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Determining the credibility of commitments in international climate policy

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The Paris Agreement on climate change aims to improve cooperation by allowing governments to set their own commitments. Its success hinges on whether governments and investors believe those national commitments. To assess credibility, we interrogate a large novel sample of climate policy elites with decades of experience and well-placed to evaluate whether nations' policy pledges are aligned with what they are politically and administratively able to implement. This expert assessment reveals that countries making the boldest pledges are also making the most credible pledges, contrasting theoretical warnings of a trade-off between ambition and credibility. We find that the quality of national political institutions is the largest explanator of the variation in credibility, and Europe's credibility is exceptionally high. We also find that economic factors, such as the costs and benefits of controlling emissions, are statistically unimportant in explaining the credibility of national pledges to cooperate.

For more than 30 years, diplomats have been trying to advance coordination on climate change policy[1,2]. Those efforts have taken many different diplomatic forms and reflected many different theories about how to govern global collective problems[3,4]. Some theories invoke the need for integrated global contracts linked to strict enforcement mechanisms, such as those linked to trade sanctions[5]. Other theories, and a growing array of evidence, suggest that integrated global contracts are impossible to craft and thus international agreements must be more decentralized and voluntary[6,7]. Still other, complementary, approaches see cooperation emerging from small groups of committed governments and firms—clubs—then deepening and expanding with effort and experience[5,6,8,9].

The Paris Agreement, although it formally did not endorse any theory of change, reflects a shift away from contracting logics to greater roles for individual national initiative and experimentation[10,11]. Paris is oriented around pledges, known formally as nationally determined contributions (NDCs), and is formally non-punitive. Some studies on the virtues and risks of the non-punitive diplomatic approach emphasize the value of flexibility[6,9,12–15]. Others point to the danger that pledge-based systems will merely codify the status quo and not lead to much (or any) deeper cooperation[5,16,17]. Voluntary commitments raise age-old debates in the study of international law: absent enforcement, can voluntarism inspire countries to deviate from the status quo in ways that solve problems like the need to cut warming pollution[18]? If governments are free to select their own commitments, won't pledges of great ambition to adopt costly policies go hand-in-hand with low credibility that deviations from the status quo will occur[8,18,19]?

Whether this new approach actually has much impact on national policies and emissions hinges on an important empirical research question: what is the credibility of the Paris pledges? Although simple to ask, this question is hard to answer. The formal content of most NDCs is extremely thin, making it difficult for analysts and governments to assess intent and credibility[20]. (In this paper we focus on NDC pledges related to controlling emissions, but the thinness of content applies as well to other climate-related pledges in NDCs such as those on financing and adaptation to climate impacts.) This opacity stems, in part, from the fact that the formal requirements for NDCs were established through an intergovernmental process based on consensus decision-making[8,21,22], which nearly always is a recipe for the lowest common denominator[15,23]. Some studies have used these pledges to show their potential collective impact on global emissions and warming[24,25]. Typically, such studies focus on whether the stated ambition of national pledges will be adequate to meet agreed collective goals, such as stopping warming at 2 °C above pre-industrial levels. The question of whether stated pledges are credible lurks in the background, unanswered.

Some organizations track the content and credibility of NDCs, often with the policy goal of putting pressure on laggards[26–29]. However, using such tools reliably raises difficult methodological challenges because it is hard, looking from the outside of a national policy process, to evaluate how current and successor national governments will put stated policies into effect. With few exceptions (for example, refs. [29] and [30]), no social science discipline has done much to advance theories and methods needed for cross-national explanation that could be used reliably for such purposes.

Results

We offer a new method for assessing the credibility of national policy strategies by tapping a novel source of information: diplomatic and scientific experts who, for decades, have participated in climate policy debates. Often, experts are a useful source of structured information when it is impractical to measure variables of interest directly[31]. Such settings arise, as in climate policy, where the phenomena under study are highly complex and assessment requires informed judgement and intuition, guided by experience, because formal sources of empirical information such as national laws and regulations are hard to evaluate independently or elusive. This logic has inspired a rich literature that uses methods of expert elicitation[32–36].

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Table 1 | Overview of the elite sample

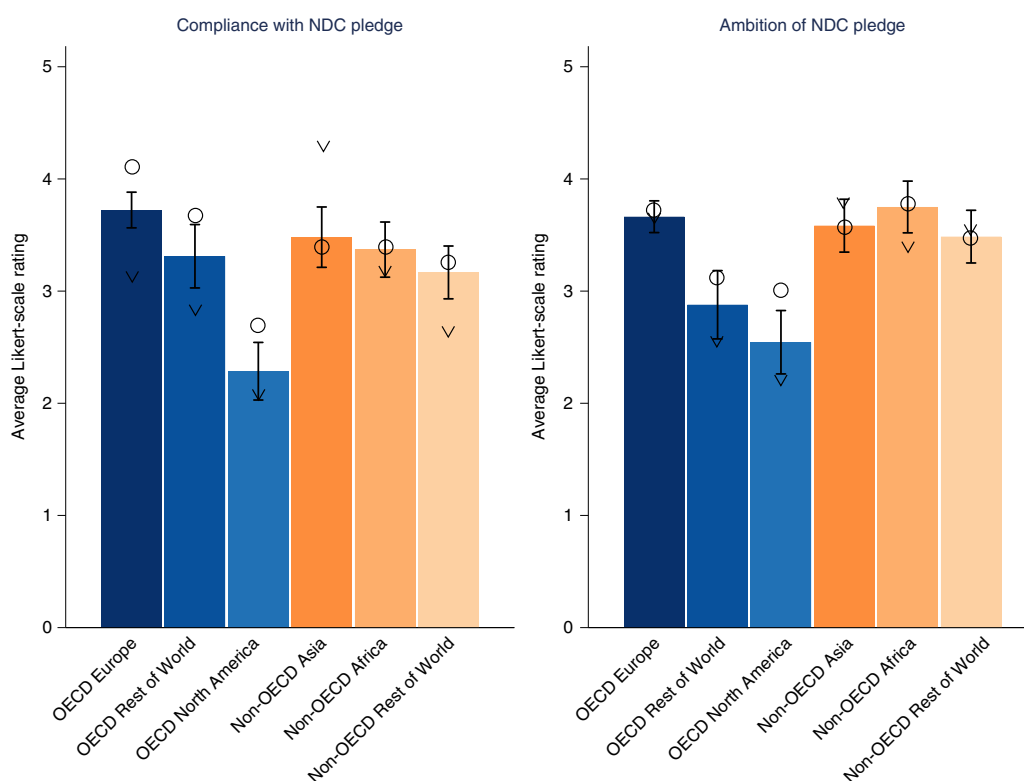|	Full sample	Negotiators	Scientists
Respondents	829	599	230
	Mean		
Age	52.61	50.25	58.82
COPs as party member	3.48	4.46	0.89
COPs as observer	1.47	1.40	1.64
	Frequency (%)		
Organization			
National or EU government	37.71	46.26	15.35
International government	6.31	7.12	4.19
Research	33.72	19.57	70.70
Private sector	5.28	6.23	2.79
Non-governmental organization	9.40	11.92	2.79
Other	7.59	8.90	4.19

Fig. 1 | Assessment of expected compliance and ambition of NDC pledge for home country. Average Likert-scale rating from respondents assessing whether their home country will honour their current Paris Agreement NDC pledge (left) and the ambition of that pledge (right). (Survey questions D2_10 and D1_10 in the Supplementary Information). Mean value for Negotiators indicated by 'o'. Mean value for Scientists indicated by 'v'. Number of observations for left panel (left to right): $n=184$, $n=74$, $n=84$, $n=79$, $n=100$, $n=103$; right panel (left to right): $n=190$, $n=74$, $n=79$, $n=84$, $n=100$, $n=106$. Whiskers indicate 95% confidence interval for the mean. See Supplementary Information for non-parametric tests of mean differences and size of subsamples. The raw data in the survey are at the country level, but we aggregate here because sample sizes are small for many countries, and we must assure respondents' confidentiality. Our regression analysis (see Table 2) uses country as the unit of analysis. Supplementary Tables 19 and 20 and Supplementary Figs. 2 and 3 provide comparisons of our measures with measures of similar concepts (expected compliance and ambition) from other sources (see Supplementary Table 18 for descriptions).

The value of expert information and reasoning has led behavioural scientists to probe when and how the experience of elites leads them to behave in ways that are different from the general public[37–46]. Experience often gives elites special skills for making complex decisions efficiently and reliably, although 'experience' is highly specific to the domain of expertise. Elite chess players have heuristics that are extremely valuable for chess but of little value for other board games such as Go[47]. Thus, while it is important to
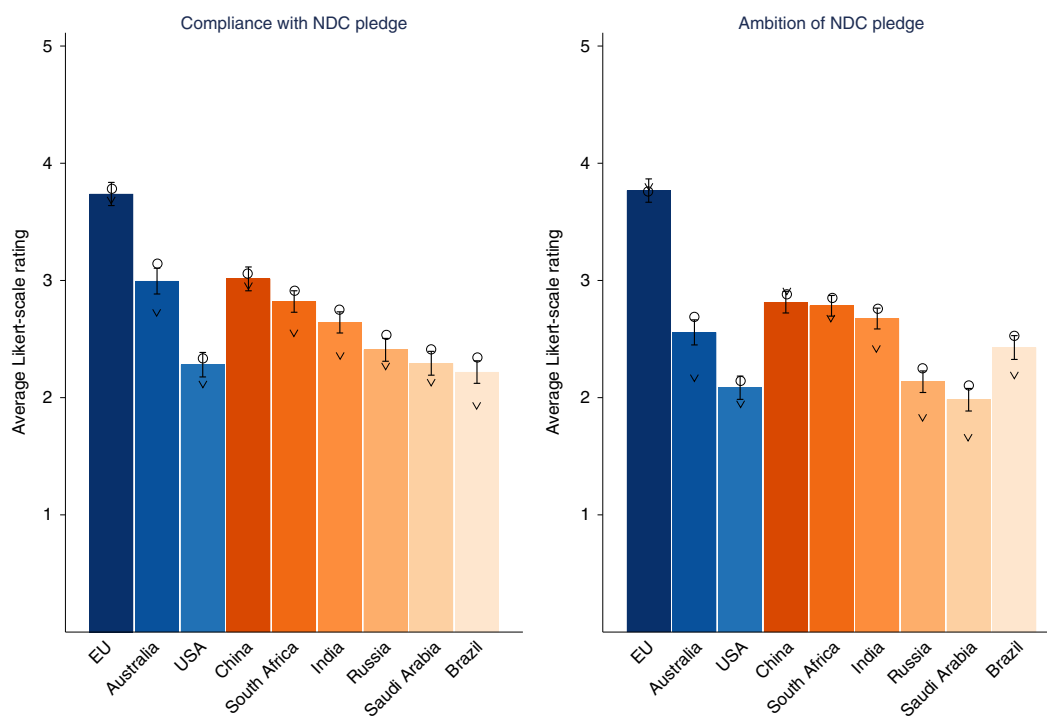
Fig. 2 | Assessment of expected compliance and ambition of NDC pledge for other countries. Average Likert-scale rating concerning confidence that a country or group of countries will fulfil their current Paris Agreement NDC (left) and the level of ambition (right). (Questions D2_1–9 and D1_1–9 in the Supplementary Information). Mean value for Negotiators indicated by 'o'. Mean value for Scientists indicated by 'v'. Sample sizes (from left to right) for left panel: $n = 473$, $n = 549$, $n = 544$, $n = 591$, $n = 512$, $n = 553$, $n = 549$, $n = 535$, $n = 545$; right panel (left to right): $n = 446$, $n = 510$, $n = 531$, $n = 567$, $n = 467$, $n = 514$, $n = 515$, $n = 510$, $n = 505$. Whiskers indicate 95% confidence interval for the mean. See Supplementary Information for non-parametric tests of mean differences and sizes of subsamples. Supplementary Figs. 4 and 5 provide comparisons of our measures with measures of similar concepts from other sources (see Supplementary Table 18 for descriptions).

get expert insights, it is also crucially important to pay close attention to kinds of expertise. Non-elite populations can be used to address some important issues surrounding climate policy such as public willingness to pay for policy and reactions to climate risks[48–54], but for the kinds of policy judgement and assessment that are the focus of this paper, perceptions of elites are distinct and indispensable.

We recruited the elite sample for this analysis with email invitations based on official registrations for Conference of the Parties (COP) sessions of the United Nations Framework Convention on Climate Change (UNFCCC), the main intergovernmental body tasked with addressing the climate crisis, and official lists of authors and reviewers of the IPCC, the body responsible for periodic assessment of climate science. Invitations contained a bespoke link to an online survey. Between September 2020 and January 2021, we recruited 829 respondents from more than 150 countries (response rate 47% on verified invitations, see Methods and Table 1). For nearly all countries, this survey period implicated just the first NDC; for the United States it spans the end of President Trump's term and the expectations for a Biden administration. (See Supplementary Information for robustness checks for updated NDCs (Supplementary Table 26), including Trump and post-Trump results in the United States (Supplementary Tables 43–52).) To our knowledge, this is by far the largest and most diverse sample of climate policy elites ever polled systematically for their insights into climate policy.

Because experience is domain specific, we distinguish two types of climate expertise: policy experts ('Negotiators') drawn from the ranks of UNFCCC delegations and science experts ('Scientists') drawn from the IPCC who also participate extensively in COPs but

more often as observers. We additionally measure levels of expertise by counting the numbers of COPs each expert has joined.

We gave each subject a battery of questions focused on national pledges (NDCs) and other elements of the Paris Agreement (for the full list of questions see the Supplementary Information). Those included expert evaluation of the likelihood that the NDC pledge submitted by their home country would be honoured—what scholars call 'compliance.' We also asked experts to evaluate for their home country and other regions the total effort implied by each submitted pledge—analogous to what is often called 'ambition.' Because the Paris Agreement is designed to let countries set their own pledges to reflect their own circumstances, we asked the experts to assess ambition relative to a country's or region's economic strength (see question D1_10 in the Supplementary Information). Expected compliance, conditional upon ambition, is credibility.

On average, experts from non-Organisation for Economic Co-operation and Development (OECD) countries consider their home countries' pledges to be highly ambitious (and no less credible) in contrast with OECD countries (Fig. 1). Within the OECD, Europe is exceptional: experts from that region consider their pledges made to be ambitious and most credible.

We also asked experts to assess the commitments of other countries (Fig. 2). Owing to the large number of countries, we limited the assessment of other countries to a selection of the countries most important for climate mitigation policies. In Europe, we asked experts to evaluate the European Union (EU) rather than individual nations. From this perspective, not only do Europeans see themselves as ambitious and credible, but so do the experts from other regions—the variation is even more pronounced compared with the self-assessments shown in Fig. 1.

Table 2 | Marginal effects (at means) from binary probit regressions, dependent variable: confidence compliance with NDC pledge for home country

	1	2	3	4
Geopolitical background				
Rest of OECD (d)	−0.3435*** (0.0716)	−0.3119*** (0.0749)	−0.3066*** (0.0757)	−0.2350*** (0.0817)
Non-OECD rest of the world (d)	−0.3008*** (0.1019)	−0.2841*** (0.1055)	−0.2661** (0.1142)	−0.1715 (0.1229)
GDP per capita (s)	−0.2337*** (0.0827)	−0.2605*** (0.0818)	−0.2027** (0.0860)	−0.2356*** (0.0839)
Ambition				
Ambition (our survey) (d)		0.2697*** (0.0493)		0.2442*** (0.0494)
Ambition (RdP&M) (s)	−0.0905*** (0.0337)		−0.0852** (0.0371)	
Expected damages				
Vulnerability (our survey) (d)	−0.0145 (0.0894)	0.0196 (0.0895)		
Vulnerability (ND-GAIN index) (s)			−0.0272 (0.1225)	−0.1548 (0.1124)
Types of government				
Quality institutions (s)	0.2934*** (0.0599)	0.2558*** (0.0588)	0.2673*** (0.0825)	0.1697** (0.0794)
Polity index (s)	−0.0690** (0.0322)	−0.0442 (0.0327)	−0.0626* (0.0319)	−0.0463 (0.0319)
Fossil fuel dependency				
Fossil fuel rents (s)	0.0873* (0.0464)	0.0140 (0.0447)	0.0737 (0.0455)	0.0094 (0.0427)
CO_2 per capita (s)	−0.0544 (0.0656)	0.0553 (0.0602)	−0.0856 (0.0648)	−0.0080 (0.0616)
Respondents				
Scientist (d)	−0.1982*** (0.0597)	−0.1879*** (0.0614)	−0.1928*** (0.0594)	−0.1835*** (0.0613)
Number of COPs (s)	0.0578** (0.0273)	0.0396 (0.0290)	0.0618** (0.0270)	0.0425 (0.0286)
National government (d)	0.1993*** (0.0522)	0.1995*** (0.0542)	0.1893*** (0.0516)	0.1877*** (0.0534)
N	497	476	507	485

Numbers indicate marginal effects at means (discrete effects for dummy variables), with standard errors in parentheses. Dummy variables are indicated with (d), standardized (mean = 0, s.d. = 1) continuous variables with (s). Significance levels are indicated by: *$P < 0.10$, **$P < 0.05$, ***$P < 0.01$. The stochastic component in the models is assumed to be normally distributed. Ambition (our survey) refers to the measure collected by our survey, ambition (RdP&M) to the measure by ref. [28].

We distinguish negotiators from scientists in the responses shown in Figs. 1 and 2 for they have distinct types of expertise. Negotiators are typically government employees and steeped in the art of what is politically and administratively feasible. They have, for their own country, particular knowledge about the quality of policy proposals and the ability to assess from intuition and experience the impact of policies on factors that ultimately matter most, such as emissions. Climate scientists, by contrast, tend to focus on imperatives of stopping climate change and, typically, the inadequacy of efforts (for example, refs. [25,28]). There are marked differences in assessments by these experts of their own countries, especially in the OECD countries (Fig. 1). Negotiators are much more optimistic about their home country's expected compliance than scientists. Non-OECD Asia is the only exception, a finding that we link to the relatively small number of scientists from this region (Supplementary Tables 5 and 8). The differences between negotiators and scientists decrease (often disappear) in Fig. 2 when the negotiators look outside their specific domain of expertise and evaluate other countries' pledges (see Supplementary Tables 14–17 for details). Policy expertise is domain specific; even the diplomats, when they look beyond the home country they know best, are not much different from scientists who lack extensive policy experience.

Now we turn to plausible explanations through regression analysis. Our dependent variable is expected compliance—that is, credibility— of the home country (Fig. 1). The theoretical literature suggests that ambition should explain compliance. Indeed, much of the scholarship in international relations, surveyed above, suggests that low ambition begets high compliance[17,18,55]. Yet the logic of the Paris Agreement is based on the opposite expectation—credible pledges will also beget more cooperation and ambition. We include two measures

of ambition. First is the experts' own assessment of ambition considering the economic capabilities of their home country or region (Fig. 1). Second, we alternatively include an independently measured assessment of ambition derived by scientists (to the measure by Robiou du Pont & Meinshausen[28]; RdP&M) who are focused on what each country must do individually so that the collective efforts add up to the widely discussed goal of stopping warming at 1.5 °C above pre-industrial levels[28]. These two measures reflect two very distinct ways of conceptualizing the idea of ambition. The former method treats ambition as a 'political' concept—a measure of what a country is pledging compared with what the nation's experts think it is obliged and able to pledge. The second measure of ambition is more 'objective' in that it reflects a dispassionate, independent assessment of what each country must do. This latter approach often shades into the concept of 'science-based targets', which is rooted in the idea that science can instruct political processes in the level of effort needed to control warming pollution. These two measures let us test which of these two theories about the relationship between ambition and credibility—a political approach or a scientific one—might yield the greatest insight into the policies nations actually adopt.

Our regression also includes a measure of expected damages from the impacts of climate change[56]. Countries vulnerable to higher damages should be more motivated in their ambition to cut pollution and thus to make credible commitments[28,29,57,58]. Following the rich literature in comparative politics and law[6,29,59–64] we include measures of the quality of institutions. Looking to the literature on the political economy of energy and industrial policy[65–69], we include a measure of the power of the industry most squarely implicated in cutting carbon pollution: fossil fuels. Finally, we control for the type of expert making the assessment, mindful that expertise is domain specific.
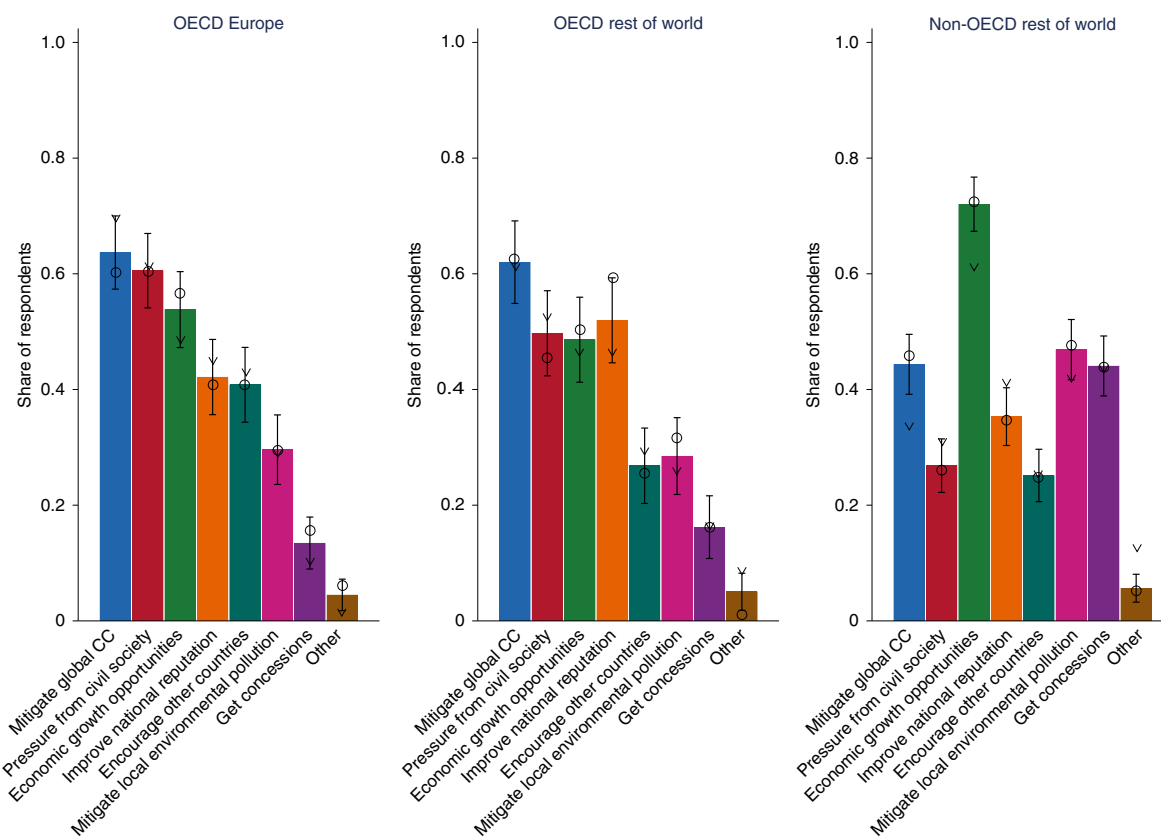
Fig. 3 | Motivations for compliance with NDC pledge for home country. Share of respondents who indicate the respective motivation from the pre-defined list of most important motivations for their home country's compliance with its NDC pledge (survey questions D5_1–8 in the Supplementary Information). Number of observations: $n = 223$ (OECD Europe), $n = 179$ (rest of OECD), $n = 380$ (rest of the world). Whiskers indicate 95% confidence interval for the mean. Mean value for Negotiators indicated by 'o'. Mean value for Scientists indicated by 'v'. CC, climate change. See Supplementary Information for non-parametric tests of mean differences.

Political and institutional factors have a substantial effect on respondents' expected compliance of their home country (Table 2). The quality of government is significant in all models: higher-quality government institutions lead to more credibility. The type of political system has consistent (if not always significant) sign and suggests that democratic governments are less credible in the commitments they make. Perhaps this reflects the incentives for politicians to make vague treaty commitments that are attractive to voters who are unable to assess credibility and cost[70]. Credibility also declines with economic strength, which suggests that economic capabilities beyond institutional quality do not increase credibility. (Although not a subject of intense empirical investigation, it has been widely assumed that richer countries would be more reliable participants in complex policy coordination needed to address collective goals like stopping climate change. Our study finds no support for that proposition.)

The ambition of the pledges is significant in all models but in sharply diverging ways. Respondents' assessments of ambition are highly correlated with credibility, but 'objective' measures of ambition by dispassionate scientists are inversely correlated with credibility. The political approach to ambition travels with credibility; the scientific one does not. Also striking is that all these factors are much more influential than the variables that, from an economic perspective, should be decisive: climate change damages and measures of the size of incumbent high-pollution industries (for example, size of fossil fuel rents and CO_2 emissions per capita).

Compared with diplomats, scientists are systematically more pessimistic about compliance—a matter that is outside their domain of expertise (see Supplementary Table 38 for a decomposition of types of scientist, which have no statistically significant effect). Experience (measured by the number of COPs attended) also correlates with rosier assessments of compliance, a finding consistent with studies that suggest the characteristics of an expert are learned on the job and may be sociological as much as individual[71].

To complement this regression analysis we also asked the experts to assess the weight of different possible explanations for their home country's compliance with its current NDC (Fig. 3). These possible explanators, taken from the literature and pre-survey pilot interviews, range from factors directly anchored in climate change goals (for example, solving the collective action problem of warming) to those related to international diplomacy (for example, national reputation) to a variety of co-benefits that are correlated with national energy policy but suggest different motivations for national action (for example, addressing local air pollution). Analysts have long noted that wealthy nations tend to view climate change as a crisis meriting action in its own right, but many emerging and developing countries tend to frame climate action within a broader set of 'sustainable development' agendas[72]. Our results are consistent: for the experts from OECD nations, the single most important explanation for compliance is mitigation of climate change. For the rest of the world, boosting economic growth and mitigation of local environmental pollution are more important.

Discussion

Theories of international cooperation, including those that have motivated the design of the Paris Agreement, have been hard to

test with data. The most critical variables—the national motivation to make and honour commitments—have been particularly hard to measure. Tapping experts steeped in the policy process offers a novel source of insight. Our results point to two major observations. First, as widely expected, credibility and ambition are closely related. But our study reveals contrasting perspectives. When policy experts assess ambition, the countries making the boldest pledges are also making the most credible pledges. This result is among the first systematic evidence that the core logic of the Paris Agreement is working. Paris was designed around the idea that by making pledges non-binding—in contrast with legally binding emission targets and timetables of the Kyoto Protocol—national governments would be more flexible to reveal what they are willing and able to implement. That, coupled with periodic review, offered a way to keep pushing for more ambition and credibility in tandem[8,10,11]. Not only do we find support for that idea, but our result also contributes to the age-old debate over the value of non-binding legal pledges. Non-binding commitments, with the right supporting institutions, can elicit greater adjustment by countries in part because non-binding instruments are more flexible and better able to accommodate uncertainty[6,15,23,55,73]. By contrast, when pledges are evaluated against what scientists say is necessary—a process focused on the geophysics of the climate, rather than the political realities of what is possible—the result is the trade-off between ambition and credibility that so many analysts have feared[15,17].

Second, our study suggests that credibility is a political and institutional story. Within political science there is a rich literature suggesting that institutional quality—including the ability of organized interest groups to exert disproportionate influence on policy processes—should have a large impact on how a country organizes political support for (and against) policies, and also the surety with which a country can implement policies once decided[74,75]. Related, there are rich literatures around democratic deliberation as a possible explanation for societal support (and thus credibility) concerning an array of national policies, including those aimed at honouring international commitments[76–79]. Still other research suggests that countries with strong redistributive institutions—welfare states—may be better able to make credible commitments because they are more capable of managing otherwise wrenching social changes, such as unemployment in declining industries, caused by national policies aimed at implementing international commitments[29,80–82].

We look at these factors with two measures of institutional type: quality and political system (Table 2). Institutional quality is associated with higher expected compliance in all of our models. The standard measure of political system—Polity IV scores—suggests that in some models less-democratic countries offer more credible pledges after controlling for institutional quality and ambition. This finding may reflect the high degree of administrative and political control that exists within consolidated autocratic governments[83]. Research on arms control, economic cooperation and other domains has suggested that governments with high administrative quality and a degree of political insulation may stay the course, implementing complex international commitments even in the face of economic and political shocks[18,78]. Such hypotheses need closer evaluation in the domain of climate change politics and policies.

In contrast with the political and institutional story, we find that most of the conventional economic factors, such as measures of expected economic damages from climate change, emissions levels or fossil fuel dependency, don't explain much of the assessed variation in the credibility of NDCs. Strikingly, our measures for climate vulnerability are insignificant. Moreover, our regressions suggest that lower gross domestic product (GDP) is also associated with higher expectations of compliance. This may reflect the impact of capacity-building programmes that have been running for decades[84,85]. In other domains of international cooperation such programmes have played important roles in boosting compliance by low-income nations[8,86]. Our results point to the need for additional research on how capacity-building commitments for developing countries link to the credibility of those countries' pledges.

These two results—about the link between ambition and credibility, and the political and institutional processes associated with credibility—suggest directions for policy and research. For policymakers, our results are consistent with other studies that suggest it is important to distinguish Paris-like processes of cooperation that utilize mechanisms of non-binding self-determined pledges from the formal diplomacy of consensus decision-making[8]. For scholars, this distinction between actual cooperation on climate change and formal diplomacy suggests it is particularly important to understand how international institutions interact with national policy processes, since these processes seem to explain so much of expected compliance, and credibility is central to effective pledge-based diplomacy. One implication for policymakers is that the machinery of international pledge-and-review will need the capacity to assess (and perhaps enhance) credibility, which may be difficult to achieve via formal intergovernmental decision-making that tends to work by consensus. Other kinds of international institutions may be needed, such as those created by groups of committed first movers on climate policy rather than through global consensus. In addition, those institutions might benefit from policy assessments by experts using methods such as those reported here. These are visions for international institutional machinery that are quite different from the standard UN-based processes.

For decades, climate cooperation has been marked by a lot of diplomacy but not much real action because pledges were non-existent, not particularly ambitious or disingenuous. That is now changing, possibly quickly. The crisis in Ukraine, although it unfolded after our survey closed, is plausibly accelerating that action—especially in the region our survey already identified as most exceptional (Europe)[87]. With the right methods and theories, a rich research agenda is unfolding as we seek to understand that variation and, in policy processes, shape national action towards more cooperative global outcomes.

Online content

Any methods, additional references, Nature Research reporting summaries, source data, extended data, supplementary information, acknowledgements, peer review information; details of author contributions and competing interests; and statements of data and code availability are available at https://doi.org/10.1038/s41558-022-01454-x.

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Methods

Data collection and sample. The research was evaluated and approved by the Ethics Committee of the University of Kassel, Germany. All human participants in our study gave informed consent before participation. To obtain the data for our empirical analyses, we invited climate policy experts via email. The invitation email contained a short introductory text and a link to an online questionnaire provided on the QuestionPro platform. The links were personalized to ensure that the questionnaire is filled out only once by each participant. The first invitation to the survey was sent out on 21 September 2020. This was followed by four reminders with an interval of roughly three weeks each. The final reminder was distributed on 5 January 2021. The possibility to take part in the survey ended on 31 January 2021. To incentivize participation, we offered to share preliminary, descriptive results of the survey within four weeks after participation of the respective respondent.

The sample is made up of climate policy experts from two sources: the UNFCCC (Negotiator sample) and the IPCC (Scientist sample). The Negotiator sample is based on the lists of participants published by the UNFCCC after each COP. For COPs 16–25 (2010–2019), email contacts for individuals who were listed as a party member at least once were taken from previous studies or searched for on the Internet. Individuals who attended the COPs as observer only (and never as party) were not included. The Scientist sample consists of authors or reviewers of the *Fifth Assessment Report* by the IPCC. The list is available on the IPCC website and the email addresses were obtained through Internet searches. In the regression analyses, we always control for whether an individual is from the Negotiator or the Scientist sample.

A total 978 individuals from 162 countries participated in the survey (700 Negotiators, 278 Scientists), meaning that they answered at least some of the questions. A total of 829 individuals answered the questions relevant to this Article (599 Negotiators, 230 Scientists). In our empirical analyses, the number of observations varies slightly across questions because respondents who did not answer a certain question or answered it with 'I don't know' had to be left out. Additionally, respondents were dropped when relevant information for their respective home country was not available to be used as explanatory variable. To calculate the response rate, we set the number of individuals who answered the questions relevant to this Article in relation to the number of individuals who were contacted and verifiably opened the link to the survey (1,768 in total: 1,313 Negotiators, 455 Scientists). Following this approach, the overall response rate is 46.89% (45.62% Negotiators, 50.55% Scientists). There is no other way for us to calculate the response rate because we do not know how many individuals have actually received and seen the invitation. Many of the contact addresses, some dating back to 2010, are no longer valid or active.

Questionnaire and empirical approach. The survey covered different aspects of international climate policy with a focus on the Paris Agreement. An early version of the survey was pre-tested at the Bonn Climate Change Conference (SB 50) in June 2019. The pre-test was conducted in the form of in-person qualitative interviews among six individuals who have been involved in climate negotiations as either party member or observing party. One pre-test participant, with experience as party member, supported the project further in an advisory role to provide feedback in matters of wording, comprehension and content of questions up until the final version of the survey. All survey questions used in this Article can be found in the Supplementary Information. Definitions and summary statistics of the dependent and explanatory variables can be found in Supplementary Tables 21–23.

The questionnaire started with a short introduction describing the subject of the survey. Here, we also provided a data protection declaration (in line with the General Data Protection Regulation of the EU) and obtained the respondents' consent to process their data. After that, we asked participants to state their home country. Respondents were told to indicate the country whose climate policy they know best. In most cases the indicated home country aligned with nationality (for 88% of respondents in the Negotiator sample, 87% in the Scientist sample) and delegation membership (90% in the Negotiator sample) of the respondent. The main part of the survey was organized into several blocks of questions. The first part relevant to this Article was concerned with the participants' assessments of the NDCs submitted under the Paris Agreement. These are the outcome variables of interest for our analysis. More specifically, the questions on the NDCs asked participants about the ambition and the expected compliance regarding the NDC of their home country and other countries. Furthermore, we elicited reasons for the fulfilment of the respective NDCs. In a later part of the survey, we additionally assessed the respondents' views on the consequences of climate change on future living conditions to be used as control variable. In the final part, we obtained information regarding the participants' personal background, such as gender, age, nationality, the field in which they have obtained their highest degree of training, the type of organization for which they work and the number of COPs they attended as a party member.

To perform regression analyses, we added a wide set of explanatory variables on the country level to our dataset. These variables were matched to the respective participant based on the indicated home country. The added variables used for the analyses presented in Table 2 can be categorized in the following way: geopolitical background, ambition of NDCs, vulnerability, dependence on the extractive fossil

fuel industry, type of government. The geopolitical background is given by OECD membership and can be OECD Europe, OECD rest of the world, non-OECD rest of the world. For ambition of NDCs we rely on the assessments made in ref. [28]. (This is not the only potential independent source of ambition. Looking beyond the RDP&M study, in Supplementary Tables 19 and 20, and Supplementary Figs. 2–5 we compare our subjective measures of credibility, based on the assessments of experts, with a variety of other metrics, including from Climate Action Tracker[88], Germanwatch[89] and from the London School of Economics database of national climate laws and policies[90].) Vulnerability (expected damages from climate change and other global challenges) is measured by the 2018 ND-GAIN Index[56]. To control for a country's dependence on the extractive fossil fuel industry, we included a variable that is the sum of oil, gas and coal rents expressed as share of GDP based on data by the World Bank[91–93]. Type of government is controlled for by using Polity IV scores along with the World Economic Forum's measure of government quality[59,94]. All added variables were standardized (mean = 0, s.d. = 1) to ease interpretation.

For some specifications, we alternatively use variables that were derived directly from the survey. For ambition, respondents gave a subjective evaluation of their home country's NDC (in relation to economic strength) using a Likert-type scale with five answer categories ranging from '(1) Not ambitious at all' to '(5) Very ambitious' and an 'I don't know' option. 'Ambition (our survey)' is constructed as a dummy variable that takes the value 1 if the respondent answered with either 4 or 5 on the Likert-type scale and 0 otherwise. Respondents' subjective expectations about climate change damages (vulnerability) were elicited by asking them to estimate the consequences of climate change on future living conditions up to 2100 for their home country. The assessments were elicited by means of a Likert-type scale with five answer categories ranging from '(1) Extremely large damages' to '(5) No damages' and an 'I don't know' option. 'Vulnerability (our survey)' is constructed as a dummy variable that takes the value 1 if the respondent answered with either 1, 2 or 3 on the Likert-type scale and 0 otherwise. The regression analyses additionally included information on the respondent itself that was elicited in the final part of the survey. Here, we controlled for whether a respondent was from the Negotiator or Scientist sample, whether the respondent works for a national government organization, and how often a respondent attended a COP as party member.

The dependent variable in the presented regressions is a respondents' assessment of the expected compliance with the NDC pledge for the respective home country. The variable was elicited using a Likert-type scale with five answer categories ranging from '(1) Not confident at all' to '(5) Very confident' and an 'I don't know' option. 'Compliance NDC' is constructed as a dummy variable that takes the value 1 if the respondent answered with either 4 or 5 on the Likert-type scale and 0 otherwise. Accordingly, we used binary probit models and report the marginal effects at the mean of the other variables. (The results for North America, dominated by the United States, are affected by the US election in 2020. More detail on how the election outcome influenced the assessments is included in Supplementary Tables 43–52. Regardless of electoral timing, we asked for an evaluation of the formal NDC that the United States had submitted back in 2016.)

For the described dependent variable, we present results from four specifications of estimations of binary probit models in the main paper. In the four specifications, we include different combinations of third-party and survey-collected measures of ambition and vulnerability. Throughout the four specifications our main results regarding the geopolitical background, NDC ambition, vulnerability, institutional quality and respondent background are robust.

The Supplementary Information provides further robustness checks, these include the following: Supplementary Table 24 shows the same results as Table 2 in the main paper with additional model statistics. Supplementary Table 25 shows specifications using different combinations of GDP per capita, vulnerability (given by the ND-GAIN index) and quality of institutions testing for multicollinearity issues. Supplementary Table 26 shows robustness checks for different measures of NDC ambition as well as robustness checks for updated NDCs. Supplementary Table 27 shows the results when the number of climate laws and policies that were adopted between 2016 and 2020 are included as additional explanatory variables. Supplementary Table 28 shows the results when the fossil fuel rents are included separately for coal, oil and natural gas. Supplementary Tables 29–33 show the results when alternative measures for fossil fuel dependency (total and per capita production) are used. Supplementary Tables 34–37 show the results for two alternative measures of vulnerability. Supplementary Table 38 and Supplementary Fig. 6 show the results when a dummy variable that indicates whether a respondent is a natural scientist is included in the model. Supplementary Table 39 shows the results from ordered probit models based on the original five-step Likert scale of the variable and Supplementary Table 40 for ambition as dependent variable. The additional regressions in the Supplementary Information indicate that our overall results regarding the geopolitical background, NDC ambition, vulnerability, institutional quality and respondent background are robust. Additionally, it includes descriptive statistics and non-parametric tests (for example, differences by geopolitical background) for all variables presented in Figs. 1, 2 and 3 (Supplementary Fig. 1 and Supplementary Tables 1–13, 41 and 42) and a

comparison between our survey measures and measures on these concepts from other sources (Supplementary Tables 18–20 and Supplementary Figs. 2–5).

Data availability

The dataset necessary to reproduce the findings of this study is publicly available in anonymized form at: https://doi.org/10.7910/DVN/SHF1HU (ref. [95]). Climate Action Tracker data are available at: https://climateactiontracker.org/countries/. Germanwatch data are available at: https://ccpi.org/download/the-climate-change-performance-index-2020/ and https://ccpi.org/download/the-climate-change-performance-index-2021/. LSE Climate Change Laws of the World data are available at https://climate-laws.org/. Data used by ref. [28] are available at https://www.nature.com/articles/s41467-018-07223-9 and http://paris-equity-check.org/warming-check.html. GDP per capita are available at https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.KD?most_recent_value_desc=false. ND Gain Index data are available at https://gain.nd.edu/our-work/country-index/methodology/. World Competitiveness Index data are available at https://www.weforum.org/reports/the-global-competitiveness-report-2020. Polity IV data are available at https://www.systemicpeace.org/inscrdata.html. Fossil fuel rent data are available at https://data.worldbank.org/indicator/NY.GDP.COAL.RT.ZS, https://data.worldbank.org/indicator/NY.GDP.NGAS.RT.ZS and https://data.worldbank.org/indicator/NY.GDP.PETR.RT.ZS. CO_2 per capita data are available at https://edgar.jrc.ec.europa.eu/dataset_ghg60#p1. Fossil fuel production data are available at https://www.eia.gov/international/data/world/coal-and-coke/coal-and-coke-production, https://www.eia.gov/international/data/world/petroleum-and-other-liquids/annual-refined-petroleum-products-production and https://www.eia.gov/international/data/world/natural-gas/dry-natural-gas-production. World Population data are available at https://data.worldbank.org/indicator/SP.POP.TOTL?view=chart. The data used from ref. [96] are available at https://web.stanford.edu/~mburke/climate/data.html.

Code availability

The code to reproduce the results is available at https://doi.org/10.7910/DVN/SHF1HU.

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Author contributions

A.D., M.L. and D.G.V. designed the research; M.L. analysed the data; and D.G.V. and A.D. wrote the paper.

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Software and code

Policy information about availability of computer code

Data collection	Survey was conducted online on the QuestionPro platform.
Data analysis	Stata 15.

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Behavioural & social sciences study design

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Study description	Elite online survey among climate policy experts. Individual-level data from online questionnaire was enhanced with open source data (e.g., World Bank) on the country-level. All data quantitative.
Research sample	Country delegates from UNFCCC COPs from 2010-2019 and authors or reviewers of the 5th IPCC Assessment Report. Study was designed as an elite survey among climate policy experts with high expertise regarding current issues of international climate policy.
Sampling strategy	No calculation to predetermine sample size was done. The sample is restricted by the availability of contact addresses and willingness to participate in the survey. Sample size is comparable or even somewhat higher compared to similar studies.
Data collection	Potential participants received an email with a personalized link to an online questionnaire on the QuestionPro platform.
Timing	September 2020 - January 2021
Data exclusions	Respondents were excluded when relevant variables for the analysis were missing.
Non-participation	The response rate is 46.89% based on participants who verifiably read (i.e. the link to the survey was opened) the invitation email. There is no other way for us to calculate the response rate, because we do not know how many individuals have actually received and seen the invitation.
Randomization	Participants were not allocated to experimental groups.

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Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging

Human research participants

Policy information about studies involving human research participants

Population characteristics	71 % male, Mean age 53 years, 28% from IPCC sample, 31% from Europe, 18% from Africa, 18% from Asia, 15% from North America, 11% from Latin America, 7% from Oceania.
Recruitment	Email addresses were researched on the Internet (only part of the potential participants addresses could be found) and invitations sent to those addresses with the invitation to participate in the survey (self-selection).
Ethics oversight	The research was evaluated and approved by the Ethics Committee of the University of Kassel, Germany.

Note that full information on the approval of the study protocol must also be provided in the manuscript.