How does polycentric engagement relate to countries' NDC ambition and alignment with national policies?

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Abstract

While the Paris Agreement is still the core of global climate governance, the system has become increasingly polycentric – with growing numbers of climate governance initiatives emerging at subnational, transnational, and international levels. It is expected that these various governance systems may work to reinforce each other and help to drive more ambitious climate policy. From a state-centered point of view, however, meeting the Paris Agreement's global temperature goal requires countries to both propose ambitious mitigation targets under their Nationally Determined Contributions (NDCs), and to adopt the necessary laws, policies, and measures at the domestic level to meet those targets. Using existing measures of NDC ambition and a newly developed index of climate policy harmonization, we apply regression analysis to investigate the drivers of countries' NDC ambition and NDC alignment with domestic policies and measures. We focus particularly on the extent to which countries with a stronger engagement in the international UN-led climate negotiations, in the broader ecosystem of international climate-related organizations, and in transnational climate governance initiatives have more ambitious NDCs and stronger domestic mitigation policies. The results suggest that developing countries with stronger involvement in the UN-led and other international climate governance processes tend to have more ambitious NDCs and stronger mitigation policies, but the same cannot be found for industrialized countries. We explain these synergistic effects of polycentric engagement in developing countries with a discussion of polycentric systems' contribution to increasing knowledge, understanding and trust, and to the emergence of new shared norms and beliefs.[1]

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Introduction

The 2015 Paris Agreement established the ambitious goal of limiting global warming to well below 2° and preferably to 1.5°C above pre-industrial levels. Meeting this goal relies crucially on the quality of countries' Nationally Determined Contributions (NDCs). Not only must these NDCs be aligned with the global mitigation goal described above, but they must be implemented and realized through national policies and measures.

The Paris Agreement's acknowledgement that countries' contributions (rather than commitments) to climate change mitigation (and adaptation) are "nationally-determined", combined with the growing engagement of other international and transnational actors in reaching this goal, underscore the increasingly polycentric nature of the global climate change regime under the United Nations Framework Convention on Climate Change (UNFCCC). We clearly do not have a traditional monocentric regime any longer (van Asselt & Zelli 2018). Rather, the UNFCCC's role may now be better understood as an orchestrator or coordinator of the initiatives and actions undertaken by state and non-state actors to address climate change (Oberthür 2016).

However, the centrality of states for reaching global climate goals – given the nationally-driven process of determining and implementing the NDCs, but also by engaging in other climate-related fora and promoting transnational governance initiatives (Roger *et al.* 2017) – cannot be understated.

Nonetheless, eight years after the adoption of the Paris Agreement, there are still two large gaps hampering its success:

- An emissions gap between the amount of mitigation that countries promise in their NDCs and what would be needed to reach that global temperature goal (in this paper, we refer to this aspect at the "ambition" of NDCs) (UNEP 2021, but see also Meinshausen *et al.* 2022), and
- An implementation gap between what the NDC targets and the policies and measures that countries are implementing nationally to meet them (this is referred to as "harmonization" or "alignment" in this paper) (Kammerer *et al.* 2021; Lee *et al.* 2023).

The goal of this paper is therefore to explain the level of alignment between the overall Paris target and the ambition of countries' individual mitigation contributions, but also with their national policies and measures, in the light of countries' engagement in polycentric governance initiatives.

To do so, we rely on a body of existing literature that has proposed various approaches to fairly subdivide the remaining emissions budget between all countries of the world and then assesses whether current NDCs are in line with these approaches (Chan 2016; Höhne *et al.* 2014; Holz *et*

al. 2018; Robiou du Pont *et al.* 2017). This literature has progressed in measuring alignment between NDCs and fair mitigation shares, which can be used as a measure of NDC ambition. However, it has not yet sought to explain this level of ambition.

Furthermore, there is a growing literature applying economic models to estimate the ambition of domestic policies and to compare this policy ambition to fair shares (Kuramochi *et al.* 2021; Nascimento *et al.* 2022; Roelfsema *et al.* 2020). This literature relies on complex modelling tools and tends to focus on a small set of countries or regions (den Elzen *et al.* 2019; Roelfsema *et al.* 2020), or applies over-simplified assumptions regarding the policies adopted to implement NDCs (Staub-Kaminski *et al.* 2014; van Vuuren *et al.* 2020), and it does not seek to *explain* the alignment between NDCs and national policies.

In contrast, the political science literature has just started to seek explanations for the stringency of countries' NDCs. For example, in an exploratory and descriptive analysis, Tobin *et al*. (2018) examine whether countries' NDC targets tend to be more similar to those of their co-members of negotiation coalitions within the UNFCCC, and find that this is the case for members of the Umbrella Group of developed countries and of the Organisation of Petroleum Exporting Countries (OPEC), but not for the BASIC group conformed by Brazil, South Africa, India and China.

On the other hand, the public policy literature has a long tradition of assessing and measuring policy design and policy effort (Howlett 2014) as well as their relationship with policy impacts (Knill *et al.* 2012). Such policy effort measurements are starting to be applied to efforts to compare countries' climate policy performance (Schaffrin *et al.* 2015; Schaub *et al.* 2022).

This paper seeks to build upon these two lines of research in political science and public policy. We draw on existing measures of countries' NDC ambition (Robiou du Pont *et al.* 2017) and two newly developed indexes of countries' alignment between their NDCs and their domestic climate mitigation targets and policies (Baker *et al.* 2023) to assess the extent to which NDC ambition and alignment with domestic targets and policies is related to countries' level of engagement in the polycentric governance of climate change. We argue that particularly developing countries, which under the previous international climate regime (the Kyoto Protocol) were only involved in project-based mitigation mechanisms, have much less capacity for 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, we argue that particularly these countries' ambition and alignment can profit from a deeper engagement with the broader ecosystem of climate-related initiatives and institutions that have been established internationally and transnationally. Such engagement allows them to learn from other actors' experiences, to build up trust in their commitment for action, and to establish stronger connections to subnational and non-governmental initiatives happening within their own territories, thus enabling and incentivizing them to adopt more ambitious

commitments and to implement the necessary policy and monitoring frameworks as well as support mechanisms to meaningfully engage in climate change mitigation.

Drivers of climate action: Explaining countries' NDC ambition and alignment with national policies

Despite the scarce political science research so far on explaining countries' NDC and climate policy ambition under the Paris Agreement, we can build on broader research in international relations and global governance studying countries' performance and cooperation in international climate politics. This extensive body of work tries to find explanations for climate policy performance, understood in various ways, including patterns of treaty ratification (e.g., Von Stein 2008), types of international commitments (Tobin *et al.* 2018), adoption and implementation of national policies, performance in terms of emissions, or provision of climate finance (Peterson 2021).

Early work studied global climate politics with a focus on international relations and international political economy theories (see Bernauer 2013), or on the characteristics of the negotiation process itself, its actors, and their bargaining strategies, and how all this affects the outcome (for a review, see Odell 2013). Another stream of literature follows the tradition of Putnam's "two-level" game theory (1988), and investigates how a country's involvement in the multiple layers of decision-making influence its cooperation in international negotiations in general, and in climate change mitigation in particular (e.g., Hovi *et al.* 2012; Sprinz & Weiß 2001).

In contrast, other scholars devote their attention to national-level characteristics to explain differences in countries' climate policy performance and/or cooperation, like climate vulnerability and abatement costs (Sprinz and Vaahtoranta 1994), the local air pollution reduction associated with implementing climate policy (Dolšak 2009), the level of democracy (Bättig and Bernauer 2009; Bernauer and Böhmelt 2013) or further differences in countries' institutions and political constraints (Lachapelle & Paterson 2013; Skjærseth *et al.* 2013; Tobin 2017).

A complementary body of work are the studies of transnational (e.g., Betsill & Bulkeley 2004; Bulkeley et al. 2014), multilevel (e.g., Jänicke 2017), or polycentric (Jordan et al. 2018; Ostrom 2012) governance, which strive to empirically describe and theoretically understand governance mechanisms beyond the traditional state-centred multilateral agreements. In order to disentangle the complexity of the global climate regime, this stream of research investigates governance processes that take place on multiple levels, involving various centres and sources of authority, and engaging various actors beyond states, including IGOs, NGOs, subnational governments, scientific bodies and businesses, as well as networks of these various actors.

Within this line of research, the move from the state- and obligations-centred Kyoto Protocol regime to the Paris Agreement with its explicitly voluntary framework of non-mandatory contributions that are determined by countries themselves and with a strong emphasis on mobilizing climate action among non-state actors, is increasingly understood as a move "towards greater polycentricity" (Jordan *et al.* 2018 p. 4). Polycentric governance systems are characterized by greater autonomy of multiple decision-making centres that self-organize to achieve a certain goal, stronger attention to actors' preferences and competencies, a stronger emphasis on institutional experimentation and learning, and a reliance on trust-building to overcome cooperation dilemmas (Dorsch & Flachsland 2017). Accordingly, rather than a traditional multilateral treaty establishing targets and timetables for states to follow, the Paris Agreement becomes an orchestrator (Abbott & Snidal 2010; Hale & Roger 2014), establishing norms and guidance "towards global decarbonisation, while leaving implementation to other" actors (Oberthür 2016 p. 81).

But to what extent does this trend towards greater polycentricity help in achieving better climate policy performance, including by traditional state actors?

Overcoming the initially descriptive nature of polycentric governance research, recent work in this field is starting to seek empirical answers to this question. For example, Andonova *et al.* (2017) and Roger *et al.* (2017) look at the interactions between sub- or non-state climate governance and national climate policy performance. [To be expanded for next version of the paper: longer review of empirical analyses of polycentric governance as a driver of policy ambition / policy performance]

In this article, we argue that in a system in which different (state) actors have vastly different experiences in and capabilities to address climate action, engagement in polycentric governance structures can be a driver of both higher ambition and better policy performance. Stronger engagement in polycentric governance systems can help (state) actors gain trust in what other actors at all levels are doing, by helping them to learn and understand the capacities, goals and actions of those other actors. 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 states from their emission reduction pledges failed to materialize (Jotzo *et al.* 2018; Urpelainen & Van de Graaf 2018). One of the reasons may have been greater awareness of the leadership displayed by subnational and non-state actors within the US, 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). In sum, better understanding and trusting each other can lead to a stronger willingness to adopt more ambitious targets and actions.

Furthermore, a key proposition of polycentric governance is that the greater room for institutional and policy experimentation can lead to more effective policy solutions than can eventually diffuse to a wider set of actors (Dorsch & Flachsland 2017). We argue that stronger

connections to polycentric governance systems for climate change mitigation can help (state) actors learn about effective institutional and policy solutions to address mitigation, and that this effect should be stronger among those actors with lower existing capacity to act.

Among the parties to the Paris Agreement, it is the developing (or former non-Annex I) country parties that tend to have such lower capacity to act. On the one hand, this is due to their lower development status, which is generally linked to weaker institutions, stronger capacity constraints and, perhaps more importantly, stronger focus on broader development challenges than in global environmental problems such as climate change (add references). On the other, the lack of climate policy capacity is linked to the regime's design. 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 the vast majority of developing countries, this meant involvement in individual mitigation projects under the framework of the Clean Development Mechanism. Under the post-2012 framework, developing countries and emerging economies 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 towards more programmatic, policy-based or sectoral solutions for mitigation. Nonetheless, the shift from these project-based or at best sector-based mitigation approaches towards 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 and reporting on emissions and mitigation measures. Such policy-making and capacity-building necessitates time and, in many cases, external support (Castro & Chaianong 2023). Stronger engagement, not only within the UNFCCC or across other traditional international organizations, but also through transnational and subnational climate-related networks is an important source of such external support.

In addition, insufficient central state capacity can at least partly be made up by stronger capacities at the subnational level. One of the critical challenges to achieving progress towards NDC targets is being able to monitor and observe that progress. Many developing countries' monitoring and reporting capacities are only now being established, and case study 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 & Chaianong 2023). If subnational units and/or civil society within those countries are engaged in transnational climate action, they can support the state government in establishing those reporting chains.

Measuring countries' NDC ambition and alignment with national policies

Researchers have developed typologies of climate policy performance like the differentiation in pusher, pioneers, symbolic leaders and laggards (Wurzel et al. 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 (CCPI) by Burck et al. (2018), the Climate Change Cooperation Index (C3-I) by Bernauer and Böhmelt (2013) and the Climate Action Tracker (CAT) developed by Climate Analytics & the New Climate Institute.

What this literature still lacks is a more structured understanding of what "climate policy performance", particularly in a multilevel governance system, actually entails. In this paper, we argue that in order to understand the drivers of climate policy performance, it is necessary to look separately at two aspects of such performance, and that, in addition, these two aspects may interact with each other in various ways. The first of them is the level of ambition of countries' climate commitments (or, in Paris Agreement parlance, contributions), which refers to the extent to which countries' climate 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 actually implementing and meeting those pledges – which we call the alignment or harmonization between NDCs and domestic policies and measures. 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 *et al.* 2018; Robiou du Pont *et al.* 2017).

Holz *et al.* (2018), for example, propose a distribution of the emissions budget on the basis of countries' responsibility for climate change (i.e., their level of cumulative greenhouse gas emissions since a specific date in the past), and their economic ability to reduce emissions (measured in terms of GDP per capita). On this basis, they calculate fair emissions reduction scenarios for each country. Robiou du Pont *et al.* (2017) assess five different equity principles, including equal per capita emissions, equal cumulative per capita emissions, capability to act, constant emissions ratio, and the greenhouse development rights framework, which incorporates both capability and historical responsibility.

In this paper, we use Robiou du Pont *et al.* (2017)'s 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 NDC target, 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*. The resulting variable (*NDC ambition*) has a quite normal-looking distribution, and constitutes our first dependent variable. Positive values indicate that the NDC is more ambitious than the countries' 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 is available for 130 countries.

To measure the level of alignment between countries' NDCs and domestic mitigation policies and measures, we have developed our own measures of "vertical climate policy harmonization". We define the process of vertical policy harmonization as "the making of a country's (...) national climate mitigation policies (...) identical or at least more similar" to what delegates of a country committed internationally (Majone 2014 p. 4). Thus, unlike studies that examine factors that drive harmonization of climate policies between countries, we study factors that influence the level of policy harmonization between a country's commitment at the international level (its NDC), and its domestically adopted climate policy at the level of national or federal policies.

Our vertical climate policy harmonization indices builds upon previous efforts to create more comparable measures of climate policy output (Schaffrin *et al.* 2015). It incorporates an assessment of three components of policy harmonization: the *level* of the target (i.e., how many emission reductions the country intends to achieve, measured in a comparable way across all countries); the sectoral *scope* of the target (i.e., which sectors of the economy are covered by the target), and the domestic mitigation *policy mix* (i.e., the amount and quality of domestic policy instruments that have been adopted to address climate change mitigation). We measure target level and scope both for the NDC and the domestic policy level and compare these two components directly, which results in a *Target Index*. For a more complete version, we qualify these results with an assessment of the domestic mitigation policy mix, to build the *Policy Effort Index*. This assessment considers both the number of policy instruments that have been adopted to address climate change mitigation across the various sectors (policy density), as well as their quality (policy intensity). To evaluate the policy intensity, we consider the instrument type (i.e., procedural measures, information and voluntary measures, economic incentives, planned government investments or regulation) as well as the likelihood of implementation (whether there is a specific implementing agency, a monitoring procedure, sanctioning for noncompliance, as well as a strict application of the measure). Further details on the operationalization and coding of the vertical climate policy harmonization indices can be found in Baker *et al.* (2023).

The coding of the indices is currently being completed and validated. For this reason, this version of the paper includes only the Target Index, for which we currently have data for 82 countries.

Explanatory variables and operationalization

As explained above, this paper focuses on the interlinkages between countries' level of engagement with the polycentric governance of climate change and their level of NDC ambition and alignment with national policy frameworks. In addition, it assesses these interlinkages separately for developed (Annex I) and developing (non-Annex I) countries.

We argue that stronger involvement in intergovernmental and transnational processes seeking to address climate change offers states, policymakers and other domestic stakeholders opportunities to learn from others, acquire information about more effective climate policies, and more easily access financial and technical support opportunities. In addition, stronger engagement may also be associated with countries that care more strongly about addressing climate change and seek new avenues for reaching this goal. We therefore expect countries with stronger engagement within and beyond the UNFCCC to have more ambitious NDCs and also stronger alignment between the NDCs and their domestic policies and measures. We operationalize countries' polycentric engagement on the basis of three variables.

First, to account for **state governments' engagement in polycentric climate governance**, we combine several measures of engagement. First, we construct a count of country memberships to intergovernmental organizations (IGOs) with relevance for climate change, on the basis of states' membership to IGOs data from Correlates of War dataset (Pevehouse *et al.* 2020) combined with the UNFCCC list of accepted IGO observers.[2] The assumption is that IGOs that have some bearing on climate action also have an incentive to register to attend the UNFCCC meetings, either to inform themselves about the progress of the negotiations, or to influence those negotiations. To this, we add the count of country memberships to climate-related partnerships coded by Rowan (2021). Finally, to reflect the role of state governments' participation in negotiation groups engaged in the UNFCCC and Paris Agreement's processes themselves, we add the number of country memberships to UNFCCC coalition groups, obtained from Klöck et al. (2020). The assumption here is that membership to negotiation coalitions is not only related to discussions on how to influence the UNFCCC process, but also offers government representatives the opportunity to exchange on their more substantive climate policy advances. As highlighted by Chin-Yee and colleagues for the case of the African Group of Negotiators (Chin-Yee *et al.* 2021), these coalitions also provide support for national climate policy, and help to catalyse capacity building and financial support opportunities. From these three measures, we derive our first two variables, *Partnerships, IGOs and coalitions*, which combines all three of them, and *Partnerships and coalitions*, which does not take into account the IGOs, on the ground that their engagement with climate policy is in many cases less direct.

[2] https://unfccc.int/process-and-meetings/parties-non-party-stakeholders/non-party-stakeholders/overview/observer-organizations

Second, to account for **engagement of subnational units, civil society and other country stakeholders** in polycentric governance, we rely on the count of country actors' memberships in transnational climate governance initiatives coded by Andonova *et al.* (2017), which is our third explanatory variable, *Subnational memberships in TCGs*.

As explained above, we expect that the role of polycentric engagement – particularly with respect to the alignment between countries' NDCs and their national climate policy – is at least partly **conditional on countries' pre-existing capacity** to address climate change and with their previous experience with mitigation action. We operationalize this aspect on the basis of 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 three explanatory variables described above and Annex I / non-Annex I membership.

In order 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 CO_2 emissions per capita, obtained from the World Development Indicators, as well as for the GDP-adjusted ND-GAINS vulnerability index. To represent countries' capacity to act, we control for GDP per capita, also from the World Development Indicators.

In addition, we expect countries' level of democracy 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 & Bernauer 2009), the effect of democracy on actual policy adoption and emissions trends or levels is more contested or inconclusive (Bättig & Bernauer 2009; Bernauer & Böhmelt 2013; Lachapelle & Paterson 2013). Bättig and Bernauer (2009 pp. 303–4) describe democracies as having a larger implementation or "words-deeds gap" in climate change policy, which would therefore imply lower scores on our Target and Policy Effort indices. Democracy is measured with the combined Freedom House – Polity indicator found in the Quality of Government dataset.

Finally, beyond engagement with partners in polycentric governance, and beyond the general macroeconomic and institutional drivers described above, we expect states' more specific capacity and experience with climate policy and the UNFCCC process to be an important predictor of the quality of their climate pledges and implementation. States with more climate governance capacity and expertise should be better able to ascertain what is acceptable both internationally and domestically (Chasek 2011; Lewis 2005; Murnighan *et al.* 1999) and therefore promise NDCs that are both more ambitious and more aligned with domestic policies. We operationalize this idea by counting the number of past UNFCCC meetings attended by each

country's 5 most experienced negotiators, obtained from the participant lists to UNFCCC meetings.

We run cross-sectional OLS regressions on those countries that have submitted NDCs and for which we had complete data. Given that the earliest NDCs were submitted in 2014, all explanatory variables are measured in 2014.

Table 1 presents the descriptive statistics and the sources of data for all of our variables.

Table 1: Variables, descriptive statistics and data sources

[Unfinished, to be provided later]

Results (also unfinished)

Results for NDC ambition

Table 2 and Figure 1 present our results for the determinants of NDC ambition, focusing on the interaction between polycentric engagement and membership to Annex I / non-Annex I.

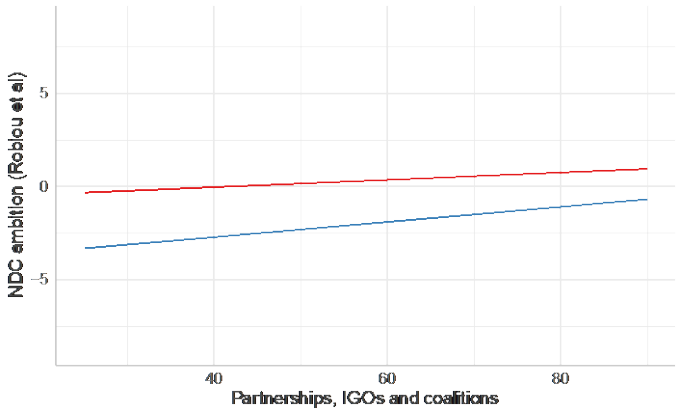
Table 2: Regression results for NDC ambition

	NDC ambition (Robiou et al.)			NDC ambition (Holz et al.)		
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Intercept	40.316 (16.423)**	40.296 (16.317)**	39.054 (16.516)**	25.980 (16.598)	25.205 (16.495)	24.586 (16.586)
Partnerships, IGOs and coalitions	0.020 (0.093)			-0.022 (0.096)		
Partnerships and coalitions		0.017 (0.117)			-0.044 (0.121)	
Subnational memberships in TCGs			0.000 (0.003)			0.000 (0.003)
Non-Annex I country	-3.519 (5.865)	-3.430 (3.471)	-2.619 (2.133)	1.159 (5.906)	2.743 (3.461)	5.514 (2.133)**
Partn., IGOs, coals. * NAI country	0.021 (0.112)			0.095 (0.114)		
Partn. and coals. * NAI country		0.048 (0.151)			0.162 (0.153)	
TCGs * Non-Annex I country			-0.000 (0.009)			0.001 (0.010)
CO2 per capita (log)	0.999 (2.931)	0.939 (2.889)	0.375 (2.970)	2.079 (3.004)	2.099 (2.958)	1.771 (3.004)
ND-vulnerability (GDP adjusted)	-3.969 (5.904)	-4.034 (5.886)	-4.103 (5.929)	2.542 (5.131)	2.360 (5.119)	2.753 (5.170)
GDP per capita (log)	-10.880 (4.247)**	-10.719 (4.174)**	-10.392 (4.236)**	-8.498 (4.284)**	-8.383 (4.212)**	-8.493 (4.248)**
Democracy	0.440 (0.268)	0.444 (0.266)*	0.469 (0.264)*	0.337 (0.254)	0.337 (0.252)	0.356 (0.250)
Delegation experience	-0.012 (0.025)	-0.011 (0.024)	-0.007 (0.023)	-0.010 (0.025)	-0.009 (0.025)	-0.007 (0.023)
R^2	0.213	0.214	0.216	0.242	0.244	0.241
Adj. R^2	0.172	0.173	0.175	0.206	0.208	0.205
Num. obs.	163	163	161	176	176	175

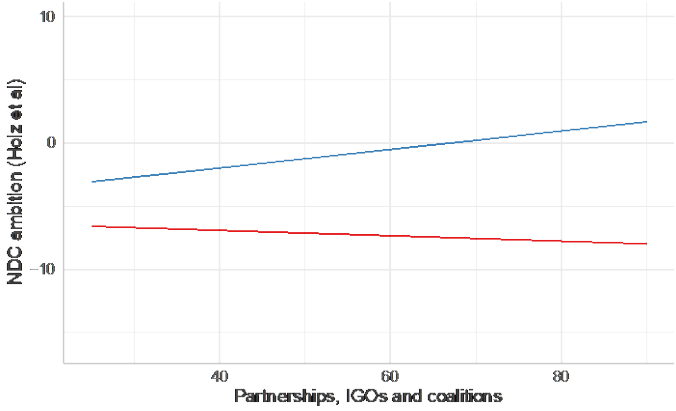
***p < 0.01; **p < 0.05; *p < 0.1

Figure 1: Interaction plots for NDC ambition

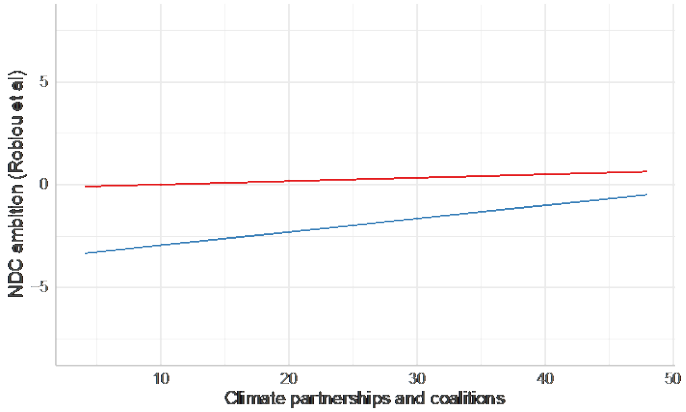
NDC ambition
(taken from Robiou et al. 2017)
Partnerships, IGO and coalitions



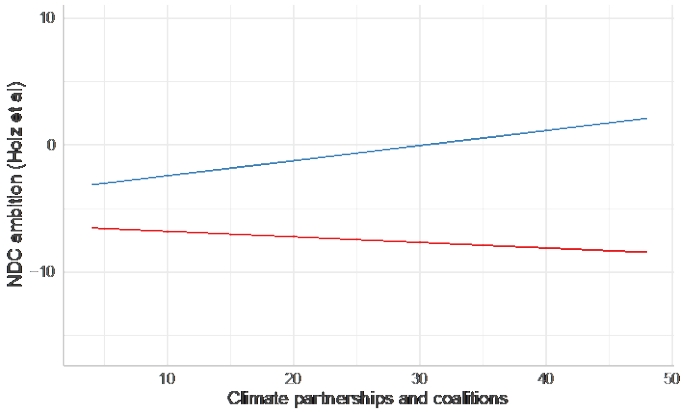
NDC ambition
(taken from Holz et al. 2018)
Partnerships, IGO and coalitions



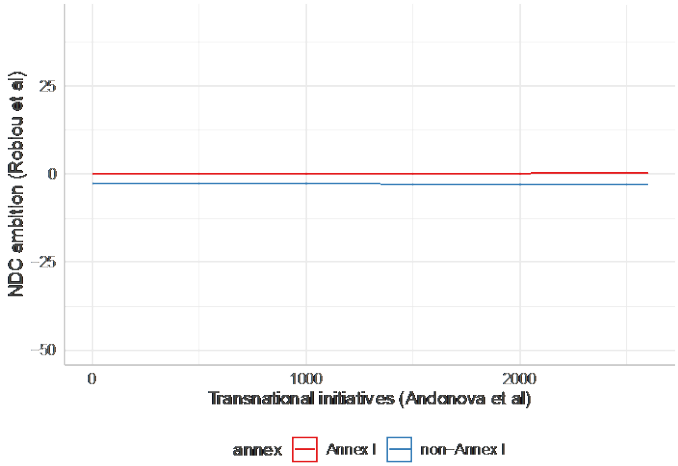
Partnerships and coalitions



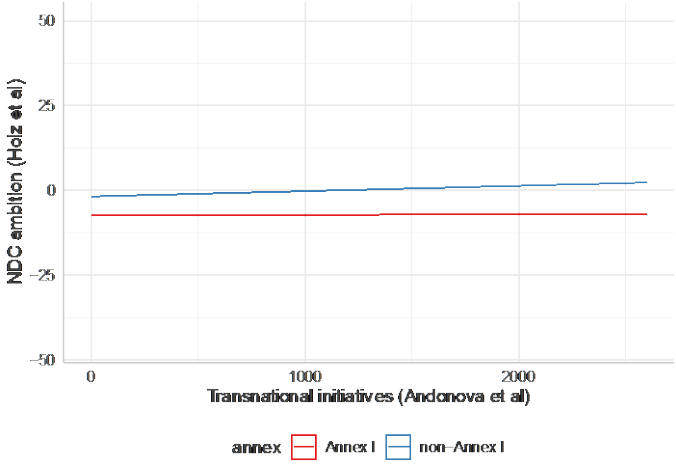
Partnerships and coalitions



Subnational membership in TCGs



Subnational membership in TCGs



Discussion of results on NDC ambition:

- NDC ambition: generally quite different findings coming from the estimations by Robiou et al. and by Holz et al. While with the data from Robiou et al we generally see that industrialized (Annex I) countries have more ambitious NDGs than developing (non-Annex I) countries, with the data from Holz et al we see the opposite. We need to evaluate the data in more detail to understand why there is this crucial difference.
- However, in our analysis we are more interested in the effect of participation in polycentric governance. Our expectation is that with increasing membership to climate-related partnerships, IGOs and coalitions, states gain more trust in each other, learn from each other and adopt more ambitious NDCs. And we expect that this effect may be stronger for developing countries, as they are the ones who need more improvements in capacity. The graphs above show that for our variables reflecting state participation in these organizations (*Partnerships, IGOs and coalitions*, as well as *Partnerships and coalitions*), the level of NDC ambition increases with more memberships, in particular for the developing (non-Annex I) countries, as expected.
- For the developed countries, the results are ambiguous. While the level of NDC ambition seems to increase with more memberships if we measure it using Robiou et al's variable, it seems to decrease if we use Holz et al's variable.
- This supports our hypotheses for the effect of engagement in polycentric governance at the state level on the ambition of NDCs.
- For our third variable, the number of subnational memberships in TCGs, however, the differences between developing and developed countries seem to be less marked, and we don't see any effect of increasing memberships on NDC ambition. Subnational climate action seems not to be relevant for encouraging states in adopting more stringent NDCs, and this is in line with case study research showing that there are still insufficient connections between local action and national target-setting.
- A challenge throughout our results, though: the analysis is cross-sectional, we have relatively few observations. Most of what we see is statistically not significant at 5%. So, while we see trends in the expected direction, we still cannot state that these trends make a statistically meaningful difference.

Results for harmonization between NDC targets and national policies

Table 3 and Figure 2 present our results for the determinants of alignment between the NDC target and national policies and measures.

Table 3: Regression results for harmonization between NDCs and national policies

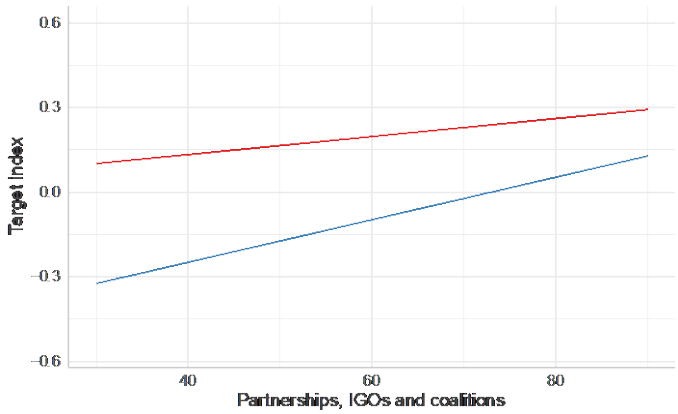
	Harmonization (Target Index)			Harmonization (Policy Index)		
	Model 7	**Model 8**	**Model 9**	**Model 10**	**Model 11**	**Model 12**
Intercept	-0.467 (0.875)	-0.520 (0.876)	-0.887 (0.906)	-1.765 (2.271)	-1.818 (2.296)	-2.851 (2.555)
Partnerships, IGOs and coalitions	0.003 (0.004)			-0.006 (0.008)		
Partnerships and coalitions		0.001 (0.005)			-0.004 (0.009)	
Subnational memberships in TCGs			-0.000 (0.000)			0.000 (0.000)
Non-Annex I country	-0.555 (0.306)*	-0.511 (0.182)***	-0.370 (0.114)***	-0.547 (0.633)	-0.155 (0.390)	0.064 (0.248)
Partn., IGOs, coals. * NAI country	0.004 (0.005)			0.010 (0.010)		
Partn. and coals. * NAI country		0.009 (0.007)			0.008 (0.014)	
TCGs * Non-Annex I country			0.001 (0.000)*			0.000 (0.001)
CO2 per capita (log)	-0.255 (0.160)	-0.274 (0.157)*	-0.358 (0.166)**	-0.329 (0.342)	-0.294 (0.342)	-0.478 (0.398)
ND-vulnerability (GDP adjusted)	0.164 (0.222)	0.158 (0.222)	0.162 (0.222)	0.088 (0.416)	0.086 (0.422)	0.123 (0.412)
GDP per capita (log)	0.197 (0.228)	0.236 (0.223)	0.325 (0.232)	0.591 (0.609)	0.533 (0.608)	0.781 (0.681)
Democracy	-0.024 (0.017)	-0.021 (0.017)	-0.016 (0.016)	-0.028 (0.041)	-0.023 (0.041)	-0.020 (0.040)
Delegation experience	-0.001 (0.001)	-0.000 (0.001)	0.000 (0.001)	-0.002 (0.002)	-0.002 (0.002)	-0.004 (0.002)*
R^2	0.243	0.242	0.251	0.09	0.066	0.144
Adj. R^2	0.155	0.155	0.163	-0.18	-0.21	-0.119
Num. obs.	78	78	77	36	36	35

***p < 0.01; **p < 0.05; *p < 0.1

Figure 2: Interaction plots for harmonization between NDCs and national policies

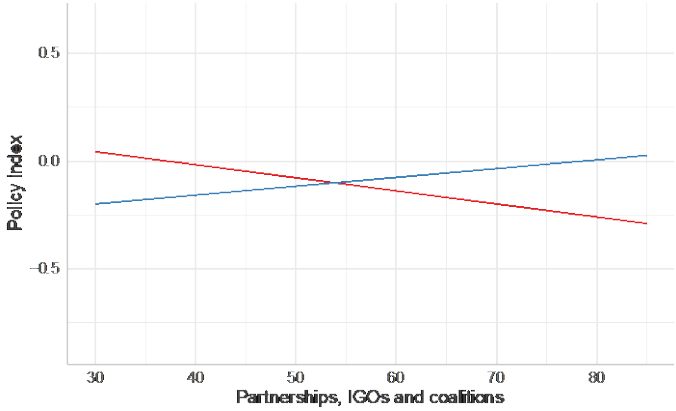
Harmonization (Target index)

Partnerships, IGO and coalitions

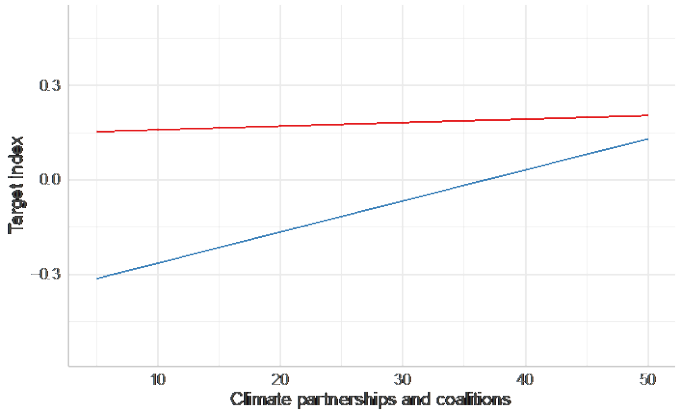


Harmonization (Policy index)

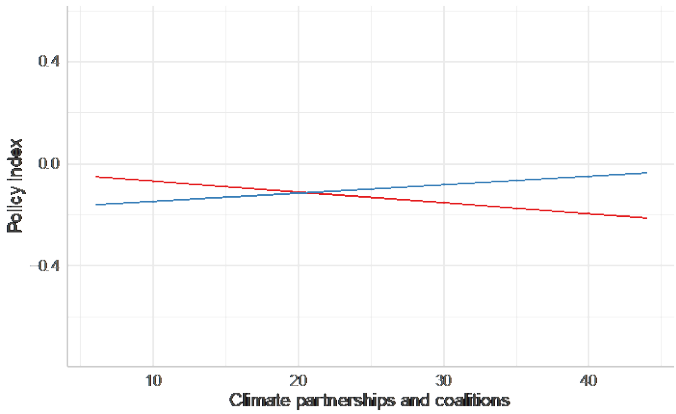
Partnerships, IGO and coalitions



Partnerships and coalitions



Partnerships and coalitions



Subnational membership in TCGs

Subnational membership in TCGs

Discussion of results on harmonization:

- For these results, we have even fewer observations than in the previous cases, so the discussion is based on the trends we observe in the graphs, but not on their statistical significance.
- In this case, we see somewhat more marked differences between developing and industrialized countries, particularly in the case of the Target index, for which we have more observations. Clearly, so far, developed (Annex I) countries, have been better able to translate their NDCs into national-level targets that are at least well-aligned with those NDCs (that would be a 0 score in the index) or even more ambitious than the NDC target (positive value in the index). We also see that, for both developing and industrialized countries, more participation in climate-related partnerships, IGOs and coalitions is associated with higher scores in the target index, this is, with more ambitious national-level mitigation targets. Again, the slope of the curve is somewhat more pronounced for the developing countries, suggesting that particularly these countries profit from participation in polycentric governance structures, which help to enable them to translate their NDCs into domestic policy-making.
- Also for our third explanatory variable, subnational membership in TCGs, we see that stronger participation in such initiatives seems to help enable developing countries to adopt more ambitious national targets. However, we need to take a closer look at these results, because there are very few developing countries with such large membership numbers. So the effect we are seeing in the graph could be simply caused by one outlier.
- Regarding the policy index, the graphs also suggest that developing countries' overall national policy effort (including their targets but also the policy mix adopted to implement those targets tends to increase with more participation in polycentric climate governance. However, because we have so few observations, the statistical uncertainty is even greater than in the previous cases.

Conclusions

[Unfinished]

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