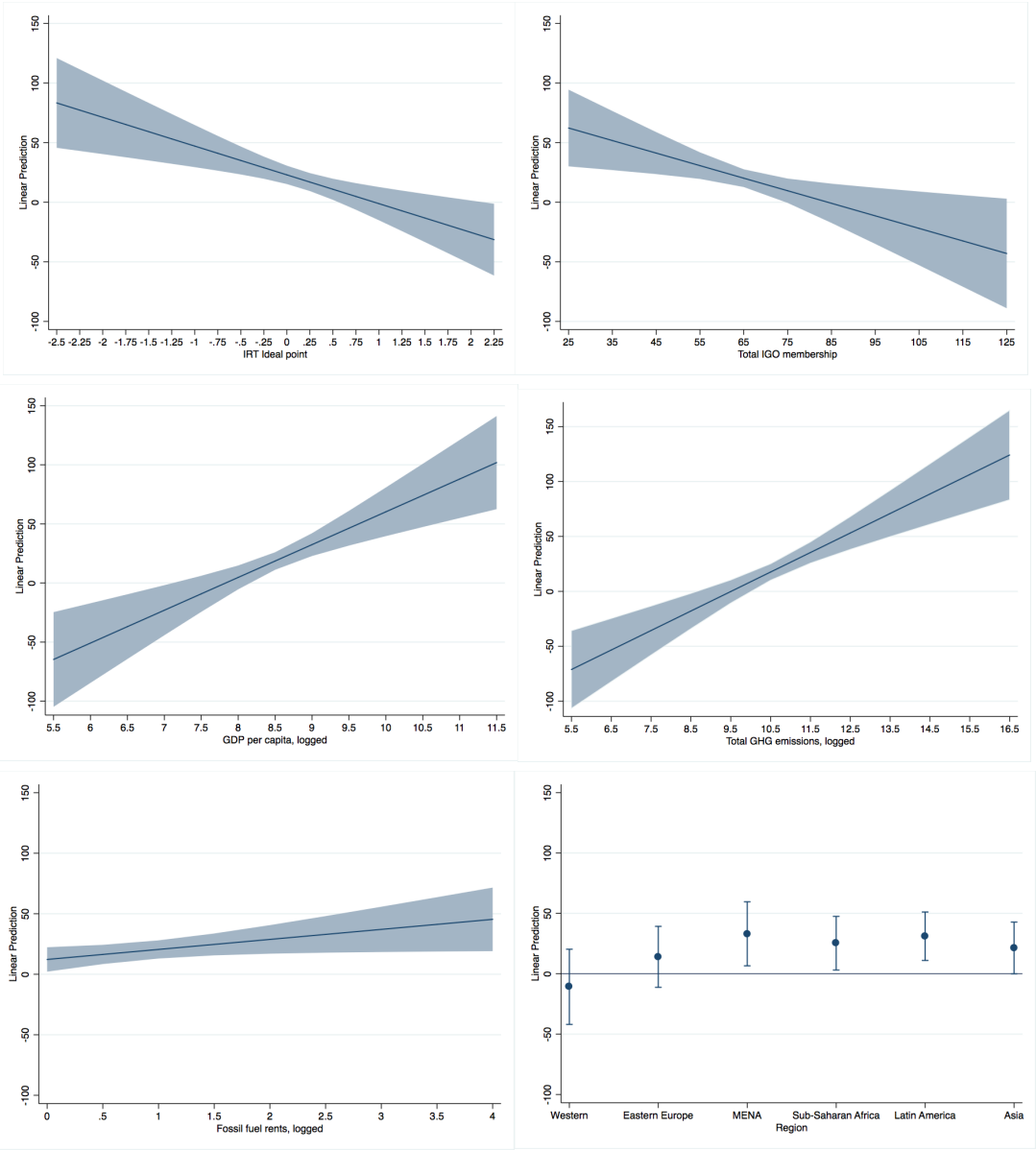


Figure 7 plots the marginal effects of the statistically significant independent variables below. The six plots have a common y-axis scale, allowing for the relative importance of each variable to be compared. The entire range of the variable is plotted on the x-axis. Since the ideal points have a mean of zero, there are more observations at that level than elsewhere and the confidence intervals narrow. Holding all other variables constant, states with mean ideal points have INDC targets slightly less ambition than the median of their assigned quotas. As ideal points shift towards the right, states' targets become more ambitious and begin to outpace their quotas. The states with the most ambitious international climate policy, as communicated in their INDCs, are those states that participate most in climate governance.[63] Ideal points remain statistically significant

63 I also conducted robustness tests for heteroskedasticity, non-linearities and the effect of outliers and the results were consistent.

predictors after subsetting the data to look only at the top 20 GHG emitters. Robustness checks are reported in the appendix (tables A2 and A3).

I now check how well my results hold when questioning the exogeneity of participation. Selection bias could pull the OLS estimates in two directions, either upward or downward. If states that have no interest in undertaking costly climate mitigation activities over-participate in climate governance as a means of deflecting attention from their treaty behavior, then the OLS estimates will be biased downward. If, however, extensive participation and strong targets are jointly determined by a common but unobserved confounder, then OLS estimates will be inflated. The precise direction and extent of the bias is ambiguous. Researchers studying the effect of participation on international cooperation have resorted to three primary techniques to mitigate selection effects:[64] Heckman selection models,[65] propensity score matching,[66] and instrumental variable estimation.[67] Heckman models and matching use a selection-on-observables strategy to compare most similar states where participation is the only salient difference between units. These techniques work best with dichotomous treatments (such as a binary indicator of membership), but are less well suited to handling continuous treatment (such as a continuous score for participation), especially with a relatively small number of observations. Instrumental variables are better suited to continuous indicators of treatment and do not rely on the same selection-on-observables assumption.

I use instrumental variable estimation now to manage concerns about endogeneity. This involves finding a variable (an instrument) that is plausibly related to the endogenous treatment variable (participation), but that affects the outcome variable (INDC targets) only via the treatment. Many studies have used regional scores as instruments, such as the proportion of countries in the same region that have ratified a treaty.[68] I use the average regional ideal point as my instrument. The resulting instrument is strongly correlated with a state's ideal point ($r = 0.39$) and a statistically significant predictor in the reduced form.

The first-stage results support a strong association between regional IRT scores and a country's ideal point estimate, suggesting that the instrument is not weak (table 5). Regional IRT scores are a statistically significant predictor of state ideal points and the relationship is in the right direction. The second stage results show a strong and sizable effect of participation on subsequent cooperative behavior. The absolute value of the coefficient for participation is stronger than before, while maintaining its statistical significance.[69] A state's underlying propensity to participate in international organizations

64 Voeten 2014 also uses a regression discontinuity design.

65 Przeworski and Vreeland 2003; von Stein 2005; McLaughlin Mitchell and Hensel 2007.

66 Simmons and Hopkins 2005; Grieco et al. 2009; Lupu 2013; Fuhrmann and Lupu 2016.

67 Morrow 2007; Simmons 2009; Hill 2010; von Stein 2013.

68 Buthe and Milner 2008; Simmons 2009; Hill 2010; Gauri 2011; Ansell and Samuels 2014: 118–122; Cole 2015.

69 It is not uncommon for IV estimates to be larger than the absolute value of the OLS estimates. Since the IV estimate is the effect of participation on compliers, if different subgroups of states

Table 5. Instrumental variable estimation of INDC target depth

	1st stage	2nd stage	Reduced form
Regional IRT score	0.451**	.	-28.988*
	(.166)	.	(14.071)
IRT ideal point	.	-92.098*	.
	.	(37.853)	.
IGO memberships	.016**	0.136	-1.149**
	(.004)	(0.809)	(0.323)
GDP per capita (logged)	-0.049	26.993**	38.884**
	(.077)	(7.376)	(8.498)
GHG emissions (logged)	0.236**	33.510**	8.451**
	(.036)	(9.393)	(3.159)
Fossil fuel rents (logged)	-0.14**	-0.455	13.188**
	(.048)	(8.034)	(4.348)
Environmental Performance Index	-0.007	-0.633	-0.236
	(.008)	(0.862)	(0.684)
Vulnerability	-0.195	-79.482	-75.311
	(1.08)	(110.888)	(96.487)
Renewable electricity output	0.003*	-0.033	-0.318*
	(.002)	(0.216)	(0.1441)
Constant	-2.37	-483.012**	-245.733*
	(1.239)	(169.983)	(111.496)
F-statistic	32.5	.	
R^2	.	0.37	0.56
N	.	161	161
** = p< 0.01; * = p <0.05			

is no longer a statistically significant predictor, and its sign has switched. The other variables behave as they have previously, with wealthier and more emitting states having worse targets, all else being equal. In postestimation, I ran the Durbin and Wu-Hausman tests of endogeneity, both of which were statistically significant meaning that ideal points should be treated as endogenous. The results of the instrumental variable regressions support the argument that the relationship between participation and states' willingness to take on meaningful GHG targets runs from participation to targets, rather than from targets to participation. While I believe that participation itself is an expression of preferences in climate governance, I also find evidence that participation has a tangible effect on state behavior, leading participants to select better targets than non-participating peers. Controlling for endogeneity, states that participate more extensively in climate governance select targets that are more ambitious as their non-participating peers. This is a very large substantive effect: a one-unit change in participation leads to a 92% shift in a country's Paris pledge downward. Moving across the range of ideal points separates states that are unwilling to contribute to mitigation from states that are willing to contribute. These findings are robust to using either the median or the mean of the equity quotas to calculate the outcome variable, as well as, lagging the instrument by five years and using robust standard errors.

are impacted more strongly then it is not surprising that the IV estimate would be larger than the OLS estimate, which is averaged over all observations.

Countries that participate more in climate governance commit themselves to better greenhouse gas targets. This is an important finding because it runs counter to an argument in the regime complexity literature, wherein states are assumed to use participation in different forums opportunistically to shirk obligations and weaken their commitments. My findings show that state participation in these forums is systematically and consistently linked with more cooperative behavior, rather than less. The proliferation of climate governance has led to better outcomes. My results do not adjudicate what underlying mechanism links participation with more pro-cooperative behavior. Accordingly, my analysis does not say whether participation leads states to select better targets because participation changes the distribution of information for all actors (common knowledge), changes the information available to participants, socializes participants to group norms, leads officials to press for cognitive consistency across their behaviors, creates a new set of pressure points for domestic and transnational activists to use, or creates club goods that reduce the relative cost of emissions reductions. These arguments are complementary rather than mutually exclusive, but are difficult to parse empirically. The instrumental variable estimate supports only the argument that participation leads to better targets, rather than reverse causality. Either way, the mechanism that links extensive participation with better targets is untested.

6. Conclusion

Does participation in international institutions affect states' behavior? In this paper, I have demonstrated that states that participate extensively across climate governance subsequently select better greenhouse gas targets in international treaties. While participation in these institutions and the targets countries selected in the Paris Agreement are conceptually and temporally distinct, they may still be related by unobserved heterogeneity. To account for selection bias, I instrument for participation using a country's regional participation score, which is standard practice in empirical studies of international institutions. My paper advances beyond many of these studies by offering more continuous measures of participation and cooperation.

My findings imply that institutional proliferation has not had a negative effect on international cooperation. Many observers have noted with unease that overlapping institutions may lead to worse cooperative outcomes than governance centralized in a single institution;[70] however, little empirical work have examined this claim systematically and at the regime-level. Using an original dataset on membership in climate governance institutions and data from climate scientists, I am able to refute this argument in climate governance. States may use multiple forums to push greater cooperation, rather than using them to subvert cooperative outcomes. This finding has affinity to Gilligan's

[70] Koskenniemi 2006; Benvenisti and Downs 2007; Alter and Meunier 2009; Johnson and Urpelainen 2012; Drezner 2013.

argument that the relationship between the breadth of participation and the depth of cooperation in a multilateral need not be inversely related, though the process is different. The Paris Agreement managed to reach both extensive participation and significant depth, as measured by the quality of states' targets.

Several arguments as to why participation affects cooperation are plausible and not mutually exclusive, but are also difficult to disentangle empirically. As stated, my analysis cannot adjudicate whether participation leads states to select better targets because participation changes the distribution of information for all actors (common knowledge), changes the information available to participants, socializes participants to group norms, leads states to press for consistency across their behaviors, creates a new set of pressure points for domestic and transnational activists to use, or creates club goods that reduce the relative cost of emissions reductions. Future work on international institutions should focus on the mechanisms through which participation leads states to cooperate.

While the ideal point estimates in this paper are unidimensional, climate governance addresses a number of different sub-issues. This paper has focused on climate mitigation. Accordingly, further research could look at the fit of my recovered ideal points to state behavior in climate finance and adaptation. Furthermore, my ideal point estimates can be compared to other measures of ideal points and negotiating positions in climate governance, as well as other ideal point estimates in international politics more broadly.[71] Overall, the new continuous measures of participation and cooperation in climate governance should facilitate comparative studies of domestic and international climate policy, as well as challenge researchers in other issue-areas to develop their own finer-grained measures.

[71] See e.g., Genovese 2014; Bailer and Weiler 2015; Lupu 2016; Bailey et al. 2017.

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Appendix

Table A1. List of global climate governance institutions

Institution	*Year initiated*
Alliance of Small Island States	1990
United Nations Framework Convention on Climate Change	1992
Activities Implemented Jointly	1995–2005
Climate Technology Initiative	1995
Kyoto Protocol	1997
Prototype Carbon Fund	2000
Clean Development Mechanism	2001
Asia Forest Partnership	2002–2013
Congo Basin Forest Partnership	2002
Johannesburg Renewable Energies Coalition	2002
Joint Implementation	2002
Least Developed Countries Fund	2002
Special Climate Change Fund	2002
Global Gas Flaring Reduction Partnership	2002
Renewable Energy and Energy Efficiency Partnership	2002
Carbon Sequestration Leadership Forum	2003
International Partnership for the Hydrogen Economy	2003
BioCarbon Fund	2004
Global Methane Initiative	2004
REN21	2005
GEF Issues 4–6	2006–2018
Global Facility for Disaster Reduction and Recovery	2006
Asia-Pacific Partnership on Clean Development and Climate	2005–2011
Global Bioenergy Partnership	2007
International Carbon Action Partnership	2007
Major Economies Meeting (formerly, Major Economies Forum)	2007
Great Green Wall for the Sahara and the Sahel Initiative*	2008
Climate Investment Funds, Clean Technology Fund + Strategic Climate Fund	2008
Efficient Electrical End Use Equipment initiative	2008
Forest Carbon Partnership Facility	2008
Global Climate Change Alliance	2008
UNIDO-UNEP Green Industry Platform	2009
Global Research Alliance on Agricultural Greenhouse Gases	2009
International Renewable Energy Agency	2009
Clean Energy Ministerial	2009
Carbon Partnership Facility	2009
International Partnership for Energy Efficiency Cooperation	2009
UN-REDD Programme Fund	2009
Cartagena Dialogue	2010
Green Climate Fund*	2010
Global Alliance for Clean Cook Stoves*	2010
International Energy and Climate Initiative - Energy+	2010

Table A1. List of global climate governance institutions

Institution	*Year initiated*
International Partnership on Mitigation and Measuring, Reporting and Verification	2010
Petersberg Climate Dialogue	2010
REDD+ Partnership	2010–2014
Mitigation of Climate Change in Agriculture Programme	2010
Low Emission Development Strategies Global Partnership	2011
Bonn Challenge	2011
Partnership for Market Readiness	2011
Adaptation for Smallholder Agriculture Program	2012
Tropical Forest Alliance 2020	2012
Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants	2012
Doha Amendment to the Kyoto Protocol	2013
Global Alliance For Climate-Smart Agriculture	2014
Global Geothermal Alliance	2014
Global Resilience Partnership	2014
Africa Renewable Energy Initiative*	2015
Carbon Pricing Leadership Coalition	2015
Food Security Climate Resilience Facility	2015
International Zero-Emission Vehicle Alliance	2015
Mission Innovation	2015
Soils for Food Security and Climate	2015
SIDS Lighthouses Initiative	2015
Zero Routine Flaring by 2030 Initiative	2015

* indicates omitted from analysis due to missing data

Robustness checks

Table A2. Regression diagnostics

	Robust	Non-linearity	Paraguay	No outliers
	1	2	3	4
IRT ideal point	-24.661**	-24.853**	-29.099**	-21.372**
	(9.421)	(7.172)	(10.340)	(5.700)
Ideal point square term	.	-0.536	.	.
	.	(4.191)	.	.
IGO memberships	-0.938*	-0.941*	-0.982	-1.108**
	(0.372)	(0.392)	(0.576)	(0.297)
GDP per capita (logged)	31.479**	31.607**	29.344**	35.244**
	(5.630)	(4.422)	(6.351)	(3.650)
GHG emissions (logged)	16.546**	16.711**	19.625**	16.683**
	(3.246)	(3.598)	(4.948)	(2.585)
Fossil fuel rents (logged)	7.523	7.459	3.190	3.264
	(5.125)	(4.044)	(5.903)	(3.277)
Eastern Europe	30.685	29.835	23.609	38.178*
	(17.765)	(21.264)	(29.806)	(15.247)
MENA	49.638*	48.791*	46.726	77.598**
	(23.832)	(21.986)	(30.942)	(16.948)
Sub-Saharan Africa	25.283	24.880	18.880	35.882*
	(22.802)	(21.992)	(32.118)	(17.293)
Latin America	39.002*	38.767*	58.403*	42.961**
	(15.006)	(17.740)	(25.957)	(13.442)
Asia	37.867	37.503	32.542	36.818*
	(19.988)	(21.075)	(30.816)	(16.091)
Constant	-278.43**	-278.89**	-259.42**	-305.68**
	(60.393)	(52.116)	(76.708)	(42.066)
R^2	0.61	0.61	0.42	0.73
N	162	162	163	150

** = p< 0.01; * = p <0.05

Model 1: Uses robust standard errors to account for heteroskedasticity
Model 2: Uses a square term to test non-linearity in ideal point estimates
Model 3: Adds Paraguay to the estimation
Model 4: Removes all countries with high studentized residuals from earlier models
OLS models

Table A3. Alternative specifications of participation

	Sum	Share	Time	IRT 2D	OC Uni
	1	2	3	4	5
Climate participation	-2.314**	-145.32**	-0.281*	-23.037**	-0.314**
	(0.556)	(33.053)	(0.117)	(6.212)	(0.107)
2D participation	.	.	.	-0.274	.
	.	.	.	(6.841)	.
IGO memberships	-1.123**	-1.115**	-1.215**	-0.910*	-1.157**
	(0.346)	(0.342)	(0.381)	(0.388)	(0.379)
GDP per capita (logged)	32.738**	32.633**	35.031**	28.789**	30.467**
	(6.021)	(6.004)	(4.382)	(4.579)	(4.431)
GHG emissions (logged)	14.524**	14.943**	14.438**	14.382**	14.733**
	(2.673)	(2.697)	(3.328)	(3.731)	(3.256)
Fossil fuel rents (logged)	10.012	9.758	8.331*	9.335*	9.842*
	(5.361)	(5.310)	(4.085)	(4.069)	(3.974)
Eastern Europe	17.532	18.939	28.350	22.308	29.074
	(18.143)	(17.957)	(21.149)	(20.606)	(20.630)
MENA	45.283	46.736*	45.869*	42.355	46.859*
	(23.332)	(23.003)	(22.176)	(21.196)*	(21.528)
Sub-Saharan Africa	16.090	18.132	25.941	24.622	28.072
	(24.687)	(24.579)	(22.253)	(21.617)	(21.909)
Latin America	35.887*	38.689*	46.920**	43.245*	43.090*
	(16.400)	(16.323)	(17.689)	(17.689)	(17.671)
Asia	29.105	32.049	36.704	38.396	35.063
	(20.179)	(20.094)	(21.247)	(20.749)	(21.047)
Constant	-235.44**	-234.33**	-260.00**	-249.82**	-222.73**
	(61.519)	(61.450)	(52.555)	(54.606)	(53.375)
R^2	0.60	0.60	0.59	0.62	0.60
N	162	162	162	162	162

** = p< 0.01; * = p <0.05

Model 1: Uses sum of memberships instead of ideal point estimate
Model 2: Uses percentage of eligible memberships
Model 3: Uses number of total years as a member of institutions
Model 4: Uses a two-dimensional IRT model
Model 5: Uses Optimal Classification scaling model (see Rosenthal 2004)
OLS models

-- END. --