

How Does Polycentric Engagement Relate to Countries' NDC Ambition and Mitigation Policy Effort?

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Abstract

Under the Paris Agreement, global climate governance has become decidedly more polycentric. However, it is still debated whether the turn toward greater polycentricity leads to more effectiveness in delivering public goods like climate change mitigation. This article argues that engagement in polycentric climate governance is linked to both more ambitious mitigation targets and stronger mitigation policy effort at the national level. Empirically, we analyze the extent to which countries' mitigation ambition and policy effort are associated with state-level memberships in transnational climate governance initiatives and with sub- and nonstate actors' memberships, while controlling for other potential explanations. We find that while polycentric engagement is not associated with higher ambition of countries' mitigation targets, it does correlate with greater policy effort. This is particularly the case for former non-Annex I countries, that is, countries without mitigation commitments under the old Kyoto regime. We explain these synergies with a discussion of polycentric systems' contribution to supporting knowledge exchange and learning.

Keywords: climate policy, polycentric governance, Paris Agreement, mitigation ambition, policy effort

Undeniably, mitigating climate change is among the key public goods required by humankind today. Accordingly, scholarship on polycentric governance is very interested in how polycentric governance arrangements might facilitate effective mitigation policies and outcomes (e.g., Jordan et al. 2018). Polycentric systems are characterized by multiple and independent centers of authority or decision-making that overlap and coordinate, which include a diversity of state and nonstate actors across different levels and sectors and are guided by an overarching system of rules (Heikkila, Villamayor-Tomas, and Garrick 2018). The degree of redundancy and interaction is what distinguishes them from fragmented governance systems (Pahl-Wostl and Knieper 2014). By fostering such

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diverse engagement, polycentricity challenges the idea that “only the largest scale ... [is] relevant for the provision and production of public goods ... and only the global scale is relevant for policies related to climate change” (Ostrom 2012, 356).

In this context, it has been argued that the international climate regime, as established under the United Nations Framework Convention on Climate Change (UNFCCC), has become more polycentric over time. In contrast to the 1997 “Kyoto Protocol–based approach” of legally binding country-specific emission reduction targets, which can be considered an “approximation” to a “monocentric system,” the Paris Agreement builds on the principle of countries’ self-determination and the mobilization of subnational and nonstate climate action (Jordan et al. 2018, 4; see also Hale 2016; van Asselt and Zelli 2018). Meeting the agreement’s global temperature goal relies crucially on the quality and successful implementation of countries’ nationally determined contributions (NDCs), which describe—inter alia—countries’ greenhouse gas (GHG) emission reduction targets and/or measures. Nonetheless, while it is mandatory for parties to the Paris Agreement to submit an NDC, their content is self-determined and their fulfillment voluntary. Hence the Paris Agreement is different from traditional multilateral treaties that establish targets and timetables for states to follow (Abbott and Snidal 2010; Hale and Roger 2014). Rather, it provides norms, rules, and guidelines “towards global decarbonisation, while leaving implementation to other” actors (Oberthür 2016, 81).

Moreover, the agreement and the related international negotiation process provide a platform for actors of different kinds and levels to meet and exchange and launch their own climate-related initiatives, for example, through the Global Climate Action (formerly Nazca) Portal and the Technical Expert Meetings (Chan, Brandt, and Bauer 2016). Thus the “UNFCCC summitry has the potential to orchestrate ... the climate regime complex” (Stoddart et al. 2023, 446; see also Chan et al. 2022; Lövbrand, Hjerpe, and Linnér 2017), facilitating greater polycentricity. As a result, the Paris Agreement places national governments within the broader ecosystem of international, transnational, and subnational climate governance initiatives. There is no question, thus, that global climate governance has become more polycentric. However, it is unclear to what extent this trend toward greater polycentricity does help to achieve better climate policy performance.

The diversity of decision-making centers and actors builds the foundation for many scholars to link polycentric governance with an increased ability to deliver public goods. Proponents argue that the advantages of polycentric systems are related to the greater autonomy of multiple decision-making centers that self-organize to contribute to a common goal, a stronger attention to various actors’ preferences and competencies, a stronger emphasis on institutional experimentation and learning, and a reliance on trust building to overcome cooperation dilemmas (Dorsch and Flachslund 2017). Critics highlight potential institutional failures inhibiting the delivery of the desired public good, due

to structural inequalities and high transaction costs across the different initiatives (McGinnis 2016), incrementalism, overwhelming complexity, a lack of normative clarity, coordination problems (Biermann et al. 2009; McGinnis 2016), or unclear accountabilities (Lieberman 2011). Moreover, Voß and Schroth (2018, 100) caution that experimentation in polycentric systems may reaffirm asymmetric relations and “help already powerful actors to assert their visions of collective order against others.” Nonetheless, empirical evidence in one or the other direction is scarce (see the introduction to this special issue), and hence the question of whether we can observe an empirical connection between polycentricity and the supply of public goods remains mostly unanswered.

In this article, we argue that engagement in polycentric climate governance and state-level climate policy performance are related to each other in a synergistic way and that such synergies are most important in those countries with lower capacity to undertake mitigation action. Furthermore, we provide systematic evidence on this relationship, focusing on state actors’ climate policy performance. To this end, we analyze the association between countries’ engagement in polycentric climate governance and their mitigation ambition and effort. We operationalize engagement in polycentric governance drawing on two levels, namely, the number of state-level memberships in transnational climate governance (TCG) initiatives focusing on mitigation and the involvement of a country’s sub- and nonstate actors in such TCG initiatives.¹ This allows us to assess whether the direct involvement of state actors in polycentric governance, or also the involvement of other concerned stakeholders within the country, is related to stronger mitigation ambition and more policy effort. We understand mitigation ambition as the degree to which each country’s NDC contributes to achieving the Paris Agreement’s long-term 1.5° goal. We measure it by comparing the level of GHG emissions that would be achieved by the NDC with what the country could in fairness be expected to do, as implied in previous literature (Höhne et al. 2017; Rogelj et al. 2016). We assess mitigation policy effort on the basis of policy density and instrument density measures. We run this analysis for 173 countries while controlling for other potential explanations of mitigation ambition and policy effort, such as climate vulnerability, wealth, dependence on fossil fuels, or the level of democracy.

Our findings suggest that engagement in polycentric climate governance is associated with mitigation policy effort, but not with the level of ambition of countries’ NDC targets. The positive association with policy effort is particularly important for former non-Annex I countries, which, under the previous international climate regime (the Kyoto Protocol), were involved only in project-based mitigation mechanisms. These countries tend to have less capacity for

1. In this article, we use the term *TCG initiatives* to encompass partnerships, networks, and other governance initiatives that include international, subnational, and other nonstate actors among their members but may also include states. Because the analysis is about climate change mitigation efforts, we focus on TCG initiatives related to mitigation.

and experience in establishing the necessary institutions and policy frameworks for addressing climate change mitigation in the encompassing way required under the Paris Agreement. Thus, a deeper engagement with the broader ecosystem of climate-related initiatives and institutions that have been established internationally and transnationally allows them to learn from other actors' experiences, to build up trust in their commitment to action, and to establish stronger connections to subnational and nongovernmental initiatives occurring within their own territories (Jordan et al. 2018). This in turn may enable and incentivize them to implement the necessary policies, monitoring frameworks, and support mechanisms to meaningfully engage in climate change mitigation.

This article proceeds with a short review of the literature on the drivers of climate action and then develops several hypotheses that focus specifically on the association between polycentric engagement and mitigation ambition and effort. This is followed by a description of our research design, data, and methodology and the presentation and discussion of our findings.

Drivers of Climate Action: Explaining Countries' NDC Ambition and Alignment with National Policies

An extensive body of research studies countries' performance and cooperation in international climate politics. This body of work tries to find, for example, explanations for climate policy performance, including patterns of treaty ratification (e.g., Bättig and Bernauer 2009), performance in terms of emissions (Bättig and Bernauer 2009), and provision of climate finance (Peterson 2021). Some recent endeavors specifically offer explanations for the stringency of countries' NDCs (Tobin et al. 2018), study the credibility of NDC targets (Victor, Lumkowsky, and Dannenberg 2022), or attempt to explain the alignment of NDCs with national policies (Baker 2023). Among the potential explanations of climate policy performance, some studies explore climate vulnerability and abatement costs (Sprinz and Vaahoranta 1994), local air pollution reduction associated with climate policy (Dolšák 2009), the level of democracy (Bättig and Bernauer 2009; Bernauer and Böhmelt 2013), the role of collaborative relationships with other countries (Kammerer and Namhata 2018), or differences in countries' institutions and political constraints (Lachapelle and Paterson 2013; Tobin 2017). In broad terms, this work has found that democracies tend to have a higher climate policy performance than nondemocracies (Bättig and Bernauer 2009; Tørstad, Sælen, and Bøyum 2020), but when comparing democracies among each other, a high dependence on fossil fuels, or generally high abatement costs, as well as a high level of political constraints can undermine this effect (Lachapelle and Paterson 2013). Collaborative ties with other, rather ambitious countries (Kammerer and Namhata 2018), high levels of climate vulnerability, and a strong left or green electorate or environmental values in a society are usually associated with better performance (Bromley-Trujillo and Poe 2020; Clegg and Galindo-Gutierrez 2023).

Finally, the literature on TCG associates the involvement of nonstate or local actors in climate governance with stronger state-level climate policy performance, arguing, in essence, that transnational action and state action are complements. This literature posits that countries with stronger national climate policy may motivate substate and nonstate actors to participate in transnational initiatives to gain information, ease compliance with policy requirements, or achieve first-mover advantages against competitors. It further suggests that ambitious national governments may themselves promote participation in transnational initiatives as a way to facilitate the design, monitoring, and enforcement of climate policies (Andonova, Hale, and Roger 2017), while acknowledging that the opposite effect—that participation in transnational governance may help states adopt stronger climate policies—is also possible. Bernstein and Hoffmann (2018), for example, propose that subnational climate policy experiments can have a catalytic impact on decarbonization by disrupting carbon lock-in beyond their own jurisdictions. Hale builds on this idea by proposing that the Paris Agreement is a catalytic institution that, by orchestrating nonstate climate action, promotes first movers, increases transnational peer-to-peer capacity building, enhances information exchange and learning, and catalyzes stronger national climate policies (Hale 2020).

Nonetheless, empirical evidence on this relationship is still scarce (see the introduction to this special issue). Exceptions are a number of studies that link domestic factors, including policy performance and institutions, to actors' involvement in TCG initiatives (Andonova, Hale, and Roger 2017; Bulkeley et al. 2014; Roger, Hale, and Andonova 2017). In essence, this literature finds a correlation between participation in TCG and the strength of policies (Hsueh 2017), but the direction of this relationship can be both ways. Some findings point to a positive relationship between strong climate institutions and policies and the likelihood of participating in or hosting TCG (Andonova, Hale, and Roger 2017; Cao and Ward 2017), while others argue that TCG initiatives in combination with state regulations lead to greater climate ambition (Michaelowa and Michaelowa 2017). Finally, Hsu et al. (2020) find that contributions by nonstate actors are rarely mentioned in the NDCs of developed countries and much more often in those of developing countries. This finding hints toward a greater need of developing countries to draw on the resources of nonstate actors, for example, in the context of capacity building.

We add to this literature by arguing that state and nonstate action are more than complements: they are synergistic. More nonstate action helps improve state action. In this argumentation, we follow Bulkeley et al. (2018, 67), who state that “the key effects of TCCG [transnational climate change governance] initiatives are likely to be catalytic and political—contributing to normative change, building the capacities of political actors and altering coalition-building and conflict dynamics.” Similarly, Cao and Ward (2017) speculate that the emergence of transnational networks will significantly transform the policy inclinations of nation-states. TCG, by fostering experimentation, building

networks, and fostering trust among various stakeholders within the climate governance system, can lay the foundation for acknowledging and integrating the contributions of nonstate entities within the broader multinational framework. Put differently, the synergies between state-led policies and TCG initiatives may lead them to reinforce each other. Hence stronger climate policies may induce more engagement in TCG initiatives. Vice versa, the increased engagement leads to even stronger policies.

Rather than functioning independently or separately, we conceive the multilateral process and TCG as integral components of a developing polycentric climate governance system. As countries have vastly different experiences in and capabilities to address climate action, engagement in polycentric governance initiatives can be a driver of both higher ambition and better policy performance. First, stronger engagement in polycentric climate governance can help countries gain trust in what other actors are doing (Ostrom 2010), which can lead to a stronger willingness to adopt more ambitious targets and actions. Engagement in climate partnerships, transnational initiatives, or climate-related intergovernmental organizations (IGOs) beyond the UNFCCC leads to repeated collaboration in different, sometimes overlapping decision-making venues, creating more opportunities to deliberate, exchange knowledge, and develop a shared understanding about interests, needs, and also the capabilities a country has to respond to climate change (Carlisle and Gruby 2019). For example, even after the withdrawal of the United States from the Paris Agreement under the Trump presidency, the feared wave of defections by other countries from their emission reduction pledges failed to materialize (Urpelainen and Van de Graaf 2018). One of the reasons may have been greater awareness of the leadership displayed by subnational and nonstate actors within the United States, including states and cities with progressive climate policy frameworks, as well as an increasing number of businesses with pro-climate attitudes (Pickering et al. 2018). This leads to our first hypothesis:

*H*_{1a}: A higher engagement of national governments in polycentric climate governance is associated with a higher likelihood that they formulate more ambitious NDCs.

Second, a key proposition of polycentric governance is that the greater room for institutional and policy experimentation can lead to more effective policy solutions that can eventually diffuse to a wider set of actors (Dorsch and Flachsland 2017). Hence we hypothesize the following:

*H*_{1b}: A higher engagement of national governments in polycentric climate governance is associated with a higher likelihood that they adopt more and stronger mitigation policies.

Stronger connections to polycentric governance systems for mitigation can help governments learn about effective institutional and policy solutions to

address mitigation (Dorsch and Flachsland 2017). We expect that this effect will be stronger among those actors with lower existing capacity to act. Among the parties to the Paris Agreement, it is the group of former non-Annex I countries² that tend to have such lower capacity to mitigate their emissions. Partly, this can be explained by their usually lower development status, which is linked to weaker institutions, stronger capacity constraints, and, perhaps more importantly, stronger focus on broader development challenges than on global environmental problems like climate change (Okereke and Schroeder 2011). But beyond general development status, these countries' lack of climate policy capacity is linked in a path-dependent way to the global climate regime's past design (Castro and Kammerer 2021). Under the old Kyoto Protocol regime, non-Annex I country parties were involved in mitigation only to the extent that this mitigation was fully supported by external financial and technical support. For most non-Annex I countries, this meant involvement in individual mitigation projects under the framework of the Clean Development Mechanism. Under the post-2012 framework, many non-Annex I countries started to engage more organically in mitigation, through a system known as nationally appropriate mitigation actions (NAMAs). The implementation of these NAMAs was in many cases supported by international technical and financial cooperation and involved a first shift from individual projects toward more programmatic, policy-based or sectoral solutions for mitigation (Cameron et al. 2015). Nonetheless, the shift from these project-based or at best sector-based approaches toward the Paris system of (mainly) economic-wide emission reduction pledges implies a massive need for new strategies, plans, and policy measures across the whole economy and at all levels, as well as for new institutions to ensure the required monitoring of and reporting on emissions and mitigation measures. Such policymaking and capacity building necessitates time and, in many cases, external support (Pauw et al. 2020). Stronger engagement, not only within the UNFCCC or across other traditional IGOs but also through transnational and subnational climate-related networks, is an important source of such external support. Research has shown that capacity building, information sharing, and provision of funding are among the main activities of TCG initiatives (Bulkeley et al. 2014, 2018). Hence, we expect that the effect of engagement in polycentric climate governance will be stronger for former non-Annex I countries:

H_{2a}: The association between states' engagement in polycentric climate governance and more ambitious NDCs is stronger in former non-Annex I countries than in former Annex I countries.

2. Annex I to the UNFCCC lists those countries that were assigned greater responsibility for addressing climate change, given their stronger economic capacity and higher historical responsibility for past emissions. These include the Organisation for Economic Co-operation and Development (OECD) members as well as several former Soviet Union countries. All other countries (including more recent OECD members) were considered non-Annex I countries and were exempted from emission reduction obligations under the Kyoto Protocol.

H_{2b} : The association between states' engagement in polycentric climate governance and more mitigation policy effort is stronger in former non-Annex I countries than in former Annex I countries.

In addition, insufficient central state capacity can at least partly be made up by stronger capacities at the subnational level. Among the central propositions of polycentric governance is the central role of local actors that self-organize to find appropriate solutions to their particular circumstances (Jordan et al. 2018). Furthermore, one of the critical challenges to achieving progress toward NDC targets is being able to monitor and observe that progress. Many countries' monitoring and reporting capacities are only now being established, and case study as well as survey research shows that many governments still lack sufficient cross-sectoral coordination as well as a clear reporting chain from the local climate actions to the centralized reporting systems required under the Paris Agreement (Castro and Chaianong 2023; Röser et al. 2020; United Nations Development Programme 2016). If subnational units and/or civil society within those countries are engaged in transnational climate action, they can support the national government in establishing those reporting chains. More generally, engagement by nonstate actors can send positive signals in favor of climate action, motivating policymakers to adopt more ambitious goals (Hsu et al. 2020). Similarly, climate policy experimentation in subnational jurisdictions can inspire learning toward more innovative solutions at the national level (Bulkeley and Broto 2013):

H_{3a} : A higher engagement of subnational units and/or civil society in polycentric climate governance is associated with a higher likelihood that governments will formulate more ambitious NDCs.

H_{3b} : A higher engagement of subnational units and/or civil society in polycentric climate governance is associated with a higher likelihood that governments will adopt more and stronger mitigation policies.

Measuring Countries' NDC Ambition and Mitigation Policy Effort

Researchers have developed typologies of climate policy performance like the differentiation in pusher, pioneers, symbolic leaders, and laggards (Wurzel, Liefferink, and Torney 2019) or the categorization in bystanders, pushers, draggers, and intermediates (Sprinz et al. 2018). In a similar vein, several indices aim at providing more comprehensive measures of climate (policy) performance. The most prominent indices are the Climate Change Performance Index by Burck et al. (2018), the Climate Change Cooperation Index by Bernauer and Böhmelt (2013), and the Climate Action Tracker developed by Climate Analytics and the New Climate Institute.³

3. See <https://climateactiontracker.org/about/>, last accessed May 27, 2024.

What this literature still lacks is a more structured understanding of what “climate policy performance,” particularly in a multilevel governance system, actually entails. We argue that to understand the drivers of climate policy performance, it is necessary to look separately at two aspects of such performance. The first is the level of ambition of countries’ climate commitments (or, in Paris Agreement parlance, contributions), which refers to the extent to which countries’ climate change mitigation pledges are in line with the Paris Agreement’s global temperature goal. The second, no less important one is the level of effort that countries are displaying in implementing and meeting those pledges—in this article, we focus on mitigation policy adoption.⁴ We argue that different drivers may affect these two aspects of climate policy performance in different ways, and therefore a more disentangled analysis is warranted.

To measure the level of ambition of countries’ NDCs, we rely on the fair shares literature, which proposes ways to distribute across countries the global emission budget that remains to achieve the Paris Agreement’s 1.5° or 2°C goals, based on various conceptualizations of equity or fairness (Höhne et al. 2014; Holz, Kartha, and Athanasiou 2018; Robiou du Pont et al. 2017).

We use Robiou du Pont et al.’s (2017) greenhouse development rights framework to create our measure of ambitious NDCs. This choice is guided by the fact that this framework incorporates both capacity and historical responsibility, which are the two principles enshrined in the Paris Agreement’s principle of common but differentiated responsibilities and respective capabilities. To assess the level of ambition of countries’ NDCs, then, we calculate the difference between the per capita emissions projected to be reached according to the latest update of the NDC target as of March 2023 (obtained from Meinshausen et al. 2023) and the per capita emissions that would be allocated to that country under the greenhouse development rights framework, as calculated by Robiou du Pont et al. (2017). The resulting variable (*NDC ambition*) constitutes our first dependent variable. Positive values indicate that the NDC is more ambitious than the country’s fair share of global mitigation, while negative values imply that the NDC is less ambitious than the fair share. A value of zero, then, means that the NDC target is perfectly aligned with the country’s fair share of mitigation. Data for this variable are available for 167 countries.⁵

4. We purposefully refrain from looking at the final outcome, that is, greenhouse gas emissions, as done in some other mitigation performance studies (Holz, Kartha, and Athanasiou 2018; Peters et al. 2017; Robiou du Pont et al. 2017). We do this because our aim is to assess national governments’ efforts in pursuing mitigation policy. Emissions may be influenced by other factors, including weather patterns, natural resources, or crises (Bernauer and Böhmelt 2013; Iyer et al. 2017; Peters et al. 2017).
5. In the Online Appendix, we present results with alternative specifications of NDC ambition based on other fairness approaches.

To measure the level of mitigation policy effort, we rely on the Climate Change Laws of the World (CCLW) data set,⁶ which covers more than 5,000 climate change–related laws and policies from all UNFCCC country parties. Of these, we keep only those 2,539 laws and policies that are categorized as pertaining to mitigation, and we generate three different dependent variables that follow the public policy literature’s concepts of policy density and instrument density (Knill, Schulze, and Tosun 2012). First, we measure *policy density*, which is the count of all mitigation laws and policies adopted at the national level by each country since 2014. We take this starting date because 2014 was the year in which countries submitted their INDCs, which were a preliminary version of the NDCs that they would submit later, once the Paris Agreement had entered into force. We consider that any mitigation policies adopted from this point in time onward are meant to contribute to meeting the Paris Agreement’s goals.

The CCLW data set encompasses both laws and other policy documents, including executive decrees, ordinances, and regulations but also broader strategy documents, road maps, action plans, and guidance notes. The data set includes a variable classifying the documents into these various types (see the list in the Online Appendix). We use this document classification to identify those laws and policies with a higher policy intensity (Knill, Schulze, and Tosun 2012), that is, with more teeth or stringency. As policies with higher intensity, we classify those that clearly have the goal of adopting new policy instruments, including acts, decisions, decrees, directives, regulations, executive orders, laws, orders, ordinances, regulations, resolutions, royal decrees, and rules. This contrasts with policies with a planning character, such as strategies, plans, or programs. We define *strong policy density* as the count of these policy documents with higher intensity.

In addition, the CCLW data set includes a classification of the policy instruments adopted by the mitigation policies described earlier. Policy instruments are the tools on which the policies and laws rely to achieve their goals. They can range from coercive measures, such as mandatory standards, prohibitions, or technology prescriptions, to economic incentives, such as taxes and subsidies, or the establishment of broader governance frameworks and institutions. In the CCLW data set, instruments are classified into regulatory measures, economic incentives, direct investment, governance frameworks, and information instruments. An individual policy can include one or more of these instruments. We therefore conceptualize the variable *strong instrument density* as the count of those policy instruments with a higher intensity, understood as a

6. More exactly, the Climate Change Laws of the World interface for the Climate Policy Radar Database, available at: <https://climate-laws.org/>, last accessed May 27, 2024, and made available under the Creative Commons CC-BY license. The data in this database were sourced primarily from the Grantham Research Institute at the London School of Economics.

stronger ability to reduce emissions in the short to medium term (Metz and Glaus 2019). This includes regulatory measures, economic incentives, and direct investments.

Explanatory Variables and Operationalization

This article focuses on the interlinkages between countries' level of engagement with the polycentric governance of climate change and their level of NDC ambition and mitigation policy effort. In addition, it assesses these interlinkages separately for former Annex I and non-Annex I countries.

To operationalize countries' engagement in polycentric climate governance, we rely on data from the Climate Initiatives Platform hosted by UNEP (UNEP CIP platform).⁷ This platform offers information on 287 international climate initiatives, including data on their membership. From these, we focus on the 273 initiatives that do not have an exclusive focus on adaptation or resilience. To this, we add ten mitigation-related initiatives listed in the UNFCCC GCAP portal⁸ but not in the UNEP CIP platform, and we consult the initiatives' own websites whenever the data on membership are incomplete or unclear. This leads us to a final sample of 283 TCG initiatives with membership information.

To account for state governments' engagement in polycentric climate governance, we use the number of national actors that are listed as members in those 283 initiatives to construct a count of country memberships to TCG initiatives as of the year 2023. This is our first explanatory variable, called *state engagement*.

Second, to account for engagement of subnational units, businesses, civil society, and other country stakeholders in polycentric climate governance, we rely on the information about the locations of all other participants listed in the UNEP CIP data to create a count of non- and substate actors' memberships in TCG initiatives within each country as of the year 2023. This is our second explanatory variable, *nonstate engagement*.

We expect that the role of polycentric engagement—particularly with respect to the mitigation policy effort—is at least partly conditional on countries' preexisting capacity to address climate change and on their previous experience with mitigation action. We operationalize this aspect drawing on the membership to the group of Annex I and non-Annex I countries under the UNFCCC. To account for the conditioning role of this membership, we use interaction terms between the two explanatory variables described earlier and Annex I/non-Annex I membership. Note that because we control for countries'

7. <https://www.climateinitiativesplatform.org/>, last accessed May 27, 2024. The UNEP CIP platform focuses on initiatives that include several nonstate actors and may also include states, have the objective or potential of reducing greenhouse gas emissions or enhancing resilience, have an international scope, and have a focal point.
8. <https://climateaction.unfccc.int/Initiatives>, last accessed May 27, 2024.

income (see later), which is closely related to their broader development status, this variable is meant to account only for the institutionalized differences introduced by the former Annex I/non-Annex I differentiation.⁹

To test our expectations, we need to control for other potential explanations of countries' NDC ambition and alignment with policies and measures. In line with Sprinz and Vaahtoranta's (1994) interest-based explanation for international environmental policy, we expect countries' climate policy performance to be associated with their costs and benefits from climate action, as well as with their capacity to act. To account for costs and benefits from climate action, we control for *fossil fuel rents*, obtained from the World Development Indicators (World Bank 2023), as well as for the *ND-GAIN index*, which measures countries' resilience and vulnerability to climate change, with higher values indicating lower vulnerability.¹⁰ To represent countries' development status and broader capacity to act, we control for *income* (logged), also from the World Development Indicators.

In addition, we expect countries' democratic quality to influence both level of ambition of NDCs and their alignment with domestic policies. While existing research has established that more democratic countries tend to display higher levels of commitment to climate change mitigation (Bättig and Bernauer 2009), the effect of democracy on actual policy adoption and emissions trends or levels is more contested or inconclusive (Bättig and Bernauer 2009; Bernauer and Böhmelt 2013; Lachapelle and Paterson 2013). *Democracy* is measured dichotomously on the basis of whether there are free and fair elections that are followed by a peaceful turnover of power (Bjørnskov and Rode 2020).

We run cross-sectional regressions on those countries that have submitted NDCs and for which we have complete data. Given the substantial differences in the timing of countries' latest NDC submissions, the control variables are evaluated on the year before each country's NDC submission. With this choice, we try to address reverse causality concerns. While ordinary least squares is used for the regressions on NDC ambition, we apply negative binomial models for the regressions on policy and instrument density, which are count variables.

Nonetheless, as discussed, the causal relationship between engagement in polycentric governance and NDC ambition or mitigation policy effort can go in both directions. We address this issue in the following way. Our main regressions are based on the most up-to-date data on NDC targets, policy effort, and state and nonstate engagement in polycentric climate governance. Here both directions of the effect are certainly possible. In the Online Appendix, we show results with a stricter temporal separation between explanatory and

9. Nonetheless, given the wide differences in capacity among the non-Annex I countries, in the Online Appendix, we show results with a three-group categorization: Annex I, least developed countries, and other non-Annex I countries.

10. <https://gain.nd.edu/our-work/country-index/>, version 2023, last accessed May 27, 2024.

Table 1
Variables and Descriptive Statistics

	<i>N</i>	<i>Mean</i>	<i>SD</i>	<i>Min.</i>	<i>Max.</i>
Ambition	167	-2.9	7.7	-63	19
Policy density	200	8.2	11	0	66
Strong policy density	200	3.9	6.5	0	38
Strong instrument density	200	5.3	9.8	0	77
State engagement	199	14	9.9	0	51
Nonstate engagement	199	200	745	0	7,315
GDP/cap (logged)	184	4.1	0.5	2.9	5.1
Fossil fuel rents	178	2.9	6.7	0	44
ND-Gain index	185	50	11	27	75
Democracy	191	0.62	0.49	0	1
Annex I membership	200				
Annex I (%)	46	23			
Non-Annex I (%)	154	77			

dependent variables: first, for the regressions on NDC ambition, we keep only data from those NDCs submitted from December 2020 onward (160 observations) and construct the polycentric engagement variables using a subset of the UNEP CIP data that has been updated earlier than December 2020. For the regressions on policy effort, we keep the most up-to-date policy density variables and again use the pre-December 2020 data on polycentric engagement. For an even stronger case that the direction of causality goes from polycentric engagement toward ambition and policy effort, we run a third set of regressions using the most up-to-date data on NDC ambition and policy effort, but data from 2015 for state engagement in climate partnerships (Rowan 2021) and from 2012 for nonstate engagement in TCG (Andonova, Hale, and Roger 2017).

Table 1 presents the descriptive statistics for all our variables. A correlation table, as well as descriptive statistics and density plots of the dependent variables by Annex I membership status, can be found in the Online Appendix.

Results

Table 2 presents our results for the determinants of NDC ambition. We build separate models to consider the role of state-level polycentric engagement

Table 2
Regression Results for NDC Ambition

	Ambition			
	Model 1	Model 2	Model 3	Model 4
Intercept	26.517 (5.864)***	32.786 (7.211)***	26.644 (5.842)***	33.530 (7.230)***
GDP/cap (logged)	-10.043 (2.663)***	-10.614 (2.686)***	-10.062 (2.644)***	-10.399 (2.655)***
Fossil fuel rents	-0.237 (0.093)**	-0.198 (0.096)**	-0.237 (0.092)**	-0.207 (0.094)**
ND-Gain index	0.225 (0.124)*	0.213 (0.139)	0.224 (0.123)*	0.160 (0.133)
Democracy	0.763 (1.328)	0.539 (1.329)	0.762 (1.324)	0.532 (1.327)
State engagement	0.003 (0.060)	-0.089 (0.088)		
Nonstate engagement			0.000 (0.001)	-0.000 (0.001)
Non-Annex I		-4.824 (2.669)*		-3.278 (2.076)
State Engagement × Non-Annex I		0.165 (0.125)		
Nonstate Engagement × Non-Annex I				0.007 (0.006)
AIC	1,094.391	1,094.984	1,094.382	1,095.281
BIC	1,115.961	1,122.716	1,115.951	1,123.014
Log-likelihood	-540.196	-538.492	-540.191	-538.641
Adjusted R^2	0.181	0.188	0.181	0.187
No. of observations	161	161	161	161

AIC = Akaike information criterion. BIC = Bayesian information criterion.

*** $p < 0.01$.

** $p < 0.05$.

* $p < 0.1$.

Table 3
Regression Results for Mitigation Policy Effort

	<i>Policy Density</i>				<i>Strong Policy Density</i>				<i>Strong Instrument Density</i>			
	<i>Model 5</i>	<i>Model 6</i>	<i>Model 7</i>	<i>Model 8</i>	<i>Model 9</i>	<i>Model 10</i>	<i>Model 11</i>	<i>Model 12</i>	<i>Model 13</i>	<i>Model 14</i>	<i>Model 15</i>	<i>Model 16</i>
Intercept	-1.184 (0.617)*	-0.474 (0.731)	-0.251 (0.658)	1.247 (0.720)*	-3.968 (0.950)***	-2.678 (1.103)**	-2.631 (0.985)***	-0.344 (1.087)	-2.670 (0.863)***	-0.831 (1.007)	-1.590 (0.890)*	1.048 (0.989)
GDP/cap (logged)	0.515 (0.276)*	0.394 (0.277)	0.323 (0.294)	0.048 (0.268)	1.007 (0.418)**	0.776 (0.415)*	0.723 (0.433)*	0.285 (0.400)	0.423 (0.383)	0.255 (0.379)	0.186 (0.393)	-0.110 (0.364)
Fossil fuel rents	-0.028 (0.011)**	-0.022 (0.011)**	-0.033 (0.012)***	-0.025 (0.011)**	-0.030 (0.017)*	-0.017 (0.017)	-0.036 (0.018)**	-0.025 (0.017)	-0.027 (0.016)*	-0.017 (0.015)	-0.032 (0.016)**	-0.019 (0.015)
ND-Gain index	0.009 (0.013)	0.012 (0.014)	0.017 (0.013)	0.017 (0.013)	0.001 (0.019)	0.008 (0.021)	0.012 (0.020)	0.014 (0.019)	0.029 (0.017)*	0.021 (0.019)	0.039 (0.018)**	0.026 (0.018)
Democracy	0.049 (0.139)	0.018 (0.138)	0.143 (0.149)	0.016 (0.136)	0.209 (0.212)	0.163 (0.209)	0.340 (0.222)	0.142 (0.204)	0.309 (0.195)	0.214 (0.192)	0.381 (0.202)*	0.193 (0.187)
State engagement	0.043 (0.006)***	0.031 (0.008)***			0.054 (0.008)***	0.028 (0.012)**			0.045 (0.008)***	0.033 (0.011)***		
Nonstate engagement			0.000 (0.000)***	0.000 (0.000)***			0.000 (0.000)***	0.000 (0.000)***			0.000 (0.000)***	0.000 (0.000)***
Non-Annex I		-0.580 (0.260)**		-0.667 (0.197)***		-1.195 (0.373)***		-0.960 (0.283)***		-1.025 (0.347)***		-1.193 (0.261)***
State Engagement × Non-Annex I		0.024 (0.012)**				0.053 (0.017)***				0.024 (0.016)		
Nonstate Engagement × Non-Annex I				0.004 (0.001)***				0.005 (0.001)***				0.004 (0.001)***

Table 3
(Continued)

	<i>Policy Density</i>				<i>Strong Policy Density</i>				<i>Strong Instrument Density</i>			
	<i>Model 5</i>	<i>Model 6</i>	<i>Model 7</i>	<i>Model 8</i>	<i>Model 9</i>	<i>Model 10</i>	<i>Model 11</i>	<i>Model 12</i>	<i>Model 13</i>	<i>Model 14</i>	<i>Model 15</i>	<i>Model 16</i>
AIC	1,020.074	1,018.826	1,051.793	1,015.27	787.845	780.866	812.874	783.492	867.433	862.086	882.529	854.402
BIC	1,042.147	1,047.205	1,073.866	1,043.65	809.918	809.245	834.947	811.872	889.506	890.465	904.602	882.782
Log-likelihood	-503.037	-500.413	-518.897	-498.635	-386.922	-381.433	-399.437	-382.746	-426.717	-422.043	-434.265	-418.201
No. of observations	173	173	173	173	173	173	173	173	173	173	173	173

AIC = Akaike information criterion. BIC = Bayesian information criterion.

*** $p < 0.01$.** $p < 0.05$.* $p < 0.1$.

(models 1 and 2) and the role of engagement by nonstate actors (models 3 and 4). In addition, we have models with and without the interaction with Annex I membership.

Clearly our hypotheses regarding NDC ambition (H_{1a} , H_{2a} , and H_{3a}) are not supported. Neither states' nor within-country stakeholders' engagement in polycentric climate governance arrangements is related to NDC ambition. These results suggest that the assumed benefits of polycentric engagement in terms of gaining trust in other countries' commitment to seriously address mitigation do not kick in when national governments decide on how ambitious their promises to the international community should be.

There is some weak evidence that membership in the non-Annex I group of the UNFCCC is related to lower NDC ambition. However, more strongly, we see that traditional macro-level variables are better at explaining NDC ambition: richer countries, and those with larger rents from fossil fuel exploitation, tend to have less ambitious NDCs. At first this might seem contradictory, but the non-Annex I group is very heterogeneous and comprises both wealthy and poor countries, as well as many oil-dependent economies.

Table 3 and Figures 1–3 present the results for mitigation policy effort. First, the regression results clearly show that the two variables representing engagement in polycentric climate governance—state-level engagement and nonstate engagement in polycentric climate governance arrangements—are positively associated with countries' efforts to adopt the mitigation policies and measures needed to address climate change. This supports hypotheses H_{1b} and H_{3b} . Second, the results suggest that non-Annex I countries are less able to adopt mitigation policies, in particular the stronger policy frameworks and instruments required to reduce emissions.

Third, the regression results and the interaction plots displayed in Figures 1–3 suggest that the effect of engagement in polycentric climate governance is

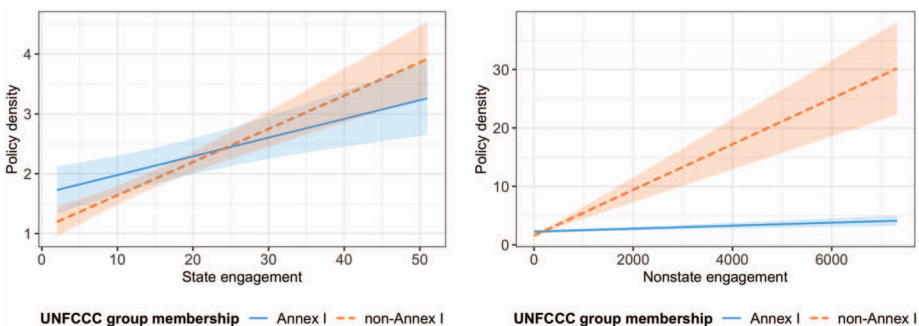


Figure 1
Mitigation Policy Effort: Interaction Plots for Policy Density

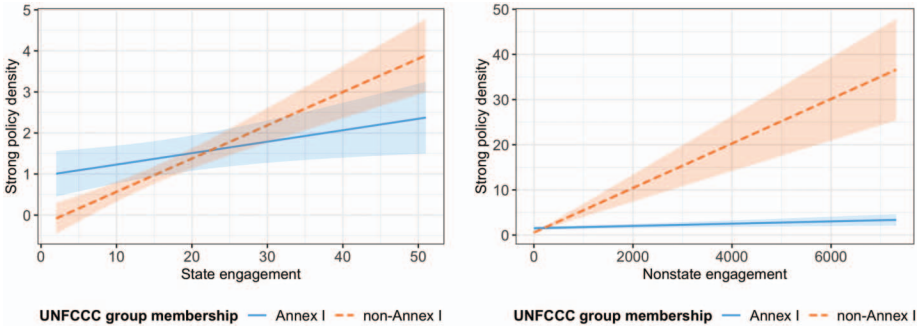


Figure 2
Mitigation Policy Effort: Interaction Plots for Strong Policy Density

more pronounced for non-Annex I than for Annex I countries, in particular for strong policy density and strong instrument density. At lower levels of engagement in climate-related partnerships and IGOs, non-Annex I countries have on average adopted fewer mitigation-related policies and policy instruments than Annex I countries. With increasing engagement in climate-related partnerships and IGOs, however, these differences disappear. These results support hypothesis H_{2b} .

The interaction plots with our second explanatory variable, nonstate and substate participation in TCG initiatives, are less clear due to the high uncertainty of the data: there are very few observations of non-Annex I countries with large numbers of memberships in TCGs. Indeed, lower participation and fewer leadership roles of actors from countries in the Global South in TCG initiatives have been identified among the limitations of these initiatives so far (Chan et al. 2018; Kaiser 2022). Nonetheless, we observe similar trends: the mitigation

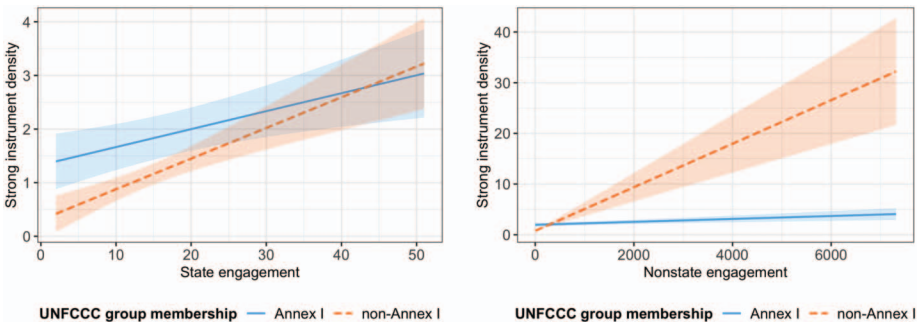


Figure 3
Mitigation Policy Effort: Interaction Plots for Strong Instrument Density

policy effort of non-Annex I countries tends to increase with increasing participation of nonstate and subnational entities in TCG. A similar trend is not apparent for the Annex I countries.

Conclusions

In this article, we assess systematically whether broader engagement in polycentric climate governance is related to countries' mitigation policy performance. We distinguish between the ambition of countries' international mitigation targets, inscribed in their NDCs, and the national mitigation policy effort, which we define as the density of the policies and instruments that national governments have adopted to address climate change mitigation.

Our results show two key findings. First, engagement in polycentric climate governance does not seem to affect the promises that countries make to the international community regarding their mitigation targets. This suggests that polycentric engagement is not playing the role proposed earlier of enhancing trust between states and promoting stronger multilateral cooperation. Rather, states' mitigation pledges are more likely to be driven by political considerations at both the national and international levels. Second, however, the strong mitigation policies and instruments that governments have been adopting since 2014 to fulfill those targets seem to be positively related to polycentric engagement.

How do we explain these findings? Engaging in a wider array of transnational and international climate-related organizations may offer state governments opportunities to learn from their peers' policymaking experiences and to identify opportunities and co-benefits of climate policy. Particularly non-Annex I countries, which in many cases still lack the basic institutions and capacities even to regularly track their emissions, and which are at least partly dependent on technical and financial support to implement their NDCs (Pauw et al. 2020), seem to profit from participation in polycentric governance at both the state and the non-/substate levels. We consider the differentiation between Annex I and non-Annex I to be central, precisely because the Kyoto regime itself placed such different demands on these two groups of countries. Annex I countries have years of experience with mitigation policies, monitoring and reporting systems, and the like. Non-Annex I countries now need to catch up—learning from peers through polycentric engagement is one way to achieve this. Our findings offer hope that the much-applauded turn toward greater polycentricity in climate governance will indeed lead to positive policy synergies with traditional state actors.

Nonetheless, it is true that non-Annex I is a very diverse category. To address this concern, in the Online Appendix, we have additional regressions with a three-way categorization of countries: Annex I, least developed countries (LDCs), and other non-Annex I countries. This additional analysis suggests that the weakest link between polycentric engagement and policy effort exists among

the LDCs. LDCs tend to emit very few greenhouse gases while being vulnerable to the effects of climate change, so that their priority is therefore adaptation rather than mitigation. At the same time, LDCs are among the countries that need the most capacity support to address climate change. Some research (most recently, Kaiser 2022) has shown that participation in climate governance initiatives is still biased toward the Global North, and it is likely that the LDCs are those that have so far profited the least from these new forms of governance. As Vofß and Schroth (2018) and Kaiser (2022) have warned, polycentric governance might reproduce existing power inequalities. Alternatively, it is also possible that data on polycentric engagement in Global South countries are less reliable or available.

Polycentric governance is an ideal, prone to institutional failures, such as structural inequalities, incrementalism, institutional overcomplexity, coordination issues, or unclear accountabilities. In this perspective, a limitation of our research design is that we cannot pinpoint a clear causal relationship between policy and instrument adoption and engagement in polycentric governance. Although we run robustness tests explaining future policy adoption with past measures of engagement in polycentric governance to try to exclude reverse causality, the opposite causal relationship has also been identified by other researchers. For example, Andonova, Hale, and Roger (2017) have shown that higher climate policy performance in the past is related to more participation of sub- and nonstate actors in TCG initiatives. It is therefore possible that policy and instrument adoption and engagement in polycentric governance are both driven by an unobserved variable (such as political will or some other form of intrinsic motivation to address climate change) that is still unaccounted for in our model. Alternatively, it seems reasonable to assume—as we do—that the two governance spheres mutually reinforce each other. More research, if possible, with panel data that would allow for tracking changes in polycentric engagement and in policy effort over time, is needed to clarify these points.

Furthermore, we have considered NDC ambition and mitigation policy effort as two separate dependent variables. It is very likely, however, that both are related: one could, for example, imagine states proposing relatively unambitious NDC targets so that it is easier for them to meet them with a given level of policy effort. Or vice versa, countries proposing ambitious NDC targets may struggle to adopt the policies and measures necessary to meet them. These interlinkages should be taken up by future research, for example, small-*N* qualitative studies aimed at unpacking the causal mechanisms through which polycentric climate governance, mitigation ambition, and policy effort may influence each other.

Nonetheless, the results shine a positive light on the potential synergies between polycentric governance and state-driven policymaking. Given the implementation gap that has been identified in the literature, this is good news. Here again, qualitative research aimed at identifying causal mechanisms would be useful for pointing toward measures to enhance and accelerate these synergies.

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